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Confirmatory Factor Analysis Of Service Quality Of Intercity Rail Transport In Thailand

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Abstract
The purposes of the study were 1) to develop the indicators of each confirmatory factor and the service quality of intercity rail transport in Thailand, and 2) to verify empirical data consistency of the confirmatory factor model and the service quality of intercity rail transport in Thailand. The Thai government has initiated a national project to develop a double-track railway system connecting all regions to improve public quality of life and at the same time to drive economic growth. However, the project won't be successful if there is no public interest in using train services. Therefore, the researcher aimed to conduct a confirmatory factor analysis (CFA) of the intercity rail transport to guide the stakeholders to implement the results of this study in designing service models with passenger needs.

There were five factors used in the study: employee – measured by indicators., such as clear and accurate communication with passengers, polite service, prompt assistance for problem solving, and completion of customer-service training; station – measured by indicators., such as a station with service points (e.g., shops, cafés), cleanliness, and parking spaces; passenger coach – measured by indicators., such as cleanliness of seats, toilets, other facilities, good ventilation, sufficient seating capacity, public information within passenger cars, and modern equipment, safety – measured by indicators., such as railway enforcement officers well trained and assigned to patrol the trains and stations to keep colleagues and passengers safe, and installation of equipment and facilities – measured by indicators., such as availability of power outlets and internet, diverse ticketing channels, and so on.

Keywords: *Quality of Life, Public, Rail Transport, Public Transport Systems.*

1. INTRODUCTION

Road transport in Thailand is a dominant system implemented for passenger and freight
Transportation, which currently cannot meet the needs of service users and it causes a persistent issue of traffic congestion. Consequently, the Thai government has invented a huge budget in various forms of transportation infrastructure. Therefore, an urgent transport action plan has been implemented with the aim of shifting road transport to other modes of transport, particularly a double-track railway system covering every region in Thailand (The Parliamentary Budget Office, 2019).

Most of the transport in Thailand is dominated by road transport, which currently cannot completely respond to the needs of service users due to congestion and delays in transport. Consequently, the Thai government has invested a substantial budget in various forms of transportation infrastructure to provide efficient coverage and connectivity. Therefore, Thai government has prepared an urgent transport action plan with the aim of shifting road transport to other modes of transport, particularly a double-track railway system linked to all regions in Thailand (The Parliamentary Budget Office, 2019). And the Ministry of Transport has been assigned to make a strategic plan to develop the transportation infrastructure with a period of 20 years (2018-2037) with the project to develop intercity trains into a double-track system. The project has enhanced spread growth in the regions in terms of economy and transportation, which is convenient for people to travel from place to place faster (Komchadluekonline, 2021). This is in accordance with the 20-year National Strategic Plan (2017-2036) and the National Economic and Social Development Plan (12th edition) (2017-2021), which aim to develop the quality of life of the people and drive the economy of Thailand (Office of Transport and Traffic Policy and Planning, 2016).

Approximately 40 million Thai people use railway transport yearly, but when compared to other modes of transport, it is quite a small amount. Moreover, the number of train passengers who use the train service both commercially and socially per day has been reduced after the COVID-19 outbreak as shown in Figure 1 below.

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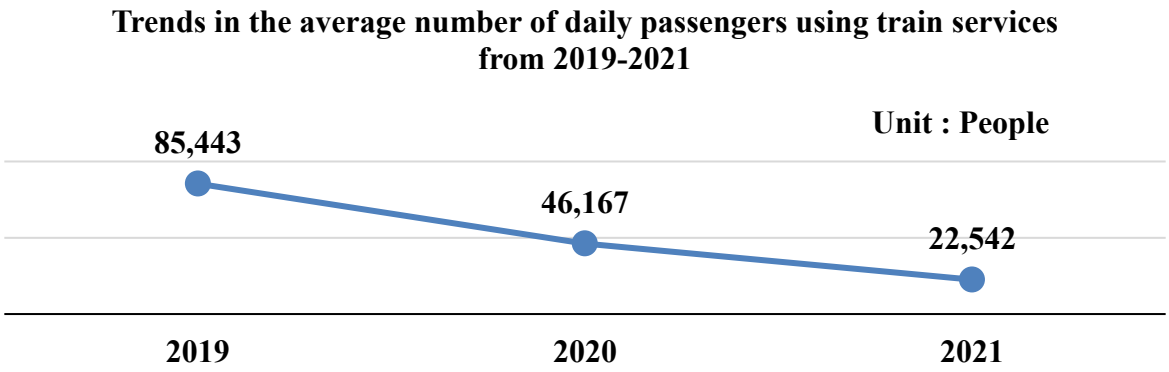


Figure 1 Trends in the average number of daily passengers using train services from 2019-2021 (Department of Rail Transport, 2021)

The ineffective administration of the intercity train system of the State Railway of Thailand has caused a persistent problem of the decreasing number of railway users. Moreover, the image crisis of organization on its inefficiency in providing services in many areas is a crucial problem as well. Additionally, in the past, the Thai government paid more attention to the development of the road transportation system than railway transport. This can be seen from the National Economic and Social Development Plan from 1st – 9th editions of the Office of the National Economic and Social Development Council that the policy of the rail transport system development was not issued at all but emphasizing more on the expressway system with the aim of reducing traffic congestion. Even though the railway transportation system, which was built during the reign of King Rama V, with the aim of providing services for the people to travel conveniently (Praphat, 2023). Therefore, the government needs a plan to serve the service to meet the needs of people.

Therefore, the researcher wanted to conduct a confirmatory factor analysis of the service quality of intercity rail transport in Thailand. The results of the study would be presented to the State Railway of Thailand to put in the plan or it could be a helpful guideline for creating service models and increasing service efficiency that could raise the standards of rail transport and benefit the country's long-term development.

2. RESEARCH OBJECTIVES

The objectives of the study were: 1) to develop the indicators of each confirmatory factor and service quality of intercity rail transport in Thailand, and 2) to verify empirical data consistency of the confirmatory factor model and service quality of intercity rail transport in Thailand.

3. LITERATURE REVIEW

The researcher conducted a literature review and it was found that there were five key components implemented to conduct a confirmatory factor analysis of the service quality of intercity rail transport in Thailand as follows:

3.1 Employee

Service quality affecting the sustainable growth of intercity rail transport in Thailand relies heavily on employees' knowledge, skills and experience (Khanchalee, R. & Phungnirand, B., 2021), that the organization can enhance its employees' performance capability through training (Seangpacharthaii, C., 2019), and the employee can learn how to speak politely with people or passengers and provide some helpful recommendations to them (Runkawee, 2022). Therefore, the development of employees' performance abilities may enhance the service quality and passenger satisfaction and improve service reliability.

3.2 Station

A railway station is a place where trains park, stop, switch, and people or passengers may get services of intercity of rail transport. The State Railway of Thailand should assign proper management of crowd control, cleanliness, safety, parking lots, and so on to provide additional services (Li et al., 2023). Moreover, a parking lot of each station should be assigned to meet the number of vehicles to park (Jonkeren & Kager, 2021). However, if the parking spaces are not sufficient, the State Railway of Thailand may cooperate with local entities, private entities, or community to provide more parking lots with a reasonable parking fee (Wilcock, 2001). When the number of parking lots is increased, the number of passengers or people may be increased as well (Kimpton et al., 2020).

3.3 Passenger coach

The modern and appropriate sizes of passenger coaches should be implemented to enlarge seat sizes or increase the comfort of seats to ensure convenience for passengers during their journey (Seangpacharthaii, C., 2019). Large LCD screens should be installed to provide passengers with information, such as notifications of arrival times at the final station and other important types of information; restroom facilities should be upgraded for better cleanliness, and CCTV cameras should be installed throughout the coaches to increase passengers' safety during travel (PPTV Online, 2016).

Moreover, passenger coaches should be equipped with modern and functional technology to enhance cleanliness and assign luggage storage (Urairat, W., Deejongkit, S. & Rojsuwan, B., 2021). Therefore, the improvement of passenger coaches is a vital component to enhance the efficiency and reliability of the rail transport system and improve the image of railway transport creating a better future for passengers (Nedeliaková, E., Valla, M., & Masár, M., 2024).

3.4 Safety

A railway station is considered as a crucial part of the railway system and plays a significant role in daily life. The State Railway of Thailand should put the emphasis on public safety by establishing safety standards and enforcing strict safety measures (Alawad, H., Kaewunruen, S., & An, M., 2020). Various types of technologies should be implemented to improve public safety and protect passengers' belongings (Cao, Y., et al., 2022). Additionally, training policies should be provided for all staff to realize regulations and raise safety awareness for passenger care (Li, M., et al., 2020). These may enhance service quality.

3.5 Facilities

Today modern railway stations are not only transportation hubs where journeys begin and end, but also social centers where people meet and hold meetings. Therefore, other facilities should be provided, such as internet services for travelers (e.g., internet hotspots, charging stations, etc.), and improved intermodal connections with other forms of urban transportation (Coppola, P., & Silvestri, F., 2020). Retail shops and cafes should be available for passengers to shop, eat, drink, or read while waiting for the train (Otsuka, N., & Reeve, A., 2024). Moreover, it is important to pay attention to all passengers including people with disabilities, the elderly, children, pregnant women, and those with large luggage to make it easier for all of them to get on and get off the trains (State Railway of Thailand, 2024). Moreover, improving convenience by enabling passengers to book and purchase tickets may enhance their preference for rail travel (Purnomo, F. M., & Indarwati, T. A., 2023). Therefore, service providers should improve service quality and the online ticketing system to increase passenger satisfaction (Sari, M. N., & Dirbawanto, N. D., 2023).

4. RESEARCH METHODOLOGY

4.1 Population and sample

The population of this study consisted of people or passengers who traveled by train. The sample size was 500 cases (Comrey, A. L., & Lee, H. B., 1992) which indicated a very good level for factor analysis. The multi-step random sampling technique, including stratified random sampling and Quata sampling was applied. The first sample group consisted of 100 cases of Northern Line passengers; the second group consisted of 100 cases of Northeastern Line passengers; the third group consisted of 100 cases of Eastern Line passengers; the fourth group consisted of 100 cases of Central Line passengers; and the fifth group consisted of 100 passengers who lived along the Southern railway line.

4.2 Research Tools

The instrument used in this study was a questionnaire developed from a review of relevant literature, documents, theories, and prior research. The questionnaire consisted of two parts:

Part 1: The respondents' general information comprised 4 items: gender, occupation, monthly income, and days of service use and a checklist format was implemented.

Part 2: The questionnaire used to assess the level of importance of the components and indicators of intercity railway service quality in Thailand contained 5 parts: Part 1: Employee (5 indicators), Part 2: Station (5 indicators), Part 3: Passenger coach (5 indicators), Part 4: Safety (5 indicators), and Part 5: Facilities (6 indicators) and a 5-point rating scale based on Likert (1932) was implemented.

To verify content validity, the questionnaire was evaluated using the Index of Item-Objective Congruence (IOC) by five experts, resulting in IOC values between 0.60 and 0.80, which was consistent with standard criteria (Rovinelli, R. J., 1976). And then the questionnaire was pilot-tested with 30 non-sample respondents (Burns, N., & Grove, S. K., 2001). Reliability was calculated by using Cronbach's alpha coefficient, and the result of the reliability value was of 0.96 which indicated high reliability and suitability for data collection (Cronbach, L. J., 1951).

4.3 Data analysis

Descriptive statistics (percentages) were used to analyze personal information data, and analyze the level of importance of service quality to calculate the mean ($\bar{X}$) and standard deviation (S.D.).

For the Confirmatory Factor Analysis (CFA) of the service quality components of Thailand's intercity rail transport, the following fit indices were used to evaluate model fit with empirical data (Gaskin, J. & Lim, J., 2016) as follows: Chi-square/degrees of freedom (CMIN/DF) was less than 3.00, Comparative Fit Index (CFI) was greater than 0.95, Standardized Root Mean Square Residual (SRMR) was less than 0.08, and Root Mean Square Error of Approximation (RMSEA) was less than 0.06.

The criteria of assessing construct validity of the indicators in each component were: 1) Factor loading between indicators and components must exceed 0.50 and be statistically significant (Kilic, A. et al., 2020), 2) Composite reliability (CR) must be greater than 0.70, and 3) Average variance extracted (AVE) must exceed 0.50 (Hair, J. F., et al., 2019).

5. RESULTS

5.1 The results of personal data analysis

It was found that the majority of the respondents were female (55.0%), followed by those who were students (32.6%), those who most held a bachelor's degree (64.0%), and the most common days of getting railway services were long holidays (34.60%).

5.2 The Results of data analysis of the importance level of intercity rail transport service quality in Thailand

The data analysis of the importance level of service quality for intercity rail transport in Thailand is presented by components and indicators, as shown in Tables 1–5.

Table 1: Mean and standard deviation of the Employee

Component and Indicators	$\bar{X}$	S.D.	Level of Importance
Employee	**4.44**	**0.63**	**Highest**
1) Clean and neat uniform (EMP01)	4.32	0.73	Highest
2) Polite service to passengers (EMP02)	4.46	0.73	Highest
3) Clear and accurate communication with passengers (EMP03)	4.52	0.70	Highest
4) Enthusiastic and prompt assistance when problems occur (EMP04)	4.45	0.72	Highest
5) Completed standard service training (EMP05)	4.45	0.75	Highest

From Table 1, it was found that the importance of Employee component in terms of service quality was at the highest level. The importance level of indicators could be put in order as follows: clear and accurate communication with passengers (EMP03), polite service to passengers (EMP02), enthusiastic and prompt assistance when problems arise (EMP04), completed standard service training (EMP05), and clean and neat uniform (EMP01).

Table 2: Mean and standard deviation of the Station

Component and Indicators	$\bar{X}$	S.D.	Level of Importance
Station	**4.44**	**0.65**	**Highest**
1) Clean and attractive railway station with landscape organization (STA01)	4.42	0.75	Highest
2) Station equipped with more information media to provide passengers with travel updates and other announcements (STA02)	4.45	0.73	Highest
3) Station with clean buildings, tidy platforms, and sanitary restrooms at all times (STA03)	4.51	0.75	Highest
4) Station with additional service points for waiting passengers, such as shops and cafés (STA04)	4.37	0.79	Highest
5) Station with sufficient parking spaces for passengers (STA05)	4.47	0.77	Highest

From Table 2, it was found that the importance of Station component in terms of service quality was at the highest level. The importance level of indicators could be put in order as follows: maintaining cleanliness of buildings, platforms, and restrooms at all times (STA03), sufficient parking spaces for passengers (STA05), station equipped with more information media to get passengers informed with travel updates and other announcements (STA02), maintaining railway station with landscape organization to ensure clean and attractive appearance (STA01), and providing more service points for waiting passengers, such as shops and cafés (STA04).

Table 3: Mean and standard deviation of the Passenger Coach

Component and Indicators	$\bar{X}$	S.D.	Level of Importance
Coach	**4.49**	**0.70**	**Highest**
1) Passenger coach with cleaned seats, sanitary restrooms, and other equipment (COA01)	4.52	0.78	Highest
2) Passenger coach equipped with a good ventilation system to prevent unpleasant odors (COA02)	4.50	0.76	Highest
3) Passenger coach with sufficient carriages and seats to accommodate demand as scheduled (COA03)	4.49	0.78	Highest
4) Passenger coach with clear informational media to show travel information or other regulations (COA04)	4.41	0.77	Highest
5) Passenger coach with modern and specified standards (COA05)	4.50	0.71	Highest

From Table 3, it was found that the importance of passenger coach component in terms of service quality was at the highest level. The importance level of indicators could be put in order as follows: taking good care of passenger coach to maintain sanitary restrooms, cleaned seats, and other equipment (COA01), passenger coach equipped with a good ventilation system to prevent odor pollution (COA02), modernized passenger coach with

specified standards (COA05), passenger coach with sufficient carriages and seats to accommodate demand on schedule (COA03), and passenger coach equipped with clear informational media to show travel information or other announcements (COA04).

Table 4: Mean and standard deviation of the Safety

Component and Indicators	$\overline{X}$	S.D.	Level of Importance
Safety	**4.48**	**0.70**	**Highest**
1) Installation of CCTV and emergency alarm systems in high-risk areas within stations and passenger coaches (SAF01)	4.54	0.72	Highest
2) Implementation of security personnel to regularly patrol stations and passenger coaches (SAF02)	4.50	0.75	Highest
3) Staff should be regularly trained in passenger safety procedures (SAF03)	4.47	0.79	Highest
4) Regular inspection and maintenance of passenger coaches based on schedule (SAF04)	4.46	0.83	Highest
5) Installation of more ramps at station areas and train doors for safe boarding by passengers with disabilities (SAF05))	4.44	0.84	Highest

From Table 4, it was found that the importance of Safety component in terms of service quality was at the highest level ($\overline{X}$=4.48). The importance level of indicators could be put in order as follows: installation of CCTV and emergency alarm systems in high-risk areas within stations and passenger coaches (SAF01), implementation of security staff to regularly patrol stations and passenger coaches (SAF02), regular staff training should be provided for passenger safety (SAF03), regular inspection and maintenance of passenger coaches based on schedule (SAF04), and additional installation of ramps at station areas and train doors for safe boarding by passengers with disabilities (SAF05).

Table 5: Mean and standard deviation of the Facilities

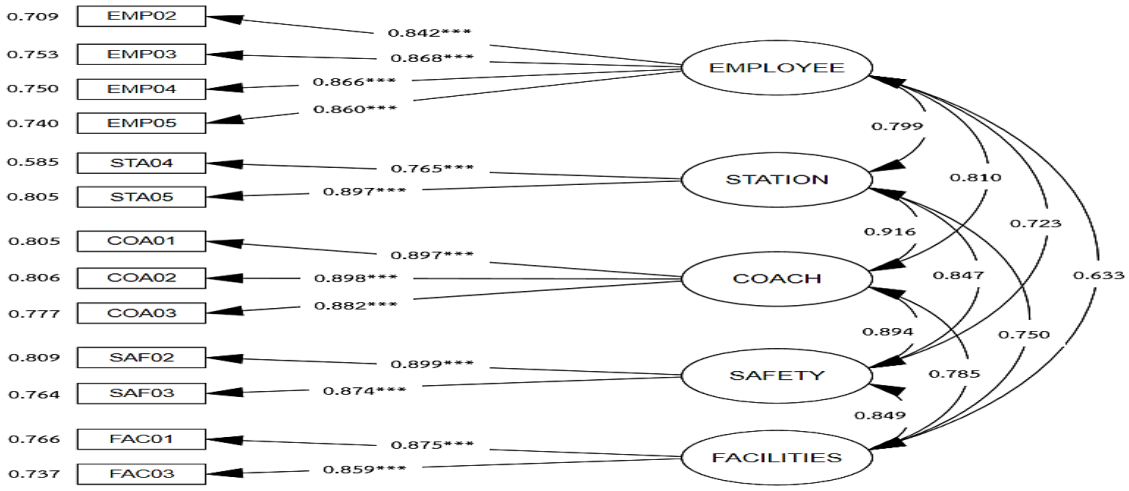
Component and Indicators	$\overline{X}$	S.D.	Level of Importance
Facilities	**4.41**	**0.71**	**Highest**
1) Provision of public transport services for passengers (FAC01)	4.39	0.82	Highest
2) Facilities must be available in stations and coaches for passengers with disabilities, such as designated seats and wheelchair storage (FAC02)	4.39	0.83	Highest
3) Installation of equipment and facilities to support urgent work needs of passengers, such as power outlets and internet access (FAC03)	4.37	0.86	Highest
4) Multiple options for ticket sales and payment methods (FAC04)	4.44	0.79	Highest
5) Ticket reservation and purchase processes are simple and easy to understand (FAC05)	4.41	0.77	Highest
6) Service centers are easily accessible with sufficient staff to assist passengers (FAC06)	4.43	0.77	Highest

From Table 5, it was found that the importance of Facilities component in terms of service quality was at the highest level. The importance level of indicators could be put in order as follows: various channels for ticket sales and payment options (FAC04), convenient service centers with sufficient staff to help passengers (FAC046), easy ticket

reservation and purchase processes (FAC05) public transport services for passengers are sufficiently provided (FAC01), fully equipped facilities must be available in stations and coaches for passengers with disabilities, such as designated seats and wheelchair storage (FAC02), and installation of equipment and facilities to meet urgent work needs of passengers, such as power outlets and internet access (FAC03).

5.3 The results of the indicator development within the confirmatory factor model of intercity rail transport service quality in Thailand

The researcher adjusted the model to develop indicators within the confirmatory factor model of intercity rail transport service quality in Thailand. The results of this development are presented in Figure 2.



*** P < 0.001

CMIN/DF = 2.680 CFI = 0.984 SRMR = 0.024 RMSEA = 0.058

Figure 2: The confirmatory factor model of intercity rail transport service quality in Thailand showing a good fit with the empirical data (standardized score).

From Figure 2, the relationships between components show that all of the correlation coefficients between each pair of major components are positive. This indicates that all five components are related in the same direction (Kanlaya Vanichbuncha, 2019).

Whereas, the results of the confirmatory factor analysis of the intercity rail transport service quality model in Thailand revealed that the Employee component could be measured by using four indicators ranked by standardized factor loadings from highest to lowest values as follows: clear and accurate communication with passengers (EMP03) – 0.868, enthusiastic and prompt assistance when problems occur (EMP04) – 0.866, completed standard service training (EMP05) – 0.860, and polite service to passengers (EMP02) – 0.842. The Station component could be measured by using four indicators ranked by standardized factor loadings from highest to lowest values as follows: sufficient parking space for passengers (STA05) – 0.897, and providing more service points for waiting passengers, such as shops and cafés (STA04) – 0.765. The Passenger coach component could be measured by using four indicators ranked by standardized factor loadings from highest to lowest values as follows: taking good care of passenger coach to maintain sanitary restrooms, cleaned seats, and other equipment (COA01) – 0.898, passenger coach equipped with a good ventilation system to prevent odor pollution (COA02) -0.896, and passenger coach with sufficient carriages and seats to accommodate demand on schedule (COA03) – 0.882. The Safety component could be measured by using four indicators ranked by standardized factor loadings from highest to lowest values as follows: implementation of security staff to regularly patrol stations and passenger coaches (SAF02) – 0.899, and regular staff training should be provided for passenger safety (SAF03) – 0.875. The Facilities component could be measured by

using four indicators ranked by standardized factor loadings from highest to lowest values as follows: public transport services for passengers are sufficiently provided (FAC01), - 0.875, and installation of equipment and facilities to meet urgent work needs of passengers, such as power outlets and internet access (FAC03) -0* 0.859.

5.4 Structural validity analysis to assess the suitability of subcomponents as indicators of each major component by verifying the construct validity of the model through evaluation of composite reliability (CR), and average variance extracted (AVE)

The results of the analysis are presented in **Table 6**.

Table 6: Composite reliability (CR) and average variance extracted (AVE)

Main Component	CR	AVE
Employ	0.918	0.738
Station	0.818	0.694
Passenger coach	0.890	0.730
Safety	0.881	0.787
Facilities	0.881	0.787

From Table 6, it is found that the composite reliability (CR) and average variance extracted (AVE) for the main components meet the specified criteria. This indicates that the indicators for each component are appropriate and valid.

6. CONCLUSION

The results of the confirmatory factor analysis of intercity rail transport service quality in Thailand revealed that the model is consistent with empirical data, and the relationships among five key components are in the same direction. Therefore, the results of each component can be discussed as follows: Railway employees play a very important role in passenger satisfaction. If the number of passengers or clients who decide to get train services is decreasing, it is because delayed or indifferent responses to problems that need solving (Yulianto, D. G., & Awan, A., 2024). Therefore, the State Railway of Thailand must urgently enhance service quality awareness to improve passenger satisfaction and encourage repeated use (Gözde & Sait, 2022). And staff training focused on polite, efficient service, and effective communication must be provided to promote service quality (Wisutwattanasak, P., et al., 2023), with the ability to provide guidance for more information and problem solving (Menglei, 2017), and other relevant travel recommendations (Runkawee, 2022). This can create a good image with a professional appearance (Seangpacharthaii, 2019), contribute strong work behavior and a positive organizational image (Oksana, 2023). Therefore, enhancing employee performance is essential for service quality that leads to passenger satisfaction and increased services.

A train station is a vital part of the rail transport system. Therefore, service quality should be improved beginning with providing sufficient parking space for passengers (Jonkeren & Kager, 2021). If station space is limited, collaboration with local entities or communities to provide affordable parking lot is recommended (Wilcock, 2001). When there are more or sufficient parking lots, it may encourage more passengers to get more rail services (Kimpton et al., 2020). Moreover, there should be a proper plan to develop station areas for commercial purposes to support daily activities of passengers, such as shopping, eating, etc. (Morikawa et al., 2023), meanwhile, a train station serves multiple functions: boarding, transferring and freight, and this may cause a big problem of crowded conditions. Therefore, more seating should be added, and station cleanliness should be regularly maintained, especially restrooms to attract passengers (Phimngam et al., 2021).

Improvement of passenger coaches is also crucial for enhancing transport system efficiency and passenger confidence (Nedeliaková et al., 2024). This includes modernizing carriages, adding sufficient and comfortable seating (Seangpacharthaii, 2019). Moreover, there should be additional equipment installation within passenger coaches to provide information, and the restrooms within carriages should be clean (Phimngam et al., 2021). CCTV installations throughout coaches can enhance passenger security (PPTV Online, 2016). Therefore, improvement of passenger coaches can definitely increase a number of passengers.

Safety is an essential part in the rail transport system. In the past, the railway police offered passengers a sense of security. However, when the agency of railway police was abolished, public confidence has been reduced because of unpleasant incidents, such as accidents, crimes (Blumenfeld et al., 2023). Therefore, enhancing service quality by rebuilding trust through safety measures is essential and the State Railway of Thailand should implement strict safety standards (Alawad et al., 2020). The policy of safety measurements in the passenger carriages, train stations and outside the areas should be assigned and issued, such as CCTV installations (Sangthong et al., 2022), increased patrols at stations and on trains (Rueanngam et al., 2023), and various technologies should be implemented to safeguard passengers and their property (Cao et al., 2022). Staff should also be trained to understand safety policies, regulations and procedures to protect passengers in all dimensions (Li et al., 2020). Passengers' sense of safety in public transport system is fundamental to increase the number of passenger (Ding et al., 2023; Foroutan & Bamdad, 2023), and enhance passenger satisfaction and increase getting services.

There are not sufficient options for passengers in rural areas to access public transport services. (Thailand Consumers Council, 2022). Therefore, the responsible agencies should improve multimodal integration to link other transport formats (Coppola & Silvestri, 2020), or coordinate with other public transport agencies to provide convenient access to railway stations, and passengers may reduce using personal vehicles and this can reduce the environmental pollution (Patraporn et al., 2021), meanwhile, there are diverse transport modes (Arreeras et al., 2020; Wicki et al., 2024) to make stations more accessible (Ibrahim et al., 2020). Moreover, a train station is not only a transportation network, but also a community hub. Therefore, other facilities should be available to enhance efficiency of the station area to support internet accessibility and entertainment area (Fadlilah et al., 2024), or there are some commercial facilities for passengers, such as shops close to the station (Qin et al., 2023). There should be retail shops, cafes where passengers can buy things, eat, or read while waiting (Otsuka & Reeve, 2024). Besides, services should be equally provided for all passengers: disabled persons, the elderly, children, pregnant women, and those with large luggage (State Railway of Thailand, 2024). Additionally, easy ticket reservation and purchase processes (Purnomo & Indarwati, 2023; Sari & Dirbawanto, 2023) may increase customer satisfaction and encourage greater use of train services.

7. RECOMMENDATIONS

The Thai government has invested in the development of railway transport system to improve the quality of life and make travel activities more convenient for the public. The research findings show the needs of people who regularly travel by train. Therefore, the government should urge the relevant agencies to expedite improvements of the components that affect convenience and public perception to enhance confidence and encourage more people to choose rail transportation services for both train and freight transport.

Moreover, after the railway development projects are completed and the public begins to get the services, there should be a follow-up to assess passenger satisfaction and gather additional feedback. This information should then be used to resolve any issues that may hinder service use to make sure that rail transport becomes a significant and preferred travel option for the public once again.

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REFERENCES

1. Alawad, H., Kaewunruen, S., & An, M. (2020). A deep learning approach towards railway safety risk assessment. IEEE Access, 8, 102811-102832.
2. Arreeras, T., Chongutsah, S., Asada, T., & Arimura, M. (2020). Factors Affecting Mode Choice in Accessing Railway Station Study in Nakhon Ratchasima. Transportation Research Procedia, 48, 3457-3468.
3. Blumenfeld, M., Lin, C. Y., Jack, A., Abdurrahman, U. T., Gerstein, T., & Barkan, C. P. (2023). Towards measuring national railways' safety through a benchmarking framework of transparency and published data. Safety science, 164, 106188. Academic Journal of Management Technology

4. Burns, N., & Grove, S. K. (2001). The Practice of Nursing Research: Conduct, Critique, & Utilization. (4th ed.). Philadelphia: W. B. Saunders.
5. Cao, Y., An, Y., Su, S., Xie, G., & Sun, Y. (2022). A statistical study of railway safety in China and Japan 1990–2020. Accident Analysis & Prevention, 175, 106764.
6. Comrey, A. L., & Lee, H. B. (1992). A First Course in Factor Analysis (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum. Cited in Lingard, Helen & Rowlinson, Steve. (2006). Sample size in factor analysis: why size matters.
7. Coppola, P., & Silvestri, F. (2020). Assessing travelers' safety and security perception in railway stations. Case studies on transport policy, 8(4), 1127-1136.
8. Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. psychometrika, 16(3), 297-334.
9. De Gruyter, C., Truong, L. T., & Taylor, E. J. (2020). Can high quality public transport support reduced car parking requirements for new residential apartments?. Journal of Transport Geography, 82, 102627.
10. Department of Rail Transport. (2021). Compare the average number of passengers on commercial and social railway services. [cited 15 Feb, 2024]. From : https://www2.drt.go.th/media/เปรียบเทียบปริมาณผู้โด
11. Ding, P., Feng, S., & Jiang, J. (2023). The Impact of Urban Rail Transit Epidemic Prevention Measures on Passengers' Safety Perception. International journal of environmental research and public health, 20(5), 4161.
12. Fadlilah, S. A. J., Sudo, S., & Novianto, D. (2024). Environmental User Preferences in Indonesian Cities Railway Station: Towards Sustainable Transit-Oriented Development (TOD). In IOP Conference Series: Earth and Environmental Science (Vol. 1361, No. 1, p. 012003). IOP Publishing.
13. Foroutan, S. L. F., & Bamdad, S. (2023). Efficiency measurement of railway passenger stations through network data envelopment analysis. Research in Transportation Business & Management, 46, 100767.
14. Gaskin, J. & Lim, J. (2016). "Model Fit Measures", AMOS Plugin. Gaskination's StatWiki.
15. Gözde, Y, & Sait, G. (2022). An EFQM-Based Self-Assessment Method for Railway Transportation Service Quality: An Application with Intuitionistic Fuzzy AHP. Ege Academic Review.
16. Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). Multivariate Data Analysis (8th ed. Annalbel Ainscow.
17. Ibrahim, A. N. H., Borhan, M. N., Md Yusoff, N. I., & Ismail, A. (2020). Rail-based public transport service quality and user satisfaction–a literature review. Promet-Traffic&Transportation, 32(3), 423-435.
18. Jonkeren, O., & Kager, R. (2021). Bicycle parking at train stations in the Netherlands: Travellers' behaviour and policy options. Research in Transportation Business & Management, 40, 100581.
19. Khanchalee, R. & Phungnirand, B. (2021). Antecedents of Efficiency on Organization Management at the State Railway of Thailand. Technical Education Journal King Mongkut's University of Technology North Bangkok. 12(1), 127-139.
20. Kilic, A., et al. (2020). Comparison of Confirmatory Factor Analysis Estimation Methods on Binary Data. International Journal of Assessment Tools in Education, 7 (3) , 451-487.
21. Kimpton, A., Pojani, D., Sipe, N., & Corcoran, J. (2020). Parking behavior: Park 'n'ride (PnR) to encourage multimodalism in Brisbane. Land use policy, 91, 104304.
22. komchadluekonline. (2021). What's good about the double-track railway system? Does it really make getting home faster?. [cited 11 Feb, 2024]. From : https://www.komchadluek.net/kom-lifestyle/477862
23. Li, M., Zhai, H., Zhang, J., & Meng, X. (2020). Research on the relationship between safety leadership, safety attitude and safety citizenship behavior of railway employees. International journal of environmental research and public health, 17(6), 1864.
24. Li, Z., Yin, J., Chai, S., Tang, T., & Yang, L. (2023). Optimization of system resilience in urban rail systems: Train rescheduling considering congestions of stations. Computers & Industrial Engineering, 185, 109657.
25. Liang, Y., Song, W., & Dong, X. (2021). Evaluating the space use of large railway hub station areas in Beijing toward integrated station-city development. Land, 10(11), 1267.
26. Likert, R. (1932). A technique for the measurement of attitudes. Archives of psychology.
27. Manopiniwee, C., and Zachau, U. (2017). The Future of Thailand's Railway System. [cited 15 Feb, 2024]. From : https://blogs.worldbank.org/th/eastasiapacific/future-of-thai-railways-5-fundamental-questions
28. Menglei, L. (2017). Evaluation of railway performance through quality of service.

29. Morikawa, S., Aoyama, M., & Kato, H. (2023). Development of railway station plazas: Impact on land prices of surrounding areas. Transport Policy, 142, 1-14.
30. Nedeliaková, E., Valla, M., & Masár, M. (2024). Modernization of railway wagons for customer satisfaction and safety. Vehicles, 6(1), 374-383.
31. Office of Transport and Traffic Policy and Planning. (2016). Main Mission Plans of the Ministry of Transport under the Draft Strategy for the Development of Thailand's Transport System (2017–2036). Ministry of Transport.
32. Oksana, P. (2023). "Portrait" of an employee — a tool to ensure the quality of services at railway stations. Tehnik transporta: obrazovanie i praktika.
33. Otsuka, N., & Reeve, A. (2024). Railway stations as public space: how to promote rail journeys via multi-functional railway stations. European Planning Studies, 32(5), 973-1009.
34. Patraporn, P., et al. (2021). The study of factors that influence the use ofhigh-speed train services in Eastern Economic Corridor (EEC). Kasetsart Engineering Journal, 34(112), 47-58.
35. Phimngam, K., et al., (2021). Interdisciplinary Academic and Research Journal, 1 (3), 1-12.
36. PPTV Online. (2016). The New Passenger Carriages of the State Railway of Thailand. [cited 11 May, 2024]. From : https://www.pptvhd36.com/news/ประเด็นร้อน/30763
37. Prapas Chongsa-nguan. (2023). Uncovering Hidden Issues in the State Railway of Thailand That Are Rarely Discussed. [Retrieved March 16, 2024]. From https://www.matichonweekly.com/column/article_644328
38. Preutthipan, S. (2020). Competitive Performance Of Rail Transportation And Friendly Environment: A Case Study Of The Use Of Air-Conditioned Power Van Car (APVC) In State Railway Of Thailand. Srinakharinwirot University Journal of Sciences and Technology, 13(26), 106-120.
39. Purnomo, F. M., & Indarwati, T. A. (2023). Consumer preference analysis in online purchase of inter-city railway tickets at Surabaya Pasar Turi station. International Management Conference and Progressive Papers, 1, 352–364.
40. Qin, Y., Zhang, Y., Yao, M., & Chen, Q. (2023). How to Measure the Impact of Walking Accessibility of Suburban Rail Station Catchment Areas on the Commercial Premium Benefits of Joint Development. Sustainability, 15(6), 4897.
41. Rovinelli, R. J. (1976). Methods for Validating Criterion-Referenced Test Items. Unplblisded Doctoral Dissertation. University of Massachusetts Amherst. [cited 5 Apr, 2024, from https://scholarworks.umass.edu/cgi/viewcontent.cgi?referer=https://www.google.Co.th/&httpsredir=1&article=4661&context=dissertations_1 "
42. Rueanngam, S., Leeratermpong, C., & Santad, P. (2023). Service Users' Safety and Compare Service Users' Safety Level of Southern Railway (Bangkok - Nakhon Si Thammarat). Journal of Management and Local Innovation, 5(3), 122-131.
43. Runkawee, N. (2022). Importance-Performance Analysis for Services of Intercity Railway Station: Case Study of Nakhon Ratchasima. Songklanakarin Journal of Management Sciences. 40(1), 84-110.
44. Sangthong, M., Seapoo, K., & Aotrit, S. (2022). Relationship Between Image and Service Quality Perceived by Customers of Railway Stationsin Nakhon Si ThammaratProvince. 3(2), 1-14.
45. Sari, M. N., & Dirbawanto, N. D. (2023). The Influence of Service Quality and Online Ticket Purchase System on Customer Satisfaction of Train Service Users:(A Study At Pt. Ka Sribilah For the Medan-Rantauprapat Route). Journal of Humanities, Social Sciences and Business, 3(1), 142-152.
46. Seangpacharthaii, C. (2019). Corporate Image, Service Quality, and Marketing Mix that Influence the Satisfaction with State Railway of Thailand Service. Master Thesis, Faculty of Business Adninistration, Bangkok University.
47. State Railway of Thailand. (2018). Safety Measures of the State Railway of Thailand. Retrieved May 26, 2020, from http://www.railway.co.th/
48. State Railway of Thailand. (2024). SafetyManual2018. [cited 16 Mar, 2024]. From : https://www.railway.co.th/assetsBackend/images/ckNewsImg/files/SafetyManual2018.pdf

49. Thailand Consumers Council. (2022). Revitalizing the Public Transportation System that Has Been Rejected by the Public. [cited 16 Mar, 2024]. From : https://www.tcc.or.th/revive-pubilic-transport/
50. The Parliamentary Budget Office. (2019). Approaches to the Development of the National Transportation System. Academic Report by the Budget Bureau of the Parliament, No. 8/2019
51. Urairat, W., Deejongkit, S., & Rojsuwan, B. (2021). Factors Affecting Customer Satisfaction ofSpecial Express "Taksinarat" 31/32 Bangkok-Hat Yai Junction-Bangkok. Vol 16 (2564): THE 16TH RSU NATIONAL GRADUATE RESEARCH CONFERENCE, 678-687.
52. Wahyudi, N. H. (2023). The Effect of Timeliness and Convenience on Passenger Railways MRT Satisfaction and Loyalty. Journal of Humanities and Social Sciences Studies, 5(2), 16-21.
53. Wicki, M., Hauller, S., Bernauer, T., & Kaufmann, D. (2024). Beyond a transport node? What residents want from transforming railway stations. European Planning Studies, 32(1), 1-23.
54. Wilcock, D. C. (2001). Commuter rail station governance and parking practices. Transportation research record, 1762(1), 40-48.
55. Wisutwattanasak, P., Champahom, T., Jomnonkwao, S., Seefong, M., Theerathitichaipa, K., Kasemsri, R., & Ratanavaraha, V. (2023). Modeling Extended Service Quality for Public Transportation in the Post-Pandemic Period: Differentiating between Urban and Rural Areas: A Case Study of Intercity Railway, Thailand. Logistics, 7(4), 93.
56. Yulianto, D. G., & Awan, A. (2024). The Influence of Service Quality on Train Passenger Satisfaction at Rantau Prapat Station PT KAI Persero Divre I North Sumatra. Railway Journal, 1(1), 5-5.