

# The Design and Implementation of a Dashboard Web-Based Service Management Operations

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**Abstract**—This research is to actualize Service Management Operation (SMO) in a company by creating a dashboard application. When the company confronts the limitations of less efficient collecting data on ongoing project reports, and current data reports detailing isn't well visualised. The data management process also is still done manually using Microsoft Excel, and it is also difficult to see the progress of the project being worked on. Dashboards have emerged to help quickly visualize the information needed and help make decisions. In addition, it should serve as a guide for raising awareness, advancing administration, and defining strategy. Visuals are intuitively displayed on dashboards, allowing workers to view records, improve information, and analyze data from ongoing efforts. Three interviews and meetings were conducted with company staff to identify application needs, learn about the SMO organization and uncover current data frameworks and structures. Applications are built using PHP, XAMPP, and MYSQL. As a result, the SMO dashboard application can assist in expanding the adequacy of SMOs' work in overseeing business and administration, which combines SMO report accommodation exercises and assignment administration so that SMO detailing can be carried out on time and streamline accelerate business and service management. Based on the results of the UAT obtained 84%, it can be seen that the reaction from the SMO Division staff to the web-based dashboard application framework based on the level of acknowledgment increased.

**Index Terms**—Service Management Operation (SMO), dashboard, application, UAT

## I. INTRODUCTION

The COVID-19-episode postures numerous challenges for organizations worldwide and has provoked numerous companies to select to have most of their representatives work from home to relieve more extensive spread [1], [2]. Nowadays, the most significant challenge is managing inaccessible work, and this new Work from Home (WFH) is considered viable after its far-reaching selection. Picking for further work requires organizations and specialists to depend intensely on information and communication developments to adjust rapidly and idealize their occupations

Organizations ought to react dependably and reliably to new challenges and openings. Representatives must

perform their obligations effectively. Agreeing to Shagirbasha (2021) and Akhtar & Sushil (2018), execution proficiency is inactive and energetic [2], [3]. Inactive alludes to the change of the existing condition, and active implies the state's constant evolution. The efficiency of employees' effectiveness in observing, overseeing, controlling, and carrying out execution exercises is measured to the degree of worker execution Key Performance Indicator (KPI). The KPI itself is worth four focuses: Financial, Client, Process, and Development Learning/HR Improvement. These four KPI focuses are implemented by XYZ firm, which is locked in an IT consulting firm. The trade now has a few supporting offices required to bolster IT benefit administration or Service Management Operation (SMO) at each KPI key point esteem.

Agreeing to Lucio-Nieto *et al.* (2016), SMO is a component to supply clients with high-quality IT services at strategic and vital levels, mindful of benefit technique and plan, IT systems, strategies, and benchmarks for conveying commercial esteem. The study conducted by Gonzales-Banales *et al.* (2016) SMO executed at COTEMAR has a few points of interest, one of which is enhancing inside forms related to IT administrations. SMO is the point of integrating records, innovation, and human assets to provide IT administrations over an organization viably provide IT administrations over an organization [4].

Right now, XYZ firm engaged in services confronts the limitations of less efficient collecting data on ongoing project reports, and current data reports detailing isn't well visualized. The data management process is still done manually using Microsoft Excel, and it is also difficult to see the progress of the project being worked on by the team. Due to frequent collisions, data updates between SMO officers and data in Microsoft Excel are not centralized. Thus, the impact of desk division is unclear. Microsoft Excel also resulted in single failure reporting, this is because this data is held by 1 division, namely the SMO Officer.

This thinks about points to actualize SMO at XYZ firm by making a dashboard application. Dashboards have appeared to assist quickly in visualizing needed information [5] and help make decisions. Dashboards are built-in rundown shapes to induce the exact data you wish to form fast choices in no time. Moreover, it should serve as a director for raising mindfulness, progressing administration, and determining strategies [6]. Intuitively

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Manuscript received March 29, 2022; revised June 17, 2022; accepted June 23, 2022.

visuals are shown on dashboards, permitting workers to see records, upgrade information, and analyze data from continuous ventures.

## II. LITERATURE REVIEW

### A. Service Management Operation

Service Management Operation (SMO) is a component for giving clients with tall quality IT administrations at strategic and vital levels. Obligations incorporate vitally and benefit plans to provide trade esteem and IT administration forms, systems, techniques, and measures [7]. There's no standard definition of SMO usefulness and scope, but it is an IT administration instrument analyzing specific purposes. IT administration is the methodology and benefit plan that characterizes, screens, reviews, and conveys commerce esteem to ongoing forms. It can oversee IT arrangements, systems, strategies, and benchmarks [8].

Agreeing to Johnston and Clark (2012), service operations management is comparable to manufacturing operations, but with the most contrast being the part of the customer, who may be a key source of alter within the benefit conveyance handle [9]. Chase and Tansik (1983) contend that service systems can be categorized into excellent services, crossbreed services, and quasi-manufacturing agreeing to the level of contact with clients [10]. It is expected that the potential operational effectiveness of the service framework depends on the level of coordinate client contact with the service office relative to the level of adding up to benefit creation. So also, Schmenner (1986) proposed the utilize of labor escalated and shopper interaction and service personalization networks to characterize the service delivery handle and recognize four sorts of administrations [11].

Mabert and Showalter (1981) recognize nine component levels that clarify their part in service systems and they're intuitive as benefit working frameworks [12]. Inside, outside, innovation, client, front line staff, back staff, item arrangement, service configuration and client interface. Assessment of adequacy requires fruitful framework interaction and emphasizes the client's part within the benefit conveyance framework, which penetrates all perspectives of operations. The discoveries of Mohar, Abdullah and Ho (2015) bolster the see of service management operations as a framework interaction proposed by Mabert and Showalter (1981) and Roth and Menor (2003) [12]-[14].

### B. Dashboard Application

The dashboard is a vital application within the commerce world. It comprises charts appearing as pointers that give chairpersons data to screen the organization's exercises [6]. It may be an administration control instrument and a standard component of execution estimation frameworks, administration frameworks, and common commerce execution administration frameworks. [15]. The dashboard is additionally a trade administration instrument. Serves as a

visual representation of the organization [16]. Anyone can utilize the Business dashboard without the need for an information technology team or even technology knowledge.

Agreeing to Petrides, Conrad, Terebo, and Melanson (2022), dashboards application give objective information that binds together lab information and increments perceivability into authority and administration, which can assist you in discovering the correct resources [17]. By giving this information, you'll be able guarantee collaboration inside your organization. Dashboard applications have the potential to decrease improvement endeavors, reuse and grow existing frameworks, as well as increment the accessibility and understanding of data [18].

## III. METHOD

A literature search was conducted on the Scopus online database between September 2021 and March 2022. The literature search aims to extricate standards in the dashboard plan and assess guidelines, which we would like to consider in model improvement. Following, we need to know if such or comparative arrangements are on the showcase and whether positive comes about can be accomplished with them. The terms and keywords for the look are (dashboard) AND (application), (service management operation), found either within the abstract or recorded keywords. The look result was 660 comes about. Irrelevant papers were screened by checking the title and reading the abstract based on the keywords. This handle returns 23 relevant documents in which the complete content has been examined. At last, 15 papers were deemed relevant for our research and those that did not focus on these three keywords would not be used.

Three interviews and gatherings were conducted with XYZ firm staff to recognize needs. This meet was conducted on a small scale with a greatest of 3 individuals. Where these 3 individuals people represent each division in the SMO management. They are Project managers, SMO Admin, and SMO officers. In this way, we pick up knowledge about the SMO organization and uncover the current data frameworks and structures. Another, thoughts and proposals for data visualization are collected. All prerequisites are depicted as utilized cases and made in case charts. Based on the chart and the comes about of a writing look on the dashboard plan, an application was created utilizing PHP, XAMPP, and MYSQL which were available from XYZ firm.

## IV. RESULT

The SMO web-based dashboard application is an information system application that provides information, including several leading indicators of SMO work activities. The creation of this dashboard template focuses on three main aspects of the dashboard: displaying data or information, personalization, and collaboration between users. The development of the dashboard helps monitor and assess the need for SMO efforts. This ensures that the business processes it carries out achieve the goals set

through the proper management strategy. This section summarizes the requirements and criteria collected for dashboard visualization and describes the application.

**A. Requirements and Use Case Description**

The Project Manager is responsible for evaluating and deciding which projects to co-operate and submitting to the SMO Administrator. The project manager also checks the ongoing project reports to see if the objectives have been achieved. The report remains an Excel file sent by the SMO agent. However, the project manager must coordinate directly with the team via email or phone to get the latest information.

SMO Admin acts as an intermediary between the Project Manager and the SMO Officer regarding the submission of project documents that the Project Manager has approved to the SMO Officer. Then follow up on information on ongoing project reports from SMO officers.

SMO representatives are responsible for reviewing project documentation and creating service profiles. Service profiles are constantly being updated. Update the information data according to the project file on site, input for planning, and submit the report file to the customer. These reports are in Excel files and sent to the project manager via email. Indeed, the current reporting system does not integrate each of the above roles.

**B. System Design**

System design for website applications is described through the Unified Model Language (UML), which consists of Use Case Diagrams, and Use Case Descriptions.

**1) Flowchart**

The following is the flow of web-based dashboard applications as is shown in Fig. 1:

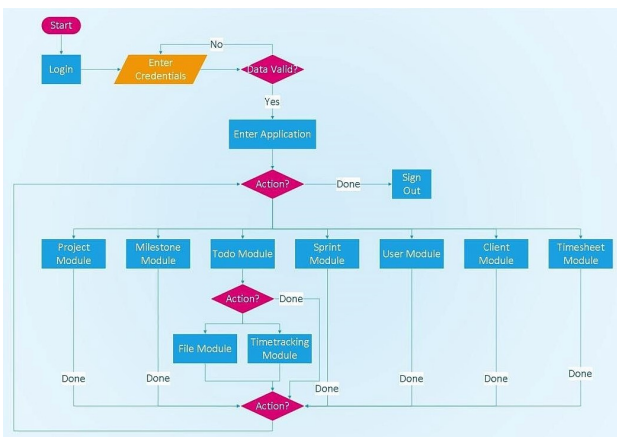


Figure 1. SMO web-based dashboard application flowchart.

**2) Role description**

1. SMO Admin is XYZ firm's internal team has access to staff data of the service management operations division. Administrators can perform user management, client management, company settings, view dashboards, and activities related to service management operations.

2. Project Manager is a team that manages service management operations activities; the activities carried

out by Managers in the system consist of working Users, Client Projects, Milestones, To-do, Timesheets, Reports, and View Dashboards.

3. SMO officer is a team in the service management operations division. SMO is given the most minor access rights among other users, namely View Dashboard, View Milestone, View Projects, View-Edit To-do, View Sprint, View Timesheet, To-do Time tracking, Attach-Delete-Download File, and View Report.

**3) User interface design**

The user interface is the central element of the data framework and permits users to associate with the framework [19]. Nowadays technological advances have seen several types of innovative user interface styles, such as user interfaces without input [20]. This interface style is designed to decrease the sum of content within the user interface but often requires special hardware. Too, most of these user interface styles are not reasonable for common information system design. Therefore, Graphical User Interface (GUI), which is an interface style based mainly on graphic components rather than text, remains the main interface design of information systems [21]. Apart from different graphic formats, GUIs also have different amounts of text. The nearness of content within the user interface presents certain challenges for a few users, such as the elderly [22].

The following is the user interface design of the SMO application as is shown in Fig. 2.

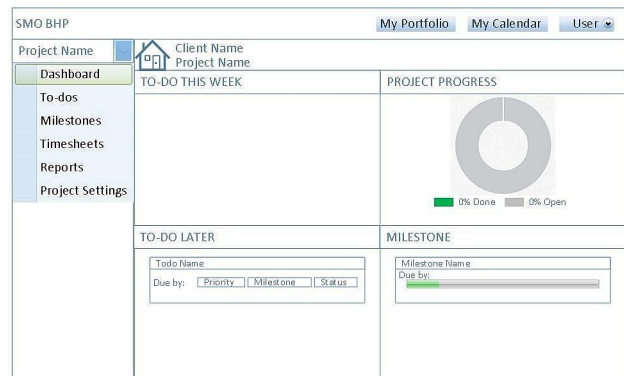


Figure 2. Dashboard user interface design.

**4) Application**

The following is a screenshot of the SMO dashboard homepage containing a list of project names. Several features support project monitoring performance, including To-Dos, Milestones, Timesheets, and Performance Reports as is shown in Fig. 3.

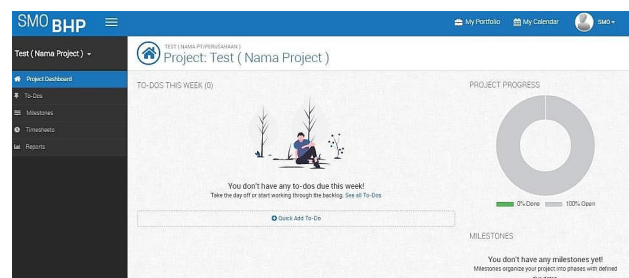


Figure 3. SMO dashboard.

A project handled by SMO, includes preventive maintenance, namely reporting. One of the features of this SMO dashboard also has a do feature that supports management reporting, and to create a task on the To-Do feature, click To-Do → Add To Do as is shown in Fig. 4.

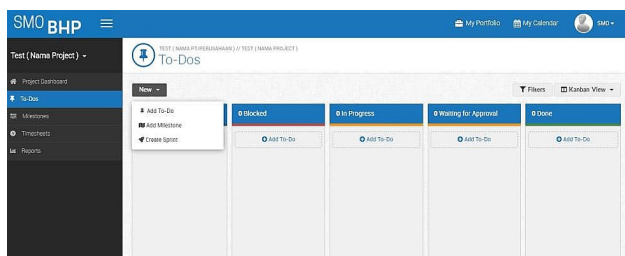


Figure 4. To-Do feature.

And it is also supported by a dashboard feature in the form of chart diagrams and cumulative flow that indicate the performance of projects handled by SMO as is shown in Fig. 5.

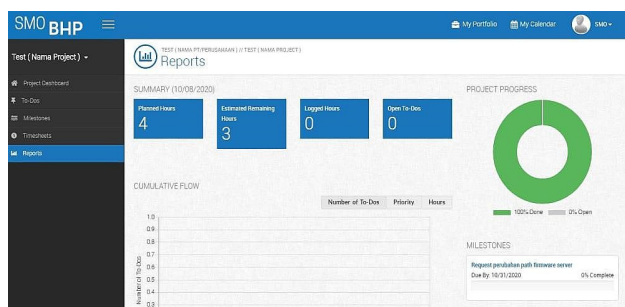


Figure 5. Report feature.

## V. EVALUATION

### A. UI and UX Evaluation

The design of the SMO dashboard application user interface in this study uses 8 golden rules proposed by Ben Shneiderman (2018) [23]. The stages of testing are based on the Eight Golden Rules to determine user responses to the application's user interface, this test is carried out using the interview method with the user. The type of interview used in this study is a structured interview proposed by Guba and Lincoln (1981). A type of structured interview is an interview in which the researcher sets his problems and questions to ask the interviewee [24]. The interview format was arranged based on the problems in the research design. In this study, the questions for the interviewees used the reference in the variables and indicators of the eight golden rules.

Qualitative data or the results of interviews with users are processed using thematic analysis. The stages of conducting thematic analysis are:

- Understand the content of the data obtained.
- Arrange the code for the data obtained and all codes that have the same meaning are entered into one group.
- Search for themes by reviewing all the codes and groups that have been created

The results of testing the SMO dashboard feature based on interviews with users on UI and UX in operations based on eight golden rules, namely.

1. Strive for consistency. There is still a need for adaptation from the previous system in maintaining disciplined consistency regarding input and also editing the contents of the data in the SMO dashboard which is supported by a service interface or user interface that is easy to understand.

2. Enable frequent users to use shortcuts. It makes it easier for users or SMOs to achieve SMO reporting submission goals with more effective shortcuts.

3. Offer information feedback. Manage honest and informative information from the results of feedback in the use of the SMO dashboard by related users.

4. Design dialogue to yield closure. Designing a dialogue in producing a conclusion as well as the purpose of an evaluation process for the SMO submission report and task management. By using an interactive step-by-step design so that users can complete an action more easily and effectively.

5. Offer simple error handling. Detects errors in the system easily, so that error handling can be handled more quickly.

6. Permit easy reversal of actions. The back or undo button feature on the SMO dashboard application page reduces the user's or SMO's worry about making a click error, for example, and also makes it easier to explore or explore the SMO dashboard.

7. Support internal locus of control. A face-to-face design or interface that is easily controlled by the user, so that the user can be the initiator rather than the respondent.

8. Reduce short-term memory load. Designing a face-to-face interface from the SMO dashboard with a simple or simple design, so that it is easily understood by the user to be able to help users reduce the burden of short-term memory and not have to remember too many commands, and can also avoid confusion to the user.

### B. System Evaluation

System evaluation on the SMO dashboard is based on the results of two testing activities which include Black Box Testing and User Acceptance Testing (UAT).

#### 1) Black box test

Application testing in terms of functional determinations without testing the design and program code to discover whether the program's capacities, inputs, and yields are by the required decisions. The results of the Black Box test can be seen in Table I.

TABLE I. BLACK BOX TESTING RESULT

No	Label	Expected Outcome	Validity	
			Y	T
1	Log In	Username, password according to validation	Y	-
2	All Project	Displays a list of existing projects	Y	-
3	All Clients	Displays a list of existing clients	Y	-
4	Management user	Display a list of existing users, add and delete users	Y	-
6	To do Activity	Add, update, view, delete activity	Y	-

Software testing is carried out using User Acceptance Testing (UAT). System testing focuses on testing the system from a system functional point of view, whether the system is functioning as intended and whether the results are as expected. The test was conducted on 25 respondents. UAT and questionnaires aim to determine the level of acceptance of the applied SMO system so that it can assist the operational process. Then the data that has been obtained from the questionnaire results using a Likert scale 5 then sorted by answers added up in percentage form by multiplying the number of answers for each item by 100 then divided by the number of respondents. Based on the questionnaire data, the percentage of each answer can be found using the following formula:

$$P = \frac{f}{n} \times 100\%$$

Note: *P* = Percentage; *f* = Frequency of answers; *n* = Number of respondents.

After the application has been developed, the next step is to carry out User Acceptance Testing (UAT) to find out user responses used in research in the form of surveys and provide questions to users where the answers to these questions consist of levels that can be selected. The result of UAT is 84%. From the results of the system's implementation and evaluation, several improvements in the SMO work process can be found, especially in work activities, including report submission and task-project monitoring.

The work increase consists of several parts, namely as follows:

1. *User Experience*. A user experience that feels faster in updating reporting information data and making it easier to monitor tasks and projects using the SMO dashboard application.

2. *Data Information*. The presentation of data information is better than conventional files or previous systems because the dashboard has data visualization in the form of diagrams or charts that are useful in determining business decisions or future projects.

3. *Feature support*. Some of the features found in the SMO dashboard application such as uploading data capture, changing project data information online, and also project data security, where some of these features did not exist in the previous conventional system.

## VI. CONCLUSION

After analyzing and planning the SMO dashboard application framework, it can be concluded that Website-based applications can supply back in expanding the adequacy of SMO work in overseeing ventures and administrations which incorporate SMO report accommodation exercises as well as assignment administration so that SMO detailing can be carried out on time and the company can collect fees/payments from clients that influence cashflow company back. Website-based applications can streamline and speed up venture and service management. All project-related data, such as venture portrayals, to-dos, points of reference, sprints,

records, time following, reports, and portfolios, are put on the same page. SMO division staff no longer need to find where the information is required to improve the SMO division's performance.

Website-based application oversees ventures with to-dos with foreordained due dates, sprints for planning brief cycles for a bit of several arranged assignments to be completed, turning points for stamping considerable time focuses within the venture cycle and being the begin and conclusion of the venture or recording the completion of critical stages, and time following to track the sum of time the user spends completing errands within the extend. All of the over highlights are interrelated to oversee ventures so that they can be completed on time and back the smooth cash stream of the company. Based on the UAT assessment, the rate was 84%; it can be seen that the reaction from the SMO Division staff to the website-based dashboard application framework based on the level of acknowledgment is extreme.

From the research and design that has been done, several suggestions are expected to be input and learned for service improvement in making SMO dashboard applications.

- 1) Development of mobile applications on the dashboard so you can stay connected and find the latest information about projects and SMO submission reports even if you are not open on your desktop or laptop.
- 2) Integration with the Risk Management System to determine decisions in the continuation of future projects.
- 3) An integrated SMO personal performance appraisal system on the dashboard that is adjusted to the KPIs and SMO work achievement targets.

## APPENDIX INTERVIEW QUESTIONS

No	Question
<b>Strive For Consistency</b>	
1	Do you think the colors in the application are consistent?
2	Is the app layout consistent?
3	What about the fonts in the app? Is the font consistent on every page?
4	How do you think the consistency of the buttons on the app?
<b>Universal Usability</b>	
5	In your opinion, is the application able to recognize user needs?
<b>Offer Informative Feedback</b>	
6	Does every action taken by the user on the application get good feedback from the system? Was the feedback informative?
<b>Design Dialogue to Yield Closure</b>	
7	Are the project management steps and tasks performed by the user on the application clear?
<b>Offer Simple Error Handling</b>	
8	Can an application interface prevent users from making serious mistakes?
9	Is there an error message when the wrong user accesses the app? Is the message understandable to the user?
10	What do you think about the indicated steps to fix errors in the application?



No	Question
<b>Permit Easy Reversal of Action</b>	
11	Is the undo/back command easy to use by the user?
<b>Support Internal Locus of Control</b>	
12	In the data entry section of the application, is data entry easy or burdensome for the user?
<b>Reduce Short-Term Memory Load</b>	
13	Does using the app require a lot of training or direction in running it?
14	Does the app have a simple interface (easy to remember)?

#### CONFLICT OF INTEREST

The author declares no conflict of interest.

#### AUTHOR CONTRIBUTIONS

Arief Agus Sukmandhani supervised the whole research development and took the lead in writing the manuscript. Jati Kesuma Rusly and Agung Pratama conducted the research, analyzed the data, and wrote the paper. The final version is written by Jenny Ohliati.

#### REFERENCES

- [1] B. Lal, Y. K. Dwivedi, and M. Haag, "Working from home during Covid-19: Doing and managing technology-enabled social interaction with colleagues at a distance," *Inf. Syst. Front.*, 2021.
- [2] S. Shagribasha, "Managing efficiency and effectiveness in the 'new normal' work environment," in *Strategic Management during a Pandemic*, V. Kumar and G. Gupta, Eds., Routledge, 2021, pp. 79-97.
- [3] M. Akhtar and S. Sushil, "Strategic performance management system in uncertain business environment: An empirical study of the Indian oil industry," *Bus. Process Manag. J.*, vol. 24, no. 4, pp. 923-942, 2018.
- [4] T. Lucio-nieto and D. L. González-bañales, "Lessons learned from the implementation of a service management office: The case of a world food company in Latin America," pp. 21-34, November 2019.
- [5] B. S. Nascimento, A. S. Vivacqua, and M. R. S. Borges, "A flexible architecture for selection and visualization of information in emergency situations," in *Proc. IEEE Int. Conf. Syst. Man, Cybern.*, 2017, pp. 3317-3322.
- [6] H. J. Irtaimeh, A. Obaidat, and A. Khaddam, "Strategic role of dashboard application in enhancing crisis management capabilities in organizations field study on jordanian cellular companies," *Int. J. Manag. Sci. Bus. Res.*, vol. 5, no. 10, p. 10, 2016.
- [7] T. Lucio-Nieto, D. L. González-Bañales, and H. P. Bermeo Andrade, "Service Management Office (SMO): An alternative for improving information technology management processes' capacity levels. Case: COTEMAR, México," *5o Congr. Int. Gestión Tecnológica y la Innovación (COGESTEC 2016)*, October 2016.
- [8] D. Cannon, "Organizing for service strategy," in *ITIL Service Strategy*, TSO (The Stationery Office), 2011, pp. 315-340.
- [9] R. Johnston, G. Clark, and M. Shulver, *Service Operations Management: Improving Service Delivery*, Pearson, 2012.
- [10] R. B. Chase and D. A. Tansik, "Customer contact model for organization design," *Manage. Sci.*, vol. 29, no. 7, pp. 1037-1050.
- [11] R. W. Schmenner, "How can service business survive and prosper?" *Sloan Manage. Rev.*, vol. 27, no. 3, pp. 21-32, 1986.
- [12] V. A. Mabert and M. J. Showalter, "Measuring the impact of part-time workers in service organizations," *J. Oper. Manag.*, vol. 9, no. 2, pp. 209-229, 1990.
- [13] A. H. A. Mohar, F. Abdullah, and V. B. Ho, "Development and validations of a holistic service operations management instrument," *Procedia - Soc. Behav. Sci.*, vol. 224, pp. 429-436, 2016.
- [14] A. V. Roth and L. J. Menor, "Insights into service operations management: A research agenda," *Prod. Oper. Manag.*, vol. 12, no. 2, pp. 145-164, 2003.
- [15] E. Turban, R. Sharda, and D. Delen, *Decision Support and Systems Interoperability*, September 2011.
- [16] A. Rosso. (Jun. 14, 2014). At the dashboard – InsuranceNewsNet. [Online]. Available: <https://insurancenewsnet.com/oarticle/At-the-Dashboard-a-518073>
- [17] A. K. Petrides, M. J. Conrad, T. Terebo, et al., "Pandemic response in the clinical laboratory: The utility of interactive dashboards," *J. Pathol. Inform.*, vol. 13, p. 100010, 2022.
- [18] D. Nadoveza and D. Kiritsis, "Concept for context-aware manufacturing dashboard applications," *IFAC Proc. Vol.*, vol. 46, no. 9, pp. 204-209, 2013.
- [19] P. Cybulski and T. Horbinski, "User experience in using graphical user interfaces of web maps," *ISPRS Int. J. Geo-Information*, vol. 9, no. 7, 2020.
- [20] T. Sharon, H. Lieberman, and T. Selker, "A zero-input interface for leveraging group experience in web browsing," *Int. Conf. Intell. User Interfaces, Proc. IUI*, pp. 290-292, 2003.
- [21] W. L. Martinez, "Graphical user interfaces," *Wiley Interdiscip. Rev. Comput. Stat.*, vol. 3, no. 2, pp. 119-133, 2011.
- [22] Q. M. Ilyas, M. Ahmad, N. Zaman, et al., "Localized text-free user interfaces," *IEEE Access*, vol. 10, pp. 2357-2371, 2021.
- [23] B. Shneiderman, C. Plaisant, M. Cohen, et al., *Designing the User Interface*, 6th ed., Pearson Education, 2018.
- [24] E. G. Guba and Y. S. Lincoln, *Effective Evaluation*, Jossey-Bass, 1981.

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