

Development of Smart Management Principles in Railway Station Facilities (Case Study at Pasar Senen Station)

Christie Aquarista^{1,*} Nurhikmah Budi Hartanti¹

¹ Department of Architecture FTSP, Universitas Trisakti, Jakarta, Indonesia

*Corresponding author. Email: christie05217029@std.trisakti.ac.id

ABSTRACT

The increasing use of rail transportation in Indonesia encourages an increase in the services that must be provided by stations, including Pasar Senen Station in Jakarta. Based on data from research that has been found, there are several important points of public service at Pasar Senen Station that have not been fully fulfilled, so the quality needs to be improved. This increase will affect the utility value of the facilities at the station, which in turn can be an opportunity to add to the visitor experience and provide solutions to existing problems. The research was conducted online which started by obtaining secondary data regarding any problems that existed at Pasar Senen Station. These data are the results of published research found on the internet, then been analyzed using a qualitative descriptive approach. The results of existing research are analyzed to determine the type of problem that is in accordance with the type of technology that already exists as a solution. Utilization of technology is used to make it easier to find what visitors need at the train station and increase their visual experience to obtain information so that the station manager can answer passengers' expectations for the provision of facilities. In addition, the development of facilities with systems can make it easier for managers to control station operations. The application of technology that includes an intelligent management system as a management system can improve the quality of public services at Pasar Senen Station so that it becomes more efficient.

Keywords: Station facilities, Smart management, Pasar senen station, Service principles.

1. INTRODUCTION

Rail transportation has been increasingly advanced and is now one of the most widely used public transportation modes in both developed and developing countries [1]. The increasing demand of rail transportation has driven numerous institutions and countries to compete on technological innovation to improve rail transportation, especially the ones related with performances of train station. International Union of Railways (UIC) stated that train stations should have their own uniqueness in role, location, service, and system utilization aspects [2], because these aspects can influence their performance to ensure space and time utilization.

In Indonesia, a specific state-owned enterprise is formed by the government to regulate rail transportation issues [3]. The institution is known as PT Kereta Api Indonesia (PT KAI). PT KAI act as the only institution that specifically deals with rail station operational

activities, along with the support services provided for the customer. Along with time, PT KAI has been able to constantly improve service quality of rail transportation in Indonesia.

Apart from the continuous efforts, there are still a number of important issues yet to be solved to improve rail station facilities in Indonesia. Indonesian rail transportation service is still far behind if compared to other countries [4]. Based on an analysis result published by Audit Board of the Republic of Indonesia (or locally known as BPK) on PT KAI, there are a number of necessary service improvements that should be achieved to enhance rail transportation quality in Indonesia, namely speed, safety, and capacity. These factors should be enhanced in order to optimize rail station as public transportation facility that plays an important role to support national economy improvement.

In this research, the research subject is Pasar Senen Station, which is one of the largest train stations in Jakarta. This station is also one of the busiest in Indonesia (kai.id, accessed on the 9th of August, 2021) and serves various types of train modes, namely commuter train (KRL) and long distance trains of various classes. Pasar Senen Station is one of the frequently visited stations by train users. Besides weekdays, the number of visit in this station will significantly escalate on holidays as people are trying to visit their hometown. Because of that, service quality optimization is vital to maintain customer level.

However, based on previous researches, this station is still unable to optimally fulfill customer needs and expectations. Based on a research conducted by Capah, user satisfaction level towards this station is at 56% [5], meanwhile based on a research by Budiman, user satisfaction level is at 74% [6]. That is why, service quality improvement is necessary, because it will create a better user satisfaction level and will become a driving factor for other users to utilize rail transportation facility in the future.

Numerous countries are trying to improve rail station quality and solve its service problems. One effort to do it is to apply the latest generation of technology for example Internet of Things (IoT) to operate the station. This system will enable them to receive use, and send data to improve their functionality [2]. The system known as smart management is one of the important pillars of smart station. Smart management is centralized on data utilization to obtain information regarding various supporting systems to predict capacity demands of people and goods, analyze transportation planning based on their needs, infrastructure resources, transportation resources operational efficiency, business planning, time estimation punctuation line plan optimization, and resource allocation adjustment [7].

Based on the description above, this research will conduct a thorough analysis on the condition and problems faced by Pasar Senen Station that need to be solved. With the identified problems we will suggest a number of solutions by utilizing the latest technology to facilitate and improve service quality of train stations in Indonesia, especially in Pasar Senen Station as subject in this research. Suitable implication will direct human mobility as users, and with directed mobility, user circulation will reach the expected levels of effectiveness and efficiency.

2. METHODS

This research was conducted online in 2021 with a qualitative approach to analyze the exact smart management implementation to overcome train station problems in Indonesia. This type of analysis was previously obtained through further exploration with an

explorative method, by identifying the problems faced by Pasar Senen Station users and to identify the suitable solutions by utilizing smart management system to enhance service quality. The result is presented with a descriptive method to critically poses analysis result based on the obtained visual and verbal data that contains necessary information regarding train station utilization.

To discover the problems, secondary data was gathered from journals and other information sources. Train station problems discussed in this research is focused on Pasar Senen Station in Jakarta. The analyzed variables are the ones related with facility fulfillment, obtained through analysis on the necessary principles of public service based on MENPAN decision number 63 Year 2003 [8]. Based on the problem analysis, we analyzed smart management implementation as solutions for the problems.

3. RESULTS AND DISCUSSION

3.1. Problems that Needs to be Solved

Jakarta is Indonesia's capital city that has become more advanced through smart city system implementation [9]. The success of smart city implementation surely depends on infrastructural support that facilitates activities performed by the people. Based on that, it is important to identify the problems faced by the users of Pasar Senen Station in this research, to analyze the most suitable way to implement smart station system.

Pasar Senen Station which is located in Senen area in Jakarta, is an A class station that not only serves local or between provinces trains, but also commuter trains for Jabodetabek areas. This situation has formed this station into a densely populated station. Up until now, the station built based on J. Van Gendt design as the architect which was officially inaugurated in March 19th 1925 has gone through a lot of changes from the initial building as smaller train stopping.

Based on a research by Capah, the satisfactory level of this station is at 54%. This number is categorized as very poor, which indicates that user satisfactory problem is a vital problem to be solved. There are a number of weaknesses in Pasar Senen Station building that need to be improved, namely health and safety factors, evacuation route, and rendezvous point that are not optimally socialized to the users; parking availability, and lack of information regarding train seats availability (which is only available at online ticketing facility) [5].

Meanwhile, based on a research by Budiman et al. the satisfactory level has already reach decent level which is at 74%. The problems focused in this research are also different with the ones discussed in Capah's

research. According to Budiman, to improve satisfactory level, the focus should be at cleanliness factors such as cleanliness at toilets, praying areas, dining areas, green open spaces, and smoking areas [6].

Based on two researches above, the linkage is discovered in service principles as regulated in Menpan Decision No.63/KEP/M.PAN/7/2003, which is as table 1 follows:

Table 1. Analysis of service principles problems

Service Principles	Problems in the Station	
	According to Capah (2015)	According to Budiman (2016)
Simplicity	Service procedure (facility availability socialization)	No problems indicated
Clarity	Lack of seating availability information	No problems indicated
Time punctuality	No problems indicated	No problems indicated
Accuration	No problems indicated	No problems indicated
Safety	No problems indicated	No problems indicated
Responsibility	No problems indicated	No problems indicated
Facility and Infrastructure	No problems indicated	No problems indicated
Easy access	Parking availability and circulation	No problems indicated
Staff	No problems indicated	No problems indicated
Friendliness	No problems indicated	No problems indicated
Convenience	No problems indicated	Area cleanliness and appropriateness

Data source: Capah [5], Budiman [6], MENPAN Decision No.63/KEP/M.PAN/7/2003 [8]

Based on the table above, we can indicate that several service points are still unable to fulfill Pasar Senen Station user satisfaction. However, based on researches by Capah and Budiman, it is indicated that the available facilities have already reach optimum level. However, the quantity of available facilities, cleanliness, access, and socialization towards the users should be improved. These problems should be solved because service is an important factor to maintain train user quantity. Moreover, Jakarta is an advanced city that implements smart city system with high level of mobility. That is why, service and information provision improvement are necessary to accelerate user mobility and reach the expected effectiveness and efficiency.

3.2. Smart Management Implementation as Solution

The smart management system is one of the innovations made by several stations in the world to improve the performance of stations including their managers. This system manages a thing or user by utilizing the latest communication information technology, derived from an intelligent management system [2]. In its application, of course, it must be adjusted again to the problems in the context, so that it can meet the local needs of its users [10]. There is a difference between stations that have a traditional management system and stations that have implemented an intelligent management system [11] Traditional stations tend to collect data related to the number of passengers and tickets in a simple manner, so the information obtained is limited. Meanwhile, stations that use intelligent management systems can take advantage of several technologies (such as WiFi,

Bluetooth, sensors, etc.), so that they can obtain more complete and detailed information about the characteristics of users of station facilities. This information is then used to adjust what services need to exist and according to user needs and overcome problems that arise.

In Indonesia, there are currently several applications of the use of technology in a facility management service system based on smart mobility by PT KAI [12]. These include the use of check-in and boarding passes, the launch of the KAI Access application, and the use of the train control system. This has shown that currently train stations in Indonesia have begun to use the latest technology to help manage their stations. See figure 1 below.




Figure 1 Utilization of intelligent management for check-in at Commuter stations (Tribunnews.com, accessed on August 12th 2021).

However, the utilization of technology for example check- in and boarding pass technology are still partial and only solve specific problem such as queue effectiveness problems. It is important to implement

other system that can support user movement effectiveness in the station such as circulation and mobility systems. The following table 2 shows the previously formulated problems along with the available solutions:


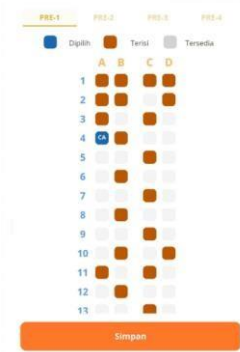
Table 2. Solutions of simplicity problem faced by Pasar Senen Station

Problem Description	Service procedure (socialization of available facility). Lack of guidance to locate areas needed by the users
Solution Idea	Facilities to guide users to certain areas are required.
Smart Management Implementation	 <p>Figure 2 22 Miles Interactive Wayfinding Kiosk (22miles.com, accessed in July 8th 2020)</p> <p>This solution is implemented by utilizing digital signal to provide information of certain areas in a busy transportation facility. This technology can solve directing and information clarity problems</p>

Problems on simplicity principle, mainly related with socialization of specific areas unavailable for the users, for example health facility, rendezvous point, and evacuation area. These facilities are important for the users because in emergency cases knowledge regarding these areas is important. Because of that, interactive directions such as 22 Miles Interactive Wayfinding Kiosk developed by Intel [13], is quite important to be placed in the station, especially on the busiest areas such as lobby or waiting room. This technology can be also quite helpful for the administrators and will make their job easier because visual direction can be easily understood. The users can also obtain new experience regarding available areas in the station through a big screen.

Table 3. Solution for clarity problems in Pasar Senen station

Problem description	Lack of information regarding available seating (which only available in online ticketing facility)
Solution Idea	Information media can be added in busy areas, such as waiting room. Besides that, this information which is available through KAI Access can be socialized better to the users.

Smart Management Implementation	 <p>Figure 3 KAI Access application.</p>
	 <p>Figure 4 Seat availability page.</p> <p>Currently, PT KAI have launched KAI Access application available for smartphones. With this app, users can easily book available ticket after signing up through KAI Access application.</p>

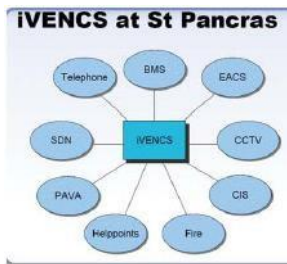
Problem regarding clarity principle is related with the lack of facility to provide information regarding seat availability on certain train. Currently, the technological solution is already available through online ticketing app known as KAI Access. With this app, users can easily access the availability information through their smartphones. However, it is important to add the facility on public areas such as waiting room. See table 4 below.

Table 4. Solution for easy access principle problem in Pasar Senen Station

Problem description	Parking availability and circulation (availability becomes lower due to high number of overnight vehicles)
Solution Idea	Providing separated parking system for overnight vehicles. Also to build an app that enable users to book parking areas to save time.
Smart Management Implementation	In Soekarno-Hatta International Airport Terminal 3, this system is already implemented. Separated location for overnight vehicles is available. Besides that, to facilitate circulation the management designs Smart Parking pilot project by adding parking area numbering to prevent conflicts on parking lots. An app that can direct the users to their parking lots is also available (www.goodnewsfromindonesia.id, accessed on August 9 th 2021)

Problem regarding easy access, related with parking space unavailability due to overnight vehicles. However, the capacity of existing parking area is quite large (up to 700 vehicles). Based on that, the solution for this problem is to separate parking areas for overnight vehicles and regular ones. Besides that, to facilitate vehicle circulation and prevent circling, Smart Parking pilot project technology as the ones implemented in Soekarno-Hatta International Airport should be considered to help users find their designated parking space. See table 5 bellow.

Table 5. Solution for convenience principle problem in Pasar Senen Station

Problem Description	Area cleanliness and appropriateness
Solution Idea	Easy system is required to automatically correct mistakes on certain areas.
Smart Management Implementation	 <p>Figure 5 iVencs System (fm.link, accessed on August 6th 2020).</p> <p>This system enables administrators to easily control the station. All operational activities are centralized in a control room with high integration to supervise situations in the station. This enables the administrator to correct problems in certain area.</p>

Problem regarding convenience principle, related with cleanliness and appropriateness of toilet and praying areas, and a number of public areas such as dining area, smoking area, and open green space that obtain low satisfactory level from the users. The solution of this problem is to establish control technology to supervise convenience level of an area. Example of a technology for this purpose is the iVench System. This system is already implemented in Pancras Station. This system enables administrators to control the station. The control room has already fitted with integration to supervise every part of the station that enables administrators to provide fast response when certain situation occurs in the station. This system can be a solution to improve service quality practiced by the staff and create a faster and more accurate service.

Based on the table and discussion above, we can see that the utilization of a number of technologies that can provide solution to improve operational quality of the

station. These technologies are implemented to assist administrators to operate the station. Besides that, the implementation of these technologies can improve users' experience and facilitate them to reach their destination easier.

4. CONCLUSION

This article is a case study conducted in Pasar Senen Station to produce solutions by implementing latest technologies. Based on our analysis, we can predict that technological utilization can assist the administrators to function effectively and to facilitate the users to obtain certain information through visual display that will surely provide better understanding. However, it is important to first improve operational system of Pasar Senen Station. The station can utilize iVencs to facilitate smart management system implementation, to enable staffs and administrators to locate problems and create the necessary solutions.

However, this article is written primarily on author analysis. There are still a number of weaknesses that can be further explored regarding this matter. In the future, further research to measure real-time effectiveness level should be conducted to enable stronger guidance to develop smart management implementation in train stations, especially Pasar Senen Station.

ACKNOWLEDGMENT

Author would like to thank Co-Author that provides the necessary guidance in the writing process to follow International Webinar Digital Architecture 2021 Proceedings held by Universitas Atmajaya Yogyakarta. Author would also like to thank all sources that provided the necessary data and ideas.

REFERENCES

- [1] N.H.B. Nordin, M.I.H. Mohd Masirin, M. I. Bin Ghazali, and M.I. Bin Azis, "Appraisal on Rail Transit Development: A Review on Train Services and Safety," IOP Conf. Ser. Mater. Sci. Eng., vol. 226, no. 1, 2017.
- [2] International Union Of Railways (UIC), "Smart Stations in Smart Cities," p. 84, 2017.
- [3] Peraturan pemerintah, "UNDANG-UNDANG NO 23 TAHUN 2007 TENTANG PERKERETAAPIAN," J. Exp. Psychol. Gen., vol. 136, no. 1, pp. 23–42, 2007.
- [4] S.M. Jannah, "Gara-gara Ini, Kereta di RI Tertinggal Jauh dari Jepang," finance.detik.com, 2018. [Online]. Retrieved from

- <https://finance.detik.com/berita-ekonomi-bisnis/d-4242627/gara-gara-ini-kereta-di-ri-tertinggal-jauh-dari-jepang>.
- [5] J. Capah, "Peningkatan Pelayanan Transportasi Antar Moda di Stasiun Pasar Senen," *J. Penelit. Transp. Multimoda*, vol. 13, p. 2, 2015.
 - [6] A. Budiman, M.F. Pradana, and Aldian, "Analisa Kinerja Pelayanan Pt . Kai (Persero)," *Oper. Maint. Transp. Syst. infrastructures*, no. October, pp. 11–13, 2016.
 - [7] S. Lin, Y. Jia, and S. Xia, "Research and Analysis on the Top Design of Smart Railway," *J. Phys. Conf. Ser.*, vol. 1187, no. 5, 2019.
 - [8] Kepmenpan, "Pedoman Umum Penyelenggaraan Pelayanan Publik (Vol Kepmenpan No 63/KEP/M.PAN/7/2003)," 2003.
 - [9] R. Mahesa, G. Yudoko, and Y. Anggoro, "Dataset on the sustainable smart city development in Indonesia," *Data Br.*, vol. 25, p. 104098, 2019.
 - [10] I.U.O.R. (UIC), "Railways and its interfaces with the urban areas," no. October, 2018.
 - [11] Global Infrastructure Hub, "Smart Stations," 2020. [Online]. Retrieved from <https://www.gihub.org/resources/showcase-projects/smart-stations/>
 - [12] R. Midiyanti and J.K.S. Ramlan, "Penerapan Manajemen Fasilitas dan Smart Mobility di PT. Kereta Api Indonesia (Persero) Implementation of Facility Management and Smart Mobility in PT Kereta Api Indonesia," *J. Manaj. Aset Infrastruktur Fasilitas*, vol. 4, no. 1, 2020.
 - [13] A. Jabez, "on Track To the Future," *Surveyor*, vol. 181, no. 5293, 1994.
 - [14] McMorow, "An integrated station management system (3D graphical user interface, dynamic virtual model of the station, interface with CCTV cameras, etc.) converts old St. Pancras station into modern terminus" [online]. Retrieved from <https://www.fmlink.com/articles/an-integrated-station-management-system-3d-graphical-user-interface-dynamic-virtual-model-of-the-station-interface-with-cctv-cameras-etc-converts-old-st-pancras-station-into-modern-terminus/>.