

OPTIMIZING SALON SERVICES: REDUCING SCHEDULING ERRORS AND WAIT TIMES THROUGH AUTOMATION

Reema Choudhary^{*1}, Emaan Akhtar², Momina Akhtar³, Nauman Riaz Choudhary⁴,
Ayesha Rashid⁵

^{*1,2,3}Department of Software Engineering, University of Gujrat, Pakistan

^{4,5}Department of Computer Science, university of Gujrat, Pakistan

¹reema.choudhary@uog.edu.pk, ²22011598-067@uog.edu.pk, ³22011598-099@uog.edu.pk,

⁴nauman.riaz@uog.edu.pk, ⁵ayesha.rashid@uog.edu.pk

DOI: <https://doi.org/10.5281/zenodo.17473665>

Keywords

Article History

Received: 09 September 2025

Accepted: 15 October 2025

Published: 29 October 2025

Copyright @Author

Corresponding Author: *

Reema Choudhary

Abstract

The aim of this research is the use of technology to increase the efficiency of salon services by eliminating conflicts in scheduling and long waiting times for services caused by manually booking appointments. By applying Business Process Reengineering (BPR) and simulation modeling, the function of an automated appointment management system was advanced to make service flow more efficient, staff utilization more productive, and customer experience more pleasant. Information on the situation was obtained through surveys, while experiments in simulation were conducted to compare different models: the traditional process, the automated (To-Be) process, and the AI-driven generative model. Through simulation, it was visible that the automated system had brought down the average service time to 20 minutes, and the AI-based generative model had further optimized the process, thus, appointments could be completed within 10 minutes only. The ANOVA statistical testing had found that the model with the AI feature had efficiency and user satisfaction levels increased significantly. On top of that, the introduction of self-service kiosks and online booking features has made the system more adaptable and user-friendly. This study highlights that digital transformation driven by AI and process simulation is an excellent solution to the problems faced by the salon industry, which leads to improved operational efficiency, better utilization of resources, and increased customer loyalty resulting from faster, more convenient and reliable service delivery.

INTRODUCTION

Through BPR, companies can structure themselves and their operations to respond faster to changing market conditions, launch new products and services ahead of competition, enhance customer value, and achieve higher performance levels [1]. Simulation helps in analyzing new systems or modifications to existing systems. It helps predict outcomes and evaluate performance before real-world

implementation [2]. Business Process Engineering and Simulation and modelling have become essential today as they work together to improve processes. Simulation models maintain the temporal accuracy of DL models while preserving the what-if analysis capability of DDS methods, offering a valuable contribution to improving process simulation accuracy in business settings [3]. In

today's rapidly developing world, fashion and personal care have become more than just a luxury that is now a necessity. Whether it is a routine cut, skin care or manicure treatment, people invest in care for themselves to increase their trust and maintain a polished look. As a result, the beauty and salon industry is prospering and businesses are expanding their services to attract more customers. Despite growing demand, however, many salons continue to rely on traditional, manual planning of meetings, leading to significant inefficiency of services. Without a structured system, salons try to manage high volumes of customers, resulting in long queues and dissatisfied clients. Salon meetings management effectively remains the main challenge for customers and employees of the salon. Manual booking processes result in long waiting times, conflict planning and errors such as double reservation. Customers not only face a delay in booking, but also experience a long waiting period in the salon before receiving their services, especially during the top hours. When previous meetings last longer than expected, it also disrupts the schedule, causing inconvenience to customers and employees. These inefficiencies frustrate customers, reduce employees productivity and negatively affect business operations, making salons more difficult to provide a smooth experience. In addition, salons without an organized planning system are trying to manage the availability of employees, monitor customer preferences and effectively manage services. A structured automated appointment control system is required to address these challenges. The use of solutions using technology can shorten customer waiting times, eliminate booking errors and increase the efficiency of the workflow. Digital transformations in the management of the salon will not only improve customer satisfaction and operational productivity, but also help businesses remain competitive in the developing industry.

Literature Review:

BPE (Business Process Engineering) is a method to completely redesign and optimize workflows by analyzing inefficiencies, simulating improvements, and implementing radical changes (e.g. replacing manual steps with digital solutions) [4]. For example, earlier many people waited in long lines outside the

central jail to meet their relatives, sometimes 100–150 people at once.

From there the jail used Business Process Engineering (BPE) to implement this change. They made a mobile app where people could book a meeting and get an e-token. Small components are made to think and act more like humans with the help of advanced language models, such as AI. These instruments are employed to understand human communication, economic systems, and urban planning. Some of the issues are the management of big systems and the problem of whether the computer can make fair decisions or not [5].

For example, airlines offer pilots extremely lifelike simulation that recreates various flight scenarios, including emergency situations, such as loss of the engine, bad weather caused by the wind, and failure of the system. These state-of-the-art simulations cost very little compared to the original training, do away with the possibilities of any danger in the real world, and ensure that pilots get the necessary skills in a controlled simulated environment.

Business process engineering (BPE), simulation and modeling are the processes that are used for the optimization of workflow. With the help of business process engineering, you can analyze the processes and make them more efficient. Modeling (like BPMN) helps in the creation of an understandable and well-structured plan of the tasks, people, and the flow of things. Simulation is a form of testing for these models that are done by using a computer to check the level of their functionality in the real world [6].

Information about the time of a process and the occurrence of issues (such as delays) within a process is very valuable. These three works activities form a loop: process mining takes the real data from systems and builds a model, checking the model in different situations, then using BPE to work on the process based on the information received. It allows us to make data-driven and well-thought-out choices and improve processes while still being able to save time and money [7].

For instance: on a car production line, BPE analyzes the manufacturing data and finds the reason for the slow welding station. Modeling produces a digital version of the process with the help of BPMN, displaying all phases and limitations. The simulation shows that by adding an extra robotic welder and changing break times, the welding station's idle time

can be cut down by 22%, thus presenting that the welding place will have less waiting time. This is an example of how BPE, modeling, and simulation

work together to increase efficiency while at the same time not lowering the quality of the product.

Table 1: List Of Previous Studies

Sr. No	Years of publications	Journal or source	Author(s)	Focus of the paper	Proposed solution	Technique/ Approach used
1	2024	<i>Applied Information Technology and Computer Science (AITCS), Vol. 5 No. 2 (2024). [8]</i>	Xuan, Khoo Zi, and Nurul Aswa Omar	Manual booking causes scheduling conflicts, missed appointments and poor customer tracking	An online system automates booking, tracks preferences and improves management	Business Process Engineering
2	2024	<i>International Journal of Academic Research in Business and Social Sciences, Vol. 14, Issue 2. [9]</i>	Hui, Lim Yew, and Poh-Choin Teo	Company z's manual scheduling caused staff overload, conflicts, delays ,customer dissatisfaction due to limited booking hours.	The company automate scheduling with the digital system reducing wait times, stream lining workflow and enhancing customer experience	Business Process Engineering
3	2024	<i>Schmalenbachs Zeitschrift für betriebswirtschaftliche Forschung. [10]</i>	Kaluza, Isabel, Guido Voigt, knut haase, and Antonia Dietze	Online booking can reduce demand as too many open slots may signal low service quality.	The study suggests limiting visible slots using optimization models to boost perceived demands, maximize bookings and increase profits.	Business Process Engineering

4	2024	Published in 2024 in <i>Applied Information Technology and Computer Science (AITCS)</i> , Vol. 5 No. 2 (2024). [11]	Xin, Alise Yeap Rou	Elvira true beauty salons manual booking causes errors, missed appointments and data security risks.	A secure online booking system with 2FA and OTP via whatsapp automate scheduling, reduce errors and enhances data security.	Business Process Engineering
5	2023	<i>Master's thesis</i> at the University of the Witwatersrand, Johannesburg. [12]	Lemena, Boitumelo	Hair salons and spas struggle with understanding and managing customer experience, satisfaction and loyalty leading to inconsistent service quality and poor customer retention.	Skilled beauticians, better time management and a good environment boost customer satisfaction and loyalty.	Business Process Engineering
6	2023	<i>Applied Information Technology and Computer Science (AITCS)</i> , Vol. 4 No. 1 (2023).[13]	Feng, CheongW ai, and Moht Zainuri Saringat	Manual walk-in bookings cause long wait time, service delays and inefficient management of sales, invoices and employees.	A mobile booking app automate appointments, employee management and sales tracking while integrating QR codes for secure booking verification.	Business Process Engineering

7	2023	<i>Highlights in Business, Economics, and Management (EMFT 2023), Volume 19.</i> [14]	Zhao, Yuyi	Small beauty salons struggle with marketing, weak promotions and customer retention due to high competition.	Businesses should leverage social media, personalize services and enhance VIP management to boost	Business Process Engineering
					marketing and customer retention.	
8	2023	<i>International Conference of Health, Science, and Technology (ICOHETECH).</i> [15]	Permatasari, Hanifah, Eko Purwanto, and Triyono Triyono	The salon industries manual booking causes long waits, conflicts and poor customer experience.	The study recommends online booking, automation and personalization to boost customer satisfaction and reduce cancellations.	Business Process Engineering

9	2021	Bachelor's thesis at Tallinn University of Technology. [16]	Taraskin, Anton	Beauty service providers struggle with digital adoption, causing inefficiency, customer dissatisfaction and loss of competitiveness.	The study suggest digital strategies like CRM, online booking and feedback tools to enhance efficiency and customer satisfaction.	Business Process Engineering
10	2020	International Journal of Computer Applications and Technology Research. [17]	Piarsa, I Nyoman, and I Made Sukarsa	Traditional booking methods make salon appointments, locations and promotions hard to access.	GIS with E-CRM enables online booking, reviews, chat and location tracking for a better customer experience.	Business Process Engineering
11	2019	International Conference on Information Management and Technology (ICIMTech).[18]	Maryani, Hendro Nindito, and Hendra Alianto	Salons face long wait time due to manual booking, causing delays, while customers prefer online reservations.	Web based booking system reduce wait times by enabling online appointments	Business Process Engineering
					, stylist selection and reservation tracking.	

12	2021	Bachelor's thesis at Tallinn University of Technology. [19]	Ramesh, Ganapathi Baliada, Brittany Harju, Daniel Scipion, Kristina Vujic, and Edward J Williams	Salons experience long wait times, inefficient staff utilization and congestion in service areas due to poor resource allocation and scheduling.	A simulation model optimizes staff scheduling, resource use and appointment flows to reduce wait times and improve efficiency.	Simulation and modeling
13	2017	<i>International Journal of Novel Research in Marketing Management and Economics</i> . [20]	Magaba, Nkhumise ni Elsie, and P M upambwa	Small and medium sized salons struggle with customer retention, service personalization and adapting to global competition, leading to declining customer loyalty.	Implementing effective CRM strategies help salon understand customer preferences, enhance personalized services and improve customer satisfaction and retention.	Business Process Engineering
14	2007	<i>Mental Health Center of Denver and University of Colorado at Boulder</i> . [21]	LaGanga, Linda R, and Stephen R Lawrence	No-shows cause revenue loss, low productivity and idle resources with rates ranging from 3% to 80%.	The study suggests an optimized overbooking model to boost revenue while balancing wait times and provider costs.	Business Process Engineering

15	2005	<i>International Journal of Simulation and Process Modelling</i> . [22]	Hlupic, Valatka, and Gert Jan De Vreede	Business process reengineering (BPR) projects often fail due to poor process evaluation, high risks and lack of predictive tools making it difficult to implement successful changes	The study recommends discrete event simulation to test strategies, reduce risks and optimize workflows before implementation.	Simulation and modeling
----	------	---	---	--	---	-------------------------

Table 1: List of previous studies

The chosen research papers concentrate on improving appointment scheduling, customer relationship management (CRM), and operational efficiency in the salon and beauty industry by utilizing digital solutions. Numerous studies emphasize the inefficiencies associated with manual booking processes, extended wait times, scheduling conflicts, and customer dissatisfaction as significant obstacles. The suggested solutions encompass online booking platforms, customer relationship management (CRM) strategies, geographic information systems (GIS), and artificial intelligence (ai) optimizations to enhance service quality and business performance. Our system combines business process engineering (BPE) and simulation by converting traditional salon appointment management into an automated digital solution. Because we have transitioned from manual

booking processes to a structured and efficient system, this aligns with BPE, as it emphasizes optimizing workflows, reducing inefficiencies, and improving service delivery. By reducing wait times, scheduling conflicts, and human errors, the system enhances both customer satisfaction and business efficiency. To illustrate the effectiveness of our system, we develop a simulation model that compares the manual appointment process with the newly implemented automated solution. This simulation offers a visual representation of waiting times, service flow, and resource utilization. Through the analysis of real-time data and various scheduling scenarios, the simulation demonstrates how automation improves efficiency, minimizes delays, and optimizes staff allocation, guaranteeing a smooth experience for both customers and salon management.

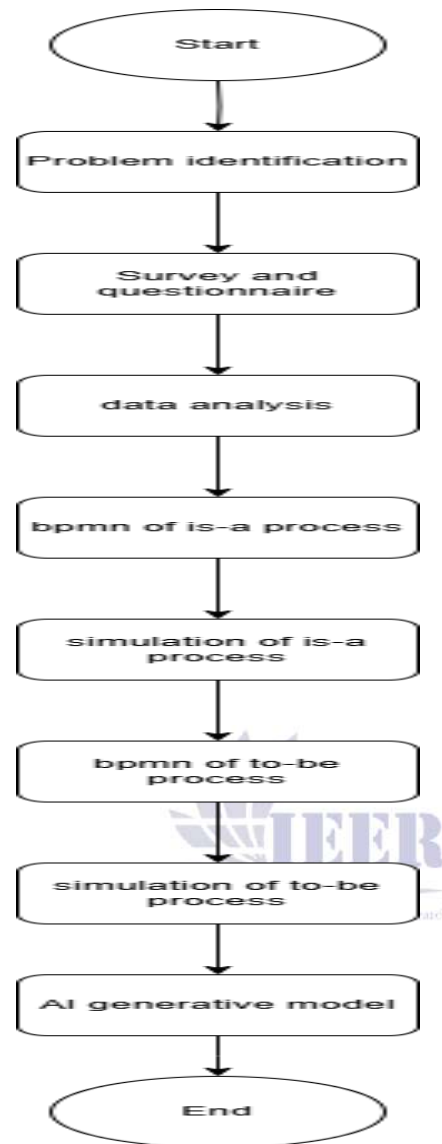


Figure 1: Methodology WorkFlow

Methodology:

Methodology is the systematic research on how scientific research is conducted. Methodology is an organized methodology for studying how research is conducted scientifically, based on different steps and techniques to solve research problems. This includes identifying appropriate approaches, understanding their assumptions, and choosing appropriate strategies according to the nature of the problem. Developing hypotheses, planning studies, collecting and analyzing data, and determining evidence-based conclusions are all steps in the process. Many customers do not wait long enough to reserve a seat

and end up standing in line as many salons still manage appointments manually. The customers are told that they will have to wait in the waiting area until the stylist is available to see them if they are busy. Customers must wait in a separate line to pay after they have completed the service. Not to mention that this whole process can be very frustrating and time consuming. Furthermore, staff scheduling is not always efficient and appointments frequently conflict, which leads to poor resource management. The manual booking system harms the salon's efficiency, as delays, misinterpretations, and overall poor management are created. Without

a real-time customer flow tracking system, the workload is often uneven; stylists are left with work hours that would otherwise be spent on appointments, or the customers have to wait too long for services. Customer delays occur because of all of these, which affects the overall experience, reducing satisfaction, and eventually affects client

loyalty. We used a well-structured questionnaire to conduct a survey to discover if others experience the same problems. Customer experiences with reservations, wait times, and satisfaction with service were the main topics of the survey. To get honest feedback we distributed it to a wide variety of salon patrons. Here is the questionnaire:

| **Questionnaire**

Purpose:

This questionnaire aims to gather feedback on the current salon booking process and identify areas for improvement. Your responses will help us develop an automated system to enhance convenience, reduce waiting time, and improve customer satisfaction.

Personal Information:

Name: _____ Age: _____
 Department: _____ Semester: _____

Instructions:

Please read all questions carefully and honestly. Read each question thoroughly before responding. Your responses will remain confidential and will only be used for research purposes.

Questions:

1. How often do you visit the salon?	<input type="radio"/> Once a week	<input type="radio"/> Twice a month
2. How much time do you usually spend at the salon during your visit?	<input type="radio"/> Once a month	<input type="radio"/> Rarely
3. How do you usually book your salon appointment?	<input type="radio"/> Less than 30 mins	<input type="radio"/> 30-60 mins
4. How difficult is it for you to book a salon appointment?	<input type="radio"/> 1-2 hrs	<input type="radio"/> More than 2hrs
5. How long do you usually wait at the salon to get services?	<input type="radio"/> Walk-in	<input type="radio"/> WhatsApp message
6. Do you feel frustrated while waiting for your turn?	<input type="radio"/> Phone call	<input type="radio"/> Through a friend or referral
7. How often do you miss an appointment because you forgot about it?	<input type="radio"/> Very difficult	<input type="radio"/> Somewhat difficult
8. Would appointment reminders (SMS/email) be helpful for you?	<input type="radio"/> Neutral	<input type="radio"/> Not difficult at all
9. Do you think online booking is a better option than calling or visiting the salon?	<input type="radio"/> 0-10 mins	<input type="radio"/> 10-20 mins
10. Do you think an automated salon booking system would improve your overall experience?	<input type="radio"/> 20-50 mins	<input type="radio"/> More than 50 mins
	<input type="radio"/> Always	<input type="radio"/> Sometimes
	<input type="radio"/> Rarely	<input type="radio"/> Never
	<input type="radio"/> Always	<input type="radio"/> Sometimes
	<input type="radio"/> Rarely	<input type="radio"/> Never
	<input type="radio"/> Extremely helpful	<input type="radio"/> Somewhat helpful
	<input type="radio"/> Not sure	<input type="radio"/> Not helpful at all
	<input type="radio"/> Strongly Agree	<input type="radio"/> Agree
	<input type="radio"/> Disagree	<input type="radio"/> Strongly Disagree
	<input type="radio"/> Strongly agree	<input type="radio"/> Agree
	<input type="radio"/> Neutral	<input type="radio"/> Disagree

Figure 2: Questionnaire

We worked hard to analyze the data and discover trends after gathering the responses. The results have shown that often these difficulties are encountered by customers. According to all the respondents, the current manual system is not satisfactory for them. This clearly states that improvements are needed. Customer satisfaction and efficiency in the salon can be dramatically improved with an automated and real-time appointment process. As demand for disciplined Business Process Management increases,

BPMN plays a key role in this effort by bringing process modeling into line with industry practices. One of the most popular models being used is BPMN, which helps businesses show clearly and consistently their business processes [23]. To make analysis more thorough and better understandable, we created a BPMN model of the process. The changes that need to be made according to the flow of the process would be documented accordingly.

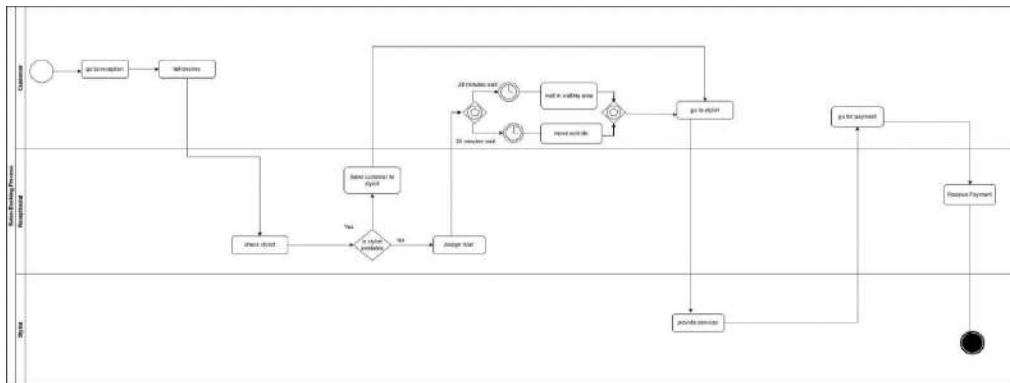


Figure 3: BPMN of Is-a process

It provides dynamic representation of real-world systems, abstracted illustration and flexibility in making complex behavioral assumptions. That is why simulation modeling is an important tool in

business and management research. It allows to analyze interdependent processes and generate virtual data to develop theory . We create simulation of current process for virtual clarity.

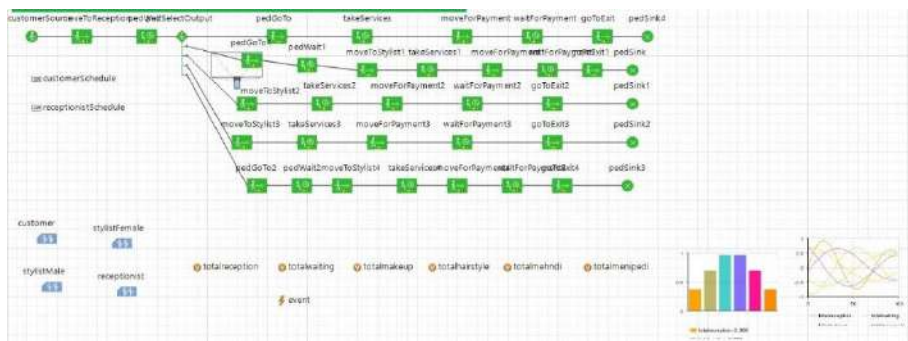


Figure 4: Simulation model of Is-a process

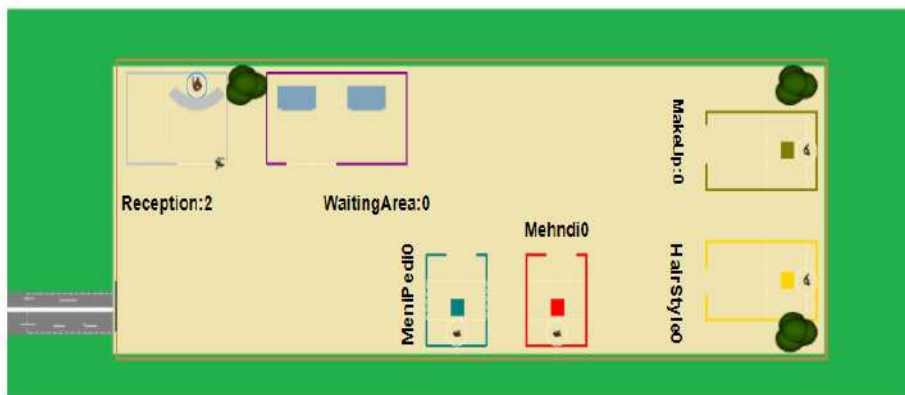


Figure 5: 2D view of Is-a process

We came up with a solution to create a system/app to allow the client to book appointments for the salon online. Clients can choose and confirm their appointment prior to arriving at the salon

through the app, which displays available stylists, time slots and services in real time. No waiting in line and scheduling issues will occur by this means. The process was considerably organized and smoother because of automated booking

management. Clients will have a much faster, easier and better experience since they just walk in at the set appointment time and have their

services delivered right away. Here's the BPMN of to be process:

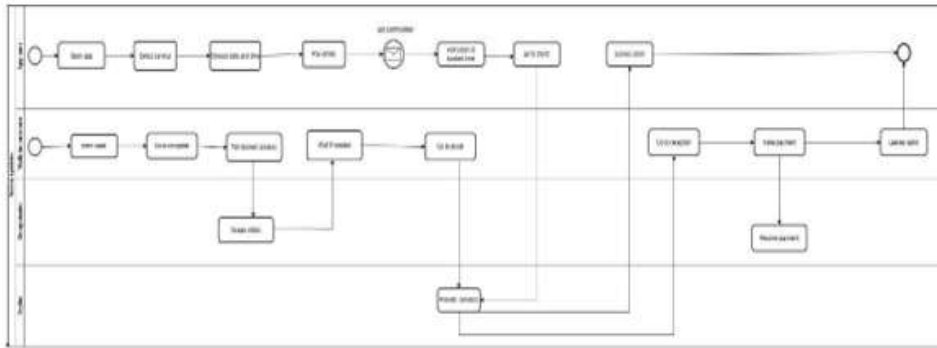


Figure 6: BPMN of To-be process

Here is the simulation of to be process:

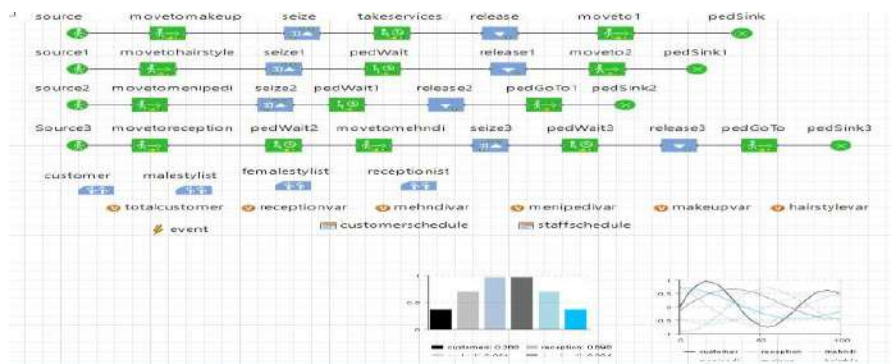


Figure 7: Simulation model of To-be process

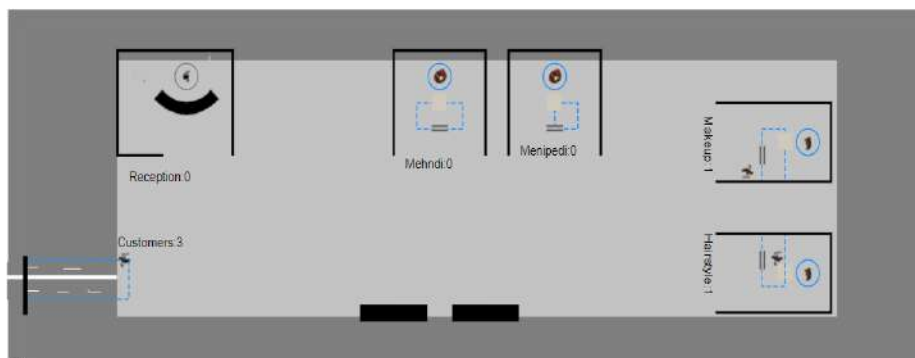


Figure 8: 2D view of To-be process

Given that we live in a time of artificial intelligence we decided to run our problem through an AI generative model and ask it to come up with some suggestions for how to fix the issue. AI analysed our problem and found that when some walk-in clients came in there would not be any reservations made, though the majority of customers would likely make

their appointments online using the app. The AI suggested we place walk in self service kiosks in the salon to address this issue. Where there were walk-in clients, they would be able to register on the kiosks and receive service according to availability. At the same time the system would ensure that previous clients who have already made an appointment with

us by using the app would receive preference. This is a genius mix of AI and automation to ensure a smooth workflow, avoid unnecessary wait time and

treat all kinds of customers in a way that is fair to everyone. Here is the BPMN of model produced by AI:

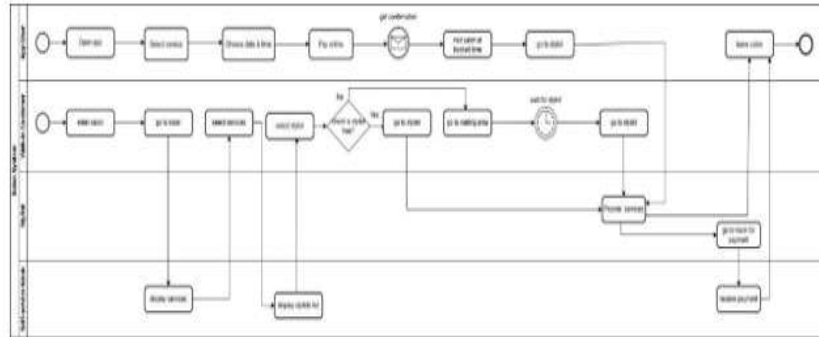


Figure 9: BPMN of AI generative process



Figure 10: Simulation model of AI generative model

Here is the simulation model produced from AI:

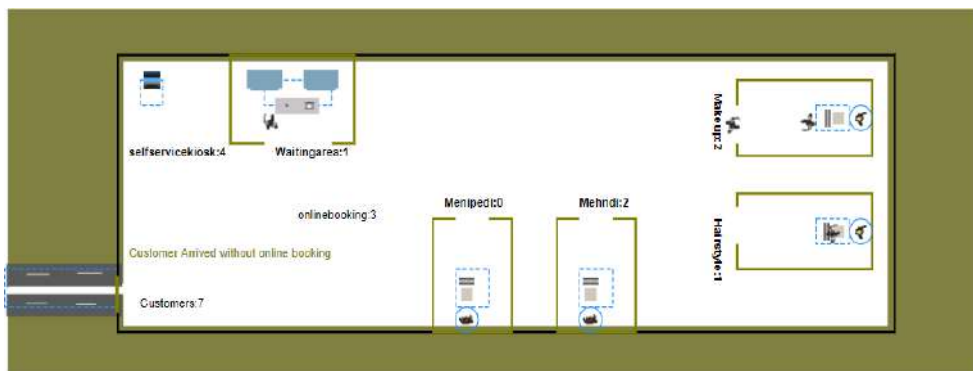


Figure 11: 2D view of AI generative model

Result:

According to a survey of 1500 respondents, 65% of respondents expressed their dissatisfaction with the

existing manual booking system and 78% of respondents reported being in general compelled to wait long at the salon. These shortcomings were

clearly shown by the simulation model of the actual ('Is-A') process as it showed underused employees and poorly managed flow of customers. Therefore, with less waiting and better stylist scheduling after adopting the automated (To-Be) system, the procedure considerably improved. The AI generative

model of choice also recommended the best timeslot based on client preference and stylist availability, further improving the experience. All in all, the new

system greatly improves customer satisfaction and efficiency. In order to simulate the manual (Is-A) process, one hundred clients entered the salon, according to the simulation model. Only a small percentage of these customer received prompt service and many customers had to wait due to the manual handling, haphazard scheduling and shortage of employees. For most customers this process took about 45 minutes or more.

No. of customers	No. of people who received direct services	No. of people who had to wait for services	Total Time
100	32	68	45 minutes

Table 2: Result of Manual (As-Is) Process

According to the simulation model [automated (To-Be) process] we studied a total of 100 clients who made appointments by the digital system. A large proportion of them got direct services without problems, however

some had to wait still because the slots were limited and there were conflicting appointments. It took about 20 minutes to complete, that's way faster.

No. of customers	No. of peoples who received direct services	No. of people who had to wait for services	Total time
100	70	30	20 minutes

Table 3: Result of To-Be Process

100 clients have engaged with the AI-enabled system according to the Generative AI process simulation model. Of these 70 percent made reservations online and were served immediately.

While AI prioritized app reservations, the remaining 30 percent used kiosks and only 15 percent of them had to wait for a short time. This method was the most effective, and only took 10 minutes to finish.

No. of customers	No. of People who received direct services	No. of people who had to wait for services	Time
100	80	20	15 minutes

Table 4: Result of Generative AI Process

Also from the simulation charts we can easily see how the three models compare in terms of customer flow, waiting times, and customer performance. The

visualizations provide evidence for the effectiveness of the proposed AI solution and support the numerical results.

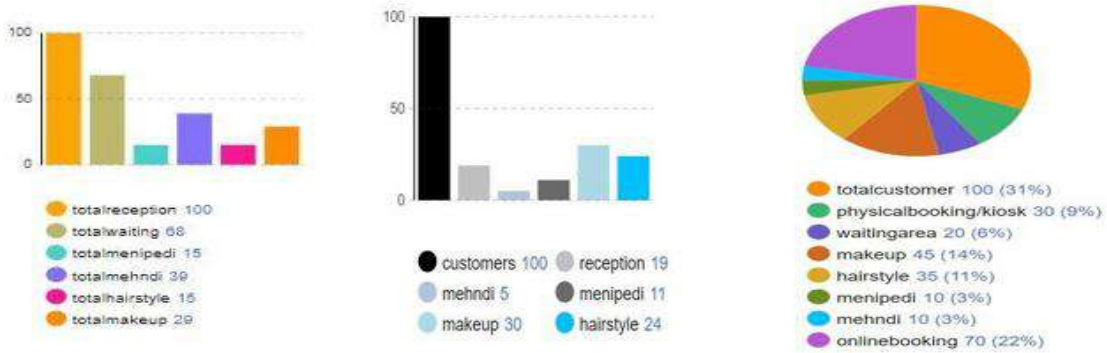


Fig 11: Is-A process chart

Fig 12: To-Be process chart

Fig 13: AI generative process chart

A statistical table assessing the time spent by 100 clients on each of three models was created using ANOVA testing. This table contains detailed information on time spent for each model.

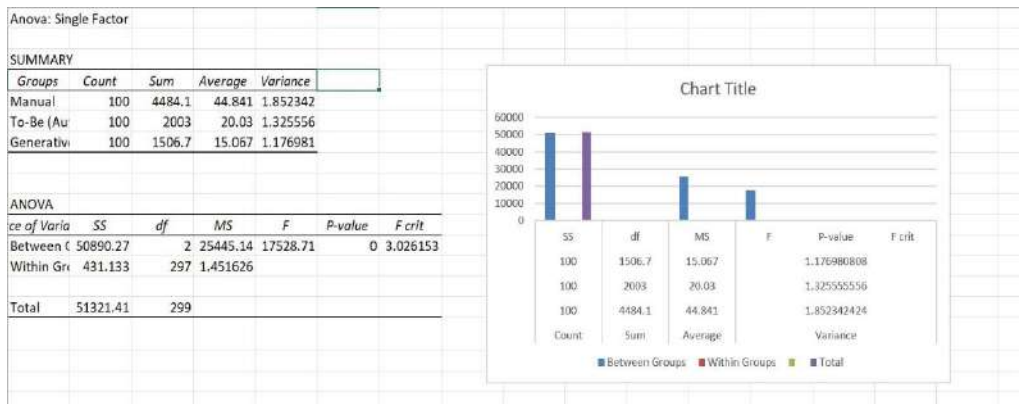


Fig 14 :ANOVA test result

After careful analysis, we found that generative model using artificial intelligence (AI) method uses less time as compared to other methods. Furthermore, AI solution also provides self-service kiosk and online appointment booking facility making it very versatile and user-friendly.

Therefore, the AI generative model is the most advantageous and efficient way of optimizing the process overall model from AI.

Conclusion:

The research findings illustrate how the inclusion of generative AI has substantially improved the overall efficiency and user-friendliness of the appointment and service management processes. A simulation of interaction with 100 clients showed that the automated digital system (To-Be model) was able to drastically cut down the service time in comparison to the traditional method, making it possible to finish within about 20 minutes. On the other hand, the AI-enabled generative model went even further in process optimization, thus the aggregate time for achieving the service was around 10 minutes, and at the same time, scheduling and prioritization were made smoother.

The ANOVA statistical analysis which was conducted to compare the three scenarios has also corroborated the findings revealed by the simulation results, pointing out that the AI-based system was far better than the other two in terms of time efficiency and service accessibility. With the introduction of self-service kiosks and online appointment booking, the generative AI solution became a more versatile, adaptive and user-friendly experience. Thus, these improvements helped to very short waiting times and at the same time system responsiveness and resource utilization were also enhanced. Their generative AI model, in effect, epitomizes the most desirable and productive strategy in the realm of process optimization by virtue of its scalable and intelligent framework, which is capable of accommodating future digital service systems in other operational domains of the same nature.

REFERENCES

- R. Bhatnagar, "Business Process Reengineering: Concept, Methods and Application," *Journal of Organization & Human Behaviour*, vol. 8, no. 2, pp. 28–36, 2019.
- I. John, *Introduction to Simulation: Introduction to Modeling and Simulation*. 2003.
- M. Camargo, M. Dumas, and O. González-Rojas, "Learning Accurate Business Process Simulation Models from Event Logs via Automated Process Discovery and Deep Learning," in *Advanced Information Systems Engineering*, vol. 13295, X. Franch, G. Poels, F. Gailly, and M. Snoeck, Eds., in *Lecture Notes in Computer Science*, vol. 13295, Cham: Springer International Publishing, 2022, pp. 55–71. doi: 10.1007/978-3-031-07472-1_4.
- R. Choudhary, A. Shahbaz, A. Usman, N. R. Chaudhry, M. H. Haider, and M. Suhail, "Enhancing Inmate Meeting Processes: A Simulation-Driven Business Process Engineering Approach." C. Gao et al., "Large Language Models Empowered Agent-Based Modeling and Simulation: A Survey and Perspectives," *Humanities and Social Sciences Communications*, vol. 11, no. 1, p. 1259, Sept. 2024, doi: 10.1057/s41599-024-03611-3.
- K. Swarooprani, "An Study of Research Methodology," *International Journal of Scientific Research in Science, Engineering and Technology*, pp. 537–543, June 2022, doi: 10.32628/IJSRSET2293175.
- B. Estrada-Torres, M. Camargo, M. Dumas, L. García-Bañuelos, I. Mahdy, and M. Yerokhin, "Discovering Business Process Simulation Models in the Presence of Multitasking and Availability Constraints," *Data & Knowledge Engineering*, vol. 134, p. 101897, July 2021, doi: 10.1016/j.datak.2021.101897.
- K. Z. Xuan and N. A. Omar, "Online Salon Appointment and Management System of FOREVER18 Hair Salon," —, vol. 5, no. 2, 2024.
- L. Y. Hui and P.C. Teo, "An Implementation of Digital Platform to Enhance the Appointment Scheduling System," *International Journal of Academic Research in Business and Social Sciences*, vol. 1, no. 2, 2024.

- I. Kaluza, G. Voigt, K. Haase, and A. Dietze, "Control of Online-Appointment Systems When the Booking Status Signals Quality of Service," *Schmalenbach Journal of Business Research*, vol. 76, no. 3, pp. 397–432, Sept. 2024, doi: 10.1007/s41471-024-00188-0.
- A. Y. R. Xin, "Appointment Management System for Elvira True Beauty Salon with Two-Factor Authentication."
- B. Lemena, "Customer Experience, Satisfaction and Loyalty at South African Hair Salons and Spas."
C. W. Feng and M. Z. Saringat, "Barbershop Service Booking Application for Hair Emotion Matrix Saloon," vol. 4, no. 1, 2023.Y.
- Zhao, "Analysis of Marketing Strategy in Life Beauty Industry," *Highlights in Business, Economics and Management*, vol. 19, pp. 646–650, Nov. 2023, doi: 10.54097/hbem.v19i.12109.
- H. Permatasari, E. Purwanto, and T. Triyono, "Analysis of the Role of Reservation Systems in Improving Customer Experience in the Salon and Spa Industry: Literature Review," in *Proceeding of International Conference on Science, Health, And Technology*, Sept. 2023, pp. 220–228. doi: 10.47701/icohetech.v4i1.3395.
- A. Taraskin, "Impact of Digital Transformation on Beauty Services Providers and Customer Satisfaction."
I. N. Piarsa, I. M. Sukarsa, and I. K. D. K. Putra, "Department of Information Technology Faculty of Engineering Udayana University Badung, Bali, Indonesia," *International Journal of Computer Applications Technology and Research*, vol. 9, no. 2, 2020.
- H. N. Maryani and H. Alianto, "Prototype Development for Online Reservation System in Barbershop and Salon Industry," in *2019 International Conference on Information Management and Technology (ICIMTech)*, Jakarta/Bali, Indonesia: IEEE, 2019, pp. 58–61. doi: 10.1109/ICIMTech.2019.8843836.
- G. B. Ramesh, B. Harju, D. Scipione, K. Vujic, and E. J. Williams, "Simulation Improves Service and Resource Allocation at a Salon."
- N. E. Magaba and P. Mupambwa, "Evaluating the Effectiveness of Customer Relationship Management on Small Medium Enterprise Salon Businesses in Johannesburg Region-A," vol. 4, no. 1, 2017.
- L. R. LaGanga and S. R. Lawrence, "An Appointment Scheduling Model to Improve Client Access and Provider Productivity."
V. Hlupic and G. J. De Vreede, "Business Process Modelling Using Discrete-Event Simulation: Current Opportunities and Future Challenges," *International Journal of Simulation and Process Modelling*, vol. 1, no. 1/2, p. 72, 2005, doi: 10.1504/IJSPM.2005.007115.
- J. Recker, M. Indulska, M. Rosemann, and P. Green, "How Good is BPMN Really? Insights from Theory and Practice," in *Proceedings of the 14th European Conference on Information Systems (ECIS)*, J. Ljungberg and M. Andersson, Eds., Göteborg, Sweden, 2006.
- Xuan, Khoo Zi, and Nurul Aswa Omar. "Online Salon Appointment and Management System of FOREVER18 Hair Salon" 5, no. 2 (2024).
- Hui, Lim Yew, and Poh-Chuin Teo. "An Implementation of Digital Platform to Enhance the Appointment Scheduling System." *INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS AND SOCIAL SCIENCES* 1, no. 2 (2024).
- Kaluza, Isabel, Guido Voigt, Knut Haase, and Antonia Dietze. "Control of Online-Appointment Systems When the Booking Status Signals Quality of Service." *Schmalenbach Journal of Business Research* 76, no. 3 (September 2024): 397–432. <https://doi.org/10.1007/s41471-024-00188-0>.
- Xin, Alise Yeap Rou. "Appointment Management System for Elvira True Beauty Salon with Two-Factor Authentication," n.d.
- Lemena, Boitumelo. "Customer Experience, Satisfaction and Loyalty at South African Hair Salons and Spas," n.d.Feng, Cheong Wai, and Mohd Zainuri Saringat. "Barbershop Service Booking Application for Hair Emotion Matrix Saloon" 4, no. 1 (2023).

- Zhao, Yuyi. "Analysis of Marketing Strategy in Life Beauty Industry." *Highlights in Business, Economics and Management* 19 (November 2, 2023): 646-50. <https://doi.org/10.54097/hbem.v19i.12109>.
- Permatasari, Hanifah, Eko Purwanto, and Triyono Triyono. "ANALYSIS OF THE ROLE OF RESERVATION SYSTEMS IN IMPROVING CUSTOMER EXPERIENCE IN THESALON AND SPA INDUSTRY: LITERATURE REVIEW." *Proceeding of International Conference on Science, Health, And Technology*, September 23, 2023, 220-28. <https://doi.org/10.47701/icohetech.v4i1.3395>.
- Taraskin, Anton. "IMPACT OF DIGITAL TRANSFORMATION ON BEAUTY SERVICES PROVIDERS AND CUSTOMER SATISFACTION," n.d.
- Piarsa, I Nyoman, and I Made Sukarsa. "I Kadek Dharma Krisna Putra Department of Information Technology Faculty of Engineering Udayana University Badung, Bali, Indonesia." *International Journal of Computer Applications Technology and Research* 9, no. 02 (2020). Maryani, Hendro Nindito, and Hendra Alianto. "Prototype Development For OnlineReservation System in Barbershop and Salon Industry." In 2019 International Conference on Information Management and Technology (ICIMTech), 58-61. Jakarta/Bali, Indonesia: IEEE, 2019. <https://doi.org/10.1109/ICIMTech.2019.8843836>.
- Ramesh, Ganapathi Baliada, Brittany Harju, Daniel Scipione, Kristina Vujic, and Edward J Williams. "SIMULATION IMPROVES SERVICE AND RESOURCE ALLOCATION AT A SALON," n.d.
- Magaba, Nkhumiseni Elsie, and P Mupambwa. "Evaluating the Effectiveness of Customer Relationship Management on Small Medium Enterprise Salon Businesses in Johannesburg Region-A" 4, no. 1 (2017).
- LaGanga, Linda R, and Stephen R Lawrence. "An Appointment Scheduling Model to Improve Client Access and Provider Productivity," n.d. Hlupic, Vlatka, and Gert Jan De Vreede. "Business Process Modelling Using Discrete-Event Simulation: Current Opportunities and Future Challenges." *International Journal of Simulation and Process Modelling* 1, no. 1/2 (2005): 72. <https://doi.org/10.1504/IJSPM.2005.007115>.
- Bhatnagar, R. (2019). Business process reengineering: Concept, methods and application. *Journal of Organization & Human Behaviour*, 8(2), 28-36.
- John II. (2003). Introduction to Simulation: Introduction to Modeling and Simulation(pp. 7-13).Camargo, Manuel, Marlon Dumas, and Oscar González-Rojas. "Learning Accurate Business Process Simulation Models from Event Logs via Automated Process Discovery and Deep Learning." In *Advanced Information Systems Engineering*, edited by Xavier Franch, Geert Poels, Frederik Gailly, and Monique Snoeck, 13295:55-71. Lecture Notes in Computer Science. Cham: Springer International Publishing, 2022. https://doi.org/10.1007/978-3-031-07472-1_4.
- Choudhary, Reema, Adrees Shahbaz, Ali Usman, Nauman Riaz Chaudhry, Muhammad Hanan Haider, and Muhammad Suhail. "ENHANCING INMATE MEETING PROCESSES: A SIMULATION-DRIVEN BUSINESS PROCESS ENGINEERING APPROACH," n.d.Gao, Chen, Xiaochong Lan, Nian Li, Yuan Yuan, Jingtao Ding, Zhilun Zhou, Fengli Xu, and Yong Li. "Large Language Models Empowered Agent-Based Modeling andSimulation: A Survey and Perspectives." *Humanities and Social Sciences Communications* 11, no. 1 (September 27, 2024): 1259. <https://doi.org/10.1057/s41599-024-03611-3>.
- Estrada-Torres, Bedilia, Manuel Camargo, Marlon Dumas, Luciano García-Bañuelos, Ibrahim Mahdy, and Maksym Yerokhin. "Discovering Business Process Simulation Models in the Presence of Multitasking and Availability Constraints." *Data & Knowledge Engineering* 134 (July 2021): 101897.

- <https://doi.org/10.1016/j.datak.2021.101897>.
- Dr. Swarooprani. K. "An Study of Research Methodology." International Journal of Scientific Research in Science, Engineering and Technology, June 28, 2022, 537-43. <https://doi.org/10.32628/IJSRSET2293175>.
- Recker, J., Indulska, M., Rosemann, M., & Green, P. (2006). How good is BPMN really? Insights from theory and practice. In J. Ljungberg & M. Andersson (Eds.), Proceedings of the 14th European Conference on Information Systems (ECIS), Göteborg, Sweden. Nguyen T. B. T. (2021). Simulation modeling - An effective method in doing business and management research. Ho Chi Minh City Open University Journal of Science -Economics and Business Administration, 12(1), 1-18.

