

Applications of Blueprints on Hospital Residency Program

Abdulaziz T. Almaktoom¹

Abstract

Residency programs are completely essential for medical school students. This pivotal experience enriches students' education and yields an opportunity to secure jobs. Training local doctors is a laborious endeavor that faces many challenges during the recruitment cycle. Private medical schools have attempted to meet their goals by reducing waste and improving processes. This study aims to investigate the issues that arise in the service flow process on the hospital residency programs and to investigate the impact of risk on the provided service. Service blueprint techniques are applied to examine and provide a comprehensive understanding of hospital residency programs and the underlying resources and processes that make it possible. Data is collected from a private hospital to develop the initial and future service blueprint, providing strategic benefits for the hospital. The study helps in reducing the service process time by almost 90%.

Keywords: *house of risk, service blueprint, quality enhancement, quality control.*

1. Introduction

Nowadays, due to the intense competition between companies to offer their customers high quality products and services, the field of business is getting riskier and becoming more complex. Moreover, owing to high demand, many businesses tend to offer more products and services, which increase their risks. Many studies agree that service has been a pressure at the back of today's world. Furthermore, services can be used in various industries, including hospitals, education, transportation, design, and business. Residency programs are an important aspect of the healthcare system. They aim to provide great care for people. The healthcare industry is a one-of-a-kind, high-contact service. Thus, it requires excellent and efficient integration between front- and back-office activities to provide the residents with timely and high-quality training. In fact, residency programs are completely essential for students from stand-alone medical schools. Most medical students are struggling while securing their training. "The travel and expense of the residency interview process are exhausting and financially cumbersome for most students" [1]. Numerous research articles have highlighted the difficulties medical students face in residency programs [2-5]. For example, Chemali, Henderson, and Fricchione discussed the challenges faced during the development and implementation of a dual residency program [6].

Additionally, service quality in hospitals has piqued the interest of various studies. Service flow must be monitored by each department's management to determine the overall service flow and to determine whether some steps need to be incorporated to increase efficiency. This will help decision makers assess how to continue the service flow at a reasonable cost while maintaining client satisfaction. Ahmed, Abd Manaf, and

¹ Department of Operations and Supply Chain Management, Effat University, Jeddah 21478, Kingdom of Saudi Arabia, atalmaktoom@gmail.com, ORCID iD: 0000-0003-4958-5946

Islam (2018) stated that Lean Six Sigma is an improved process improvement method that improves quality and speed while reducing the waste and costs of a product or service [7]. This approach is rapidly gaining popularity and is being used in the service and manufacturing industry to improve the business quality performance. Using this approach, the quality performance of the organization can be improved by maximizing the process speed of services and reducing costs and cycle [8]. Since the early 2000s, the Lean Six Sigma methodology has been incorporated into many healthcare organizations to improve value-added activities to better meet their needs. Subsequently, healthcare organizations have not only increased their value-added activities but also reduced non-value-added activities, such as waste and unnecessary services. Additionally, healthcare quality performance can be improved by applying the Lean Six Sigma approach to nurse and physician care, hospital environment, patient safety, hospital stay, and waiting time inside the hospital. Moreover, these factors can lead to an increase in patient satisfaction and to loyalty in healthcare services. According to a previous study in [9], the use of the Lean Six Sigma approach provides the staff with a sense of ownership and accountability, which motivates them to perform better. Additionally, Schonberger (2019) stated that the primary goal of Lean is to provide customers with a faster, more flexible, and higher-quality response [10].

The service blueprint shares some similarities with other similar frameworks, such as business process modeling notation (BPMN) and unified modeling language (UML), [11]. However, unlike the other frameworks, service blueprint is less complex and simpler in every aspect, from how it displays the service steps and provides clear valuable information that can assess the managers in different ways to seeing the service from the customer viewpoint; it presents the fail points that may occur [12]. Additionally, the way service blueprint portrays the mapping flow of the service stages helps in examining the interactions among the stages, especially between the customers and the employees, resulting in the identification of the risk event and the risk agent. Overall, the service blueprint is a framework for planning, designing, and service development and innovation [11].

Service Blueprint

The service blueprint diagram is presented as a technical method for service control, offering advantages such as accurate verbal definitions, preemptive tackling of issues, and, most importantly, pinpointing failures in service operations [11]. The concept of service blueprinting was first introduced by G. Lynn Shostack in the Harvard Business Review in 1984. It aims to lessen the risk of service failures by visualizing a customer trip map, and it has been used in various tourist and hospitality applications, including airline services, historic residences, hotel and restaurant services, and nature-based tourism services [13]. A service blueprint is a visual representation of the service processes, and it aids service providers in the planning, delivery, and management of innovative solutions. It shows how the operation will take place and who will be in charge of what. These graphic representations highlight the potential differences and display how the customer, staff, and support services can work together to obtain the best possible outcome. Visual service designs can express sophisticated service activities more clearly and effectively than verbal explanations.

Then, the service blueprint was modified to be more customer-focused for planning the customer processes against the organization structure [14]. Moreover, the service blueprint was refined to differentiate between the onstage and backstage activities. All these components and important features form a structural base that helps to shine light on the role of the customer within the service process [15]. It also helps employees and internal units to observe what they need to do to the entire integrated system; therefore, service blueprint helps reinforce employees into becoming more customer-oriented and provide clarifications across departmental.

According to Suzianti, Avicenna, and H. Larasati in [16], service blueprint is a complete mapping of all service activities and interactions and is a useful technique for identifying problems in the service system and criteria that could improve the service performance, uniformity, and consistency. Furthermore, it is often referred to as the “moment of truth,” wherein the interactions and connections between customers and employees are mapped from the moment they have contact with the service until it is completed, including backstage processes. It objectively demonstrates the people who provide the service from the same point of view. Five zones and four boundaries make up the service blueprint. The five regions are physical evidence, consumer actions, onstage interaction, backstage contact, and support process. They divide services into front- and back-of-the-house tasks. A service blueprint plays a significant part in the specific design of the product-service system. It is a well-known design tool that has its origins in the service business, where the horizontal axis reflects the chronology of actions, while the vertical axis reflects the numerous service areas in the service plan [17].

Service plans can more clearly and efficiently communicate complicated service processes to stakeholders than verbal explanations of the services [18]. In research, blueprints can be used to provide details about treatments. In implementation science, a clearly defined blueprint can be used to compare the exact nature of service changes to the status. A blueprint can help solve difficulties and bring disparate processes together. An implementation blueprint provides broad principles regarding content understanding, implementation features, and action planning [19-20].

2. Methodology

Qualitative approaches are frequently used in business and management research. This is mainly because qualitative approaches can reveal a wealth of information about underlying mechanisms and processes [21]. Furthermore, qualitative research is inductive in nature, with the researcher exploring meanings and insights in a specific context. It is used to investigate people’s actions, opinions, feelings, and experiences [22-23]. Furthermore, it does not comprise statistical analysis and empirical computation. Social and cultural anthropology, philosophy, psychology, history, and sociology are the foundations of qualitative research. Furthermore, qualitative research yields a “deep grasp of the particular.” It also aims to develop new concepts and theories by systematically describing and interpreting topics or events from the perspective of the individual or population being examined. There are six main qualitative data collection methods: one-on-one interviews, focus group, record keeping, observation, longitudinal studies, and case studies. Case studies denote one-on-one interviews, record keeping, and observation. Additionally, the case studies evaluated herein provide in-depth analysis of the hospital residency program process in a private hospital in Saudi Arabia.

Service Blueprint is a graphic or map that accurately reflects the service environment so that the numerous people involved in its delivery can understand and interact with it honestly regardless of their positions or perspectives (Figure 1). The service phase is depicted in two dimensions: The horizontal axis displays the events taking place between the service customer and service provider. The vertical axis divides different regions of action. These areas of action are distinguished by different lines.

For example, the Blueprint model of a restaurant can be created according to the following.

1. Customer action denotes the customer movement, including customers entering the restaurant, customers asking the employee, and the number of people dining and ordering food.
2. Front stage interactions refer to the actions performed by employees, such as greeting customers, leading the customers to their table, and giving customers the menu.

The line dividing the front stage interactions and the physical evidence is known as the line of interaction.

3. Backstage interactions refer to the activities performed by the employees without getting involved with the customers, such as kitchen assistant and preparing food. Backstage and front stage interactions are divided by a line known as line of visibility.

4. Support process is an important stage for supporting the front and backstage interactions, such as storage, supply, and maintenance equipment. Lastly, the line dividing the backstage interactions and the support process is known as the line of internal interaction.

After creating the blueprint, two things are identified: fail points and risk of excessive waiting.

Fail points denote the failures that occur when delivering a service to the customer. They are written in a table and classified into three parts:

1. Sub system, which is the action that the customers make, such as customer arrives at the restaurant and customer chooses the food and drink.
2. Sub process/activity, which is the action that employees make, such as welcoming and greeting and writing orders.
3. Potential fail point, which denotes points where the failure has occurred, such as no employee greets or welcomes customers and employees do not provide drinks and food to customers.

Risk of excess waiting denotes the time that the costumers wait; it is written in a table and classified into three parts:

1. Sub system, which is the action that the customers make, such as customer arrives at the restaurant and customer chooses the food and drink.
2. Sub process/ activity, which is the action faced by the customer, such as there is only one place to place the order and there is a limited number of menus.
3. Potential time to wait, which denotes the instances the customer must wait, such as the customer can only order at the cash register and waiting for other customers to finish ordering.

The sequence of interaction, the line of visibility, and the internal business line are the three horizontal lines that differentiate the primary components of service blueprint. Consumers communicate with providers through the line of contact. Service interactions appear as horizontal lines that cross the communication flow. Additionally, front stage and backstage employee actions are separated by the visibility sequence. Consumers are blind to acts that take place below the line, and the horizontal line of contact separates lower-level workers from higher-level workers. IT interaction is a support system for calculating raw material expense and input. The failure points, or potential failures, are represented by a circular symbol with the letter "F." The risk of an excessive delay is represented by a triangle symbol with the letter "W." Service blueprint should be analyzed to discover the fail points or process failures that occur when providing services to clients.

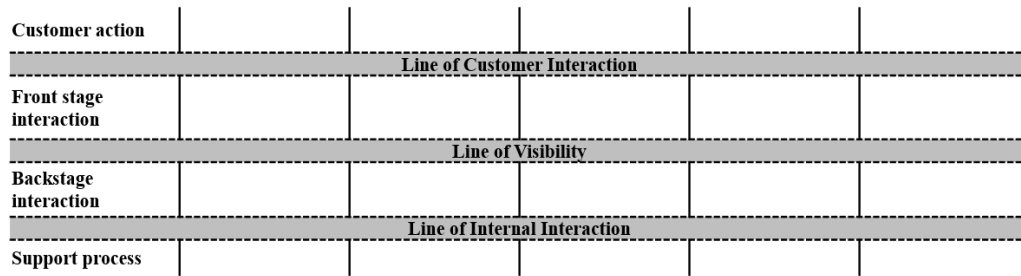


Figure 1: Components of Service Blueprint

Blueprints can be used:

- (1) if there is a desire to improve customer service experience.
- (2) to create new services or to revise the design of existing ones.

Physical evidence, for example, is an optional component. It refers to the tangible characteristics of each phase in the service process that may impact a customer's view of the service experience and the service firm. The appearance of service staff, location signage, advertising, website design, and delivery vehicles are all examples of physical evidence. These and other forms of visible evidence influence the service quality evaluation by setting service expectations and influencing the service quality evaluation. Clarification of the physical evidence of services can help to ensure that the message is consistent across the entire service experience. Time can be included in service plans to determine the time required for the entire service experience or certain aspects of it. This can be helpful for calculating staff expenses and determining the cost-effectiveness of each step in the process.

Managerial Uses of Service Blueprints:

- Ensure that all front stage, backstage, and support actions are performed consistently. Standardization can be aided by time-and-motion studies and quality improvement cycles.
- Identify additional service stages that may appeal to different consumer groups.
- Incorporate physical proof into the marketing communications strategy; every touch point in the service delivery process is an opportunity to send a quality message to patients. Subsequently, detect quality cues within the service experience and alter them as needed to deliver the desired message. Simplify the service delivery process. Examine each phase of the process and eliminate those that do not bring value.
- Identify the critical points in the service process that influence client perceptions. There may simply be a few touch points that influence customer loyalty. Ensure that consumer expectations are exceeded at those touch points.

Finally, the service blueprint tool is used to identify the challenges and solutions of the rotation resident program.

3. Case study

A local private hospital offers postgraduate (PG) training program for residents' medical doctors' activities. This program is guided by the chief resident who monitors and trains new residents and assigns rotation. Residency training program director (RPT): The person who ensures that the residents who are assigned to a medical specialty are trained, monitored, and evaluated following the program guidelines. Many procedures take place at the start of this program, such as receiving official email requests, sending rotation

requests for RPT approval, and submitting requested documents, including CV, hospital classification, blood test, national ID or Iqama, recommendation letters, official letter, and personal photos. Then, the residents must attend two orientations for the RPT system, prepare files for human resource (HR) transactions, send files to the chief of medical and clinical office (CMCO) for approval, send files to HR to prepare the users, and activate users by adding them in the system. Then, the residents are provided an ID with user number and are evaluated (residents to consultants and consultants to residents) and cleared. Residents must complete numerous procedures, which are time consuming. Additionally, all steps need to be manually completed. It usually takes around two months to complete the required paperwork to start the program and four months after completing the program and receiving clearance. Three phases are defined: observation, analysis, and recommendation and implementation.

3.1 Observation

As a first step, all processes are observed, and data are collected to understand the complete process. These procedures are visualized through service blueprint as the initial state.

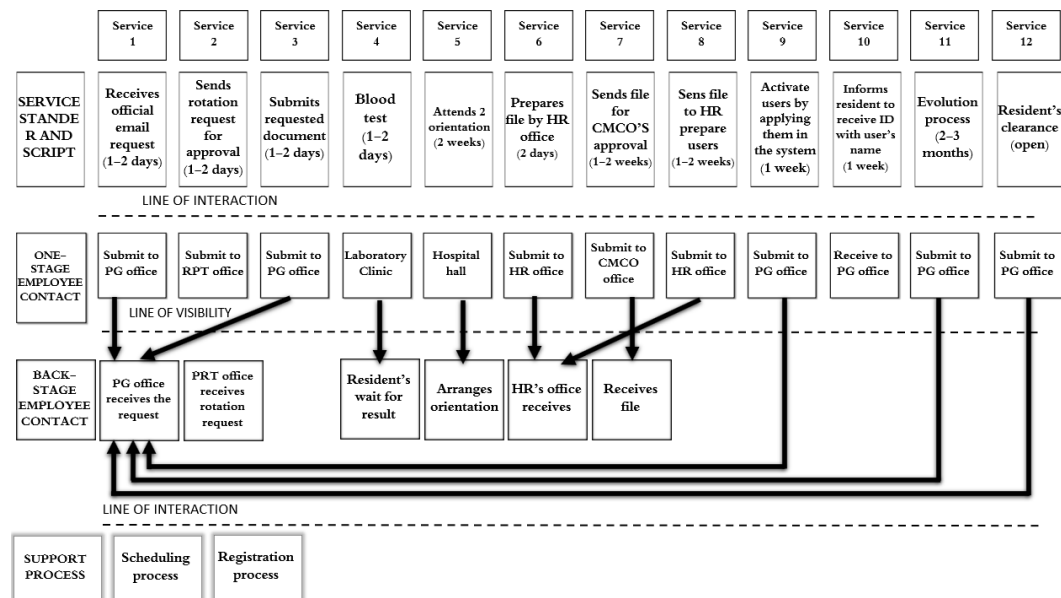


Figure 2: Service Blueprint of Initial State

Service Blueprint: Initial State

Figure 2 displays how the procedures start and end, including all the details.

1- Service Stander and Script: it shows how to recognize the service to create a meaningful and mutually beneficial client experience.

- The residents receive an official email request from the PG office within two days.
- The PG office will send the rotation request for approval within two days.
- It takes two days to submit the requested documents.
- The residents will take the blood test in two days.
- Scheduling residents' orientations takes two weeks, and they must attend two orientations.
- The HR will prepare the resident's file, which takes two days.
- The files are sent to the CMCO for approval, which takes around two weeks.

- The files are sent to the HR office to create users, which takes two weeks.
 - The activation of users in the system takes one week.
 - Informing the residents to collect their ID with user number takes one week.
 - After completing the program, the evaluation process from residents to consultants and from consultants to residents takes three months.
 - Submission of the clearance to the PG office depends on the evaluator (open).
 - Line of Interactions: the point at which the residents interact with the hospital.
- 2- On-stage Employee Contact: face-to-face engagement occurs between front desk and residents.

- The residents submit the documents to the PG office.
- The PG office submits the rotation request to the residency training program.
- The requested documents are submitted to the PG office.
- The residents go to the laboratory for a blood test.
- The residents attend the two orientations in the hospital's hall.
- HR prepares files.
- The files sent to the CMCO are submitted.
- The files sent to HR are submitted.
- System users are submitted to the PG office.
- The residents receive their IDs from the PG office and start the program.
- After residents complete the program, the evaluation process is submitted to the PG office.
- Then, clearance is submitted to the PG office.
- Line of Visibility: the line that separates all customer-visible service actions from those that are not visible.

3- Backstage Employee Contact: all actions performed by employees that are not visible to the residents.

- The PG office receives the requested documents.
- The residency training program office receives the rotation requests.
- The residents wait for their blood test results.
- The employees arrange the two orientations in the hospital's hall.
- The HR receives the files.
- The CMCO receives the files.
- Line of Internal Interaction: this line differentiates staff and resident actions from those of other service support activities and persons.

4- Support Process: all tangibles to which residents are exposed that can impact their judgments of quality.

- The scheduling process for all activities and actions that the residents and employees are required to perform.
- The registration process for the residents in the program.

3.2 Analysis

Following the observations of the case studies, the service process potential fail points and excessive wait risk are defined (Figure 3 and Tables 1 and 2).

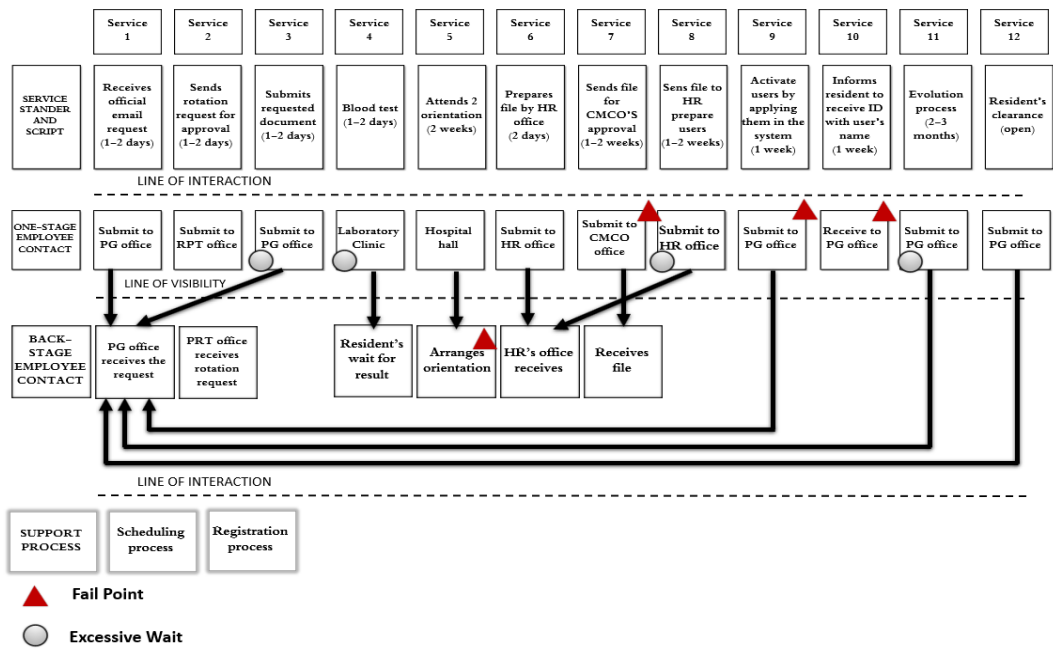


Figure 3: Potential fail points and excessive wait risk

Table 1: Fail Point

Sub-system	Resident arrives to schedule the first orientation	Resident submits the files to CMCO for approval	Resident communicates with HR to activate the user in the system	Resident receives their ID
Sub-process/activity	The employee schedules the orientation	The process takes time to approve	Employee cannot activate the user	Employee calls the resident to pick up their ID and user's number
Potential fail point	Orientation cancelation due to maintenance in the hospital's hall.	The approval was not acceptable according to an updated policy.	Residents have incomplete information.	Some ID has incorrect information

Table 2: Excessive Wait

Sub-system	Resident arrives at the postgraduate office to submit the requested documents	Resident arrives at the laboratory for the blood test	Resident communicates with HR to activate the user	Submit the evaluation from residents to consultants and from consultants to residents to postgraduate office
Sub-process/activity	The employee is not available in his office	Nurses are busy with other patients	The system is down or needs time to restart	Consultants are busy or have forgotten to evaluate the resident
Potential time to wait	Resident needs to wait to submit the documents.	Resident waits until his turn arrives.	Resident returns later to activates the user in the system.	Resident waits for consultants to submit evaluation.

3.3 Recommendation and Implementation

After the analysis of the blueprint, an online system is developed to reduce the error and process time. The blueprint eases the development of the online system.

Service Blueprint: Future State (System Based)

In the updated state, the developed online system is applied. Figure 4 shows that the updated system reduces the time for the procedures at each phase. Using service blueprint to visualize the processes and identify risks.

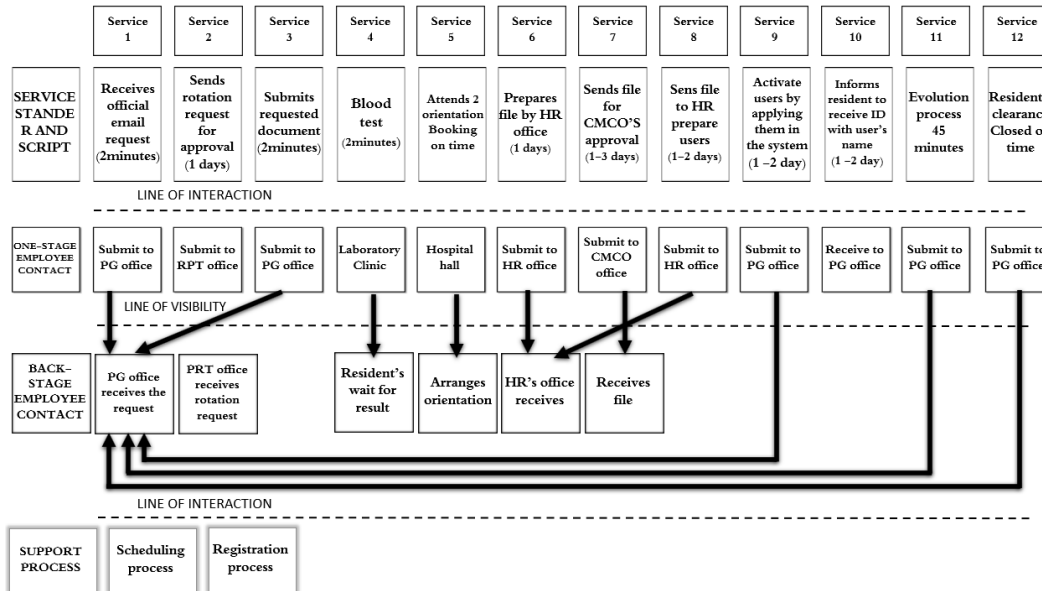


Figure 4: Future State of Service Blueprint

Figure 4 shows how the procedures start and continue at each phase with the time required for each step. These procedures are as follows:

- The residents receive an official email request from the PG office in 2 min.
- The PG office completes the rotation request within one day.
- Submit the requested documents in 2 min.
- The residents take the blood test in 2 min.
- The residents attend two orientations (booking from the system that displays hall availability).
- The HR processes the files in one day.
- The CMCO approves the files within three days.
- The HR prepares users within two days.
- The users in the system are activated within two days.
- The residents are asked to collect their ID with user number within two days.
- The evaluation process from residents to consultants and from consultants to residents takes a maximum of 45 min.
- The clearance is submitted to the PG office (closed on time in the system).

In summary, service blueprint helped develop an online system by comprehensively visualizing processes and identifying fail points and excessive wait times. Subsequently, the time prior to starting the residency program is reduced from 60 days to 12 days and

the time for evaluation and clearance after the completion of the program is reduced from 120 days to one day.

5. Conclusions

This study outlined the significance of the service flow process and illustrated how decisions affect its various elements. In the field of service and manufacturing, Lean is a well-known concept. Blueprints help in identifying wastes that lead to service flow disruptions. Additionally, other Lean tools can be used depending on the issues and type of waste that hospitals deal with. In this study, service blueprint is used to explain how hospital services should be implemented. Previous literature employing service blueprint was reviewed. However, the service blueprint has not been applied to the residency training programs in private hospitals. Analysis showed that hospitals do not recognize the long time that they are taking to complete various processes. Moreover, they are unaware of the defined failure points and excessive wait times. Thus, a service blueprint was developed to comprehensively illustrate the processes. The proposed solution was implemented, and it significantly reduced the service time.

Acknowledgements: Author gratefully acknowledges members of Deanship of Graduate Studies and Scientific Research at Effat University for their support.

References

1. Mokhtari AK, Saillant NN (2022) Disruptive innovations: uncertainty, a pandemic, and the residency application cycle. *Journal of Surgical Research* 271:A1-A2. <https://doi.org/10.1016/j.jss.2021.09.027>
2. Yaow CYL, Mok HT, Ng CH, Devi MK, Iyer S, Chong CS (2020) Difficulties faced by general surgery residents. A qualitative systematic review. *Journal of Surgical Education* 77(6):1396-1406. <https://doi.org/10.1016/j.jsurg.2020.06.003>
3. Balon R, Morreale MK, Coverdale J, Guerrero AP, Aggarwal R, Louie AK, Brenner AM et al (2020) Medical students who do not match to psychiatry: what should they do, and what should we do? *Academic Psychiatry* 44(5):519-522. <https://doi.org/10.1007/s40596-020-01295-w>
4. Hill MR, Goicochea S, Merlo LJ (2018) In their own words: stressors facing medical students in the millennial generation. *Medical education online* 23(1):1530558. <https://doi.org/10.1080/10872981.2018.1530558>
5. Lyss-Lerman P, Teherani A, Aagaard E, Loeser H, Cooke M, Harper GM (2009) What training is needed in the fourth year of medical school? Views of residency program directors. *Academic Medicine* 84(7):823-829. doi: 10.1097/ACM.0b013e3181a82426
6. Chemali Z, Henderson DC, Fricchione G (2022) Developing a dual residency program in psychiatry and neurology in an area of regional conflict: The University of Hargeisa–Massachusetts General Hospital–Boston Medical Center Experience. *The Journal of Neuropsychiatry and Clinical Neurosciences* 34(1):77-83. <https://doi.org/10.1176/appi.neuropsych.21010003>
7. Ahmed S, Abd Manaf NH, Islam R (2018) Measuring lean six sigma and quality performance for healthcare organizations. *International Journal of Quality and Service Sciences* 10(3):267-278. <https://doi.org/10.1108/IJQSS-09-2017-0076>
8. Shokri A (2017) Quantitative analysis of six sigma, lean and lean six sigma research publications in last two decades. *The International Journal of Quality & Reliability Management* 34(5):598-625. <https://doi.org/10.1108/IJQRM-07-2015-0096>
9. Psychogios AG, Atanasovski J, Tsironis LK (2012) Lean six sigma in a service context. *The International Journal of Quality & Reliability Management* 29(1):122-139. <https://doi.org/10.1108/02656711211190909>

10. Schonberger RJ (2019) The disintegration of lean manufacturing and lean management. *Business Horizons* 62(3):359-371. <https://doi.org/10.1016/j.bushor.2019.01.004>
11. Bitner MJ, Ostrom AL, Morgan FN (2008) Service blueprinting: a practical technique for service innovation. *California Management Review* 50(3):66-94. <https://doi.org/10.2307/41166446>
12. Siau K, Loo PP (2006) Identifying difficulties in learning UML. *Information Systems Management* 23(3):43-51. <https://doi.org/10.1201/1078.10580530/46108.23.3.20060601/93706.5>
13. Pandey A, Kulshrestha R (2021) Service blueprint 4.0: A service design for hotels beyond COVID-19. *Worldwide Hospitality and Tourism Themes* 13(5):610-621. <https://doi.org/10.1108/WHATT-05-2021-0076>
14. Kingman-Brundage J (1989) The ABCs of Service System Blueprinting. In: Bitner MJ, Crosby LA (ed) *Designing a Winning Service Strategy*. American Marketing Association, Chicago, pp 30-33.
15. Gumesson E, Kingman-Brundage J (1992) Service design and quality: applying service blueprinting and mapping to railroad services. In: Kunst P, Lemmink J (ed) *Quality Management in Service*, VanGorcum, pp 102-114.
16. Suzianti A, Avicenna, Larasati H (2017) Service redesign using factor analysis, TRIZ, and service blueprint (case study on garuda Indonesia's sales and service office at senayan city). *MATEC Web of Conferences* 104:3009. <https://doi.org/10.1051/mateconf/201710403009>
17. Geum Y, Park Y (2011) Designing the sustainable product-service integration: A product-service blueprint approach. *Journal of Cleaner Production* 19(14):1601-1614. <https://doi.org/10.1016/j.jclepro.2011.05.017>
18. Holdford DA (2019) Using service blueprints to visualize pharmacy innovations. *Pharmacy* 7(2):43. <https://doi.org/10.3390/pharmacy7020043>
19. Chafouleas SM, Johnson AH, Overstreet S, Santos NM (2016) Toward a blueprint for trauma-informed service delivery in schools. *School Mental Health* 8(1):144-162. <https://doi.org/10.1007/s12310-015-9166-8>
20. Bouncken RB, Qiu Y, Sinkovics N, Kürsten W (2021) Qualitative research: Extending the range with flexible pattern matching. *Review of Managerial Science* 15(2):251-273. <https://doi.org/10.1007/s11846-021-00451-2>
21. Chafouleas SM, Johnson AH, Overstreet S, Santos NM (2016) Toward a blueprint for trauma-informed service delivery in schools. *School Mental Health* 8(1):144-162. <https://doi.org/10.1007/s12310-015-9166-8>
22. Mohajan HK (2018) Qualitative research methodology in social sciences and related subjects. *Journal of Economic Development, Environment and People* 7(1):23-48. <https://doi.org/10.26458/jedep.v7i1.571>
23. Almaktoom, A. T. (2023). Health care overbooking cost minimization model. *Heliyon*, 9(8). <https://doi.org/10.1016/j.heliyon.2023.e18753>