Integration of an independent e-ticketing system into a common e-ticketing platform in ferry services

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Abstract. The demand for mobility has evolved with increasing globalization. Multimodal passenger transport has grown steeply. The ease of obtaining information on the schedule, making a ticket reservation, and making a payment is obvious. This method of e-ticketing is also more cost-efficient, simple and practical, compared to conventional ticketing system with a hardcopy ticket. Nearly all transport providers have been providing an e-ticketing service, both independently and integrated in a multimodal e-ticketing platform. This paper outlines a study on the integration of e-ticketing system of a ferry operator, and an effort to integrate it into a common e-ticketing platform. The finding shows that the biggest challenge of entering into an e-ticketing system and integrating it into an e-commerce, i.e., common e-ticketing platform lies in the core of ship operations, namely the necessity to have an access on a real-time and reliable ship scheduling.

1. Introduction
Nowadays, the problems faced by sea transportation are digital technology which gradually replacing conventional works. The trending phenomenon of app ride applications ranging from Gojek, Grab, to Uber raises the disruption effect for conventional players as if they were an alarm for entrepreneurs in other sectors to have a turn.

Ferry/ro-ro ships are a means for passenger transport to cross rivers, straits, and longer sea voyages of up to about 24 hours. The growing economy goes hand in hand with this passenger transport growth by ferry/ro-ro ships. Beside passengers, this type of ship also carries cars and truck, and it serves as the so-called a moving bridge. This ferry/ro-ro service is appealing for many due to its high frequency, short waiting time at terminal. A part within this ferry/ro-ro transport is the ticketing process. Most of ticketing systems of the ferry/ro-ro services in Indonesia are still conventional, by using hard copy tickets which are reserved at the counters, located in the terminal areas.

The digital era has penetrated all aspects of human life. The following provides a brief overview how the landscape of e-commerce and its impact and challenges. An application of electronic commerce (E-Commerce) has made a close relationship between producers and customers so that in the application of E-Commerce can be penetrated to remote locations [1]. As a means for sharing business information, e-commerce shows a strong contribution in maintaining business relationships, and conducting business transactions through telecommunications networks [2]. It is increasing obvious, that many small medium enterprises utilize e-commerce to enter the global market.

There is virtually no geographical limitation anymore to conduct business globally [3,4]. Anther role which e-commerce has shown its strength is a marketing tool. It could display, promote the product tirelessly, anytime. It is highly accessible, as long as it is connected to internet [5]. From the various

background problems that have been mentioned, it is known that to follow the development of the digital era then the sea transportation sector needs to make a new breakthrough that can reach and assist the sea transportation services users in obtaining information about the payment system that can be done anywhere and anytime [6,7]. Therefore e-ticketing (ET) as an opportunity to minimize the time of purchase, increase the flexibility of consumer comfort, can reduce the cost of ticket processing, can minimize the risk of loss of tickets, stolen, lagged, or even splashed by water, eliminating paper form threads, and assisting travel agents in making changes in the itinerary.

The paper elaborates the transformation a ferry/roro operator in modernizing its conventional ticketing system into an independent e-ticketing system. At present all e-ticketing platforms provide a facility for purchasing tickets for nearly all modes of transport, namely bus, train, and airlines, except for ships and ferries. The study investigates the challenges of integrating an independent e-ticketing system into a common e-ticketing platform, furthermore it aims to seek ways to smoothen its process.

2. Methodology
The following steps are conducted address the problem statements:
1. A field research is conducted at Port of Merak and Bakauheni. The processes of a conventional ticketing system, experiences and preferences of both users and ferry operator are documented.
2. Investigation on the introduction of non-cash payment system, which serves as a steppingstone towards an e-ticketing system.
3. Studying the architecture of the e-ticketing system, which is operated independently and dedicatedly by a prominent ferry operator.
4. Comparison on the properties and capabilities of few independent e-ticketing systems and a common e-ticketing platform.
5. Identifying lacking elements for an integration of the existing e-ticketing system into a common e-commerce-based e-ticketing platform

3. Conventional Ticketing System
The transformation towards a modern e-ticketing system starts with implementing a non-cash payment system. This system aimed at reducing irregularities, by using electronic money, see Figure 1. The implementation of this non-cash payment system is supposed to support the government policy to shift from cash into non-cash payment, especially in ferry business [8,9].

This is part of the modernization of the ferry industry in which there have been significant changes, especially in the purchase of ferry tickets that were previously dominated by manual transactions to become digital. Payment with electronic money makes it easy not only for ferry service users. But it can also be felt from various parties related to the company's business flow, both from shipping operators, Land Transportation Shop Operators (BPTD), the Syahbandar Office and the Port Authority (KSOP), Masters, insurance companies, and ASDP itself as the mover of the electronic money program [10,11].

Figure 1. Non-cash payment at a conventional ticket counter

With this payment method is expected to minimize the potential leakage of revenue, accuracy of the manifest and also facilitate the recording of financial transaction data to be more valid. The application of non-cash services is expected to increase the convenience of service users in transaction because payment will be shorter, and transactions can be done more securely. This non-cash payment system precedes the transformation into an e-ticketing system.

4. Implementation an e-Ticketing System

E-ticketing or electronic ticket is a way to document the sales process of the customer's travel activities without having to issue a physical document or paper ticket. The e-Ticketing is part of E-Commerce where to make e-Ticketing the following elements are a pre-requisite for establishing good and E-Ticketing and E-Commerce [12,13]:

    a. Process. Process related to physical products or services, usually going through the value chain.
    b. Institutions. One of the principles held in an e-Commerce is the applied of the network (inter-networking).
    c. Information technology. Operationally, technological infrastructure factors will determine the level of performance of the desired e-Commerce business.

E-Commerce uses common the following technology standards: Electronic Data Interchange (EDI), Open Buying on the Internet (OBI), Open Trading Protocol (OTP), Open Profiling Standard (OPS), Secure Socket Layer (SSL), Secure Electronic Transaction (SET), Trustee.

The functionality of an e-ticketing system is as follows: Consumers start entering the system through registration. When a buyer starts searching a ticket, he is in position to browse all possible options ranging from ports of origin and destination, date and time of departure and tariffs. A selection process is followed with a confirmation, putting the reservations tickets into a basket also known as a shopping cart. In turn, the payment process proceeds, see Figure 2.
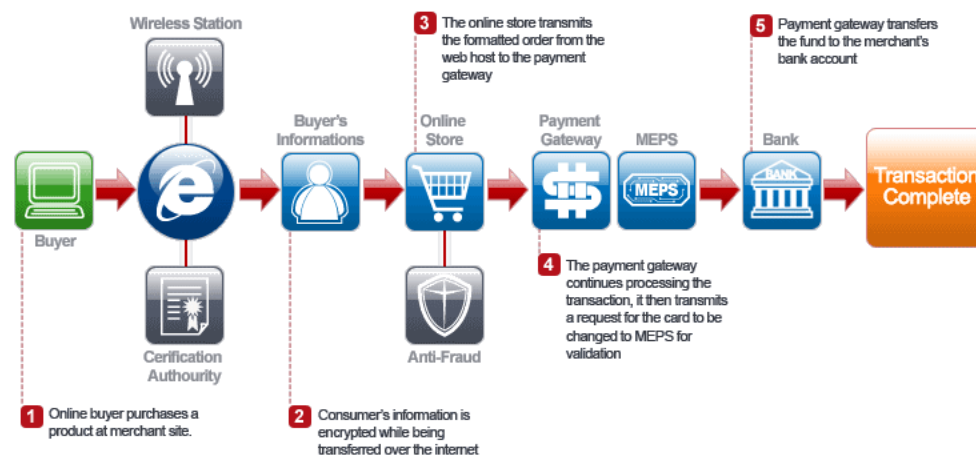

Figure 2. Flow of activities in an e-commerce

The previously developed non-cash payment system served as an important step towards transformation into a full e-ticketing system. The development of an e-ticketing system commences with the establishing the e-payment procedure. In order to be able to produce a secure system, the company needs to apply an encryption algorithm encompassing customers, merchants and financial service providers which authorize credit card and bank transfer transactions, see Figures 3, 4 & 5.
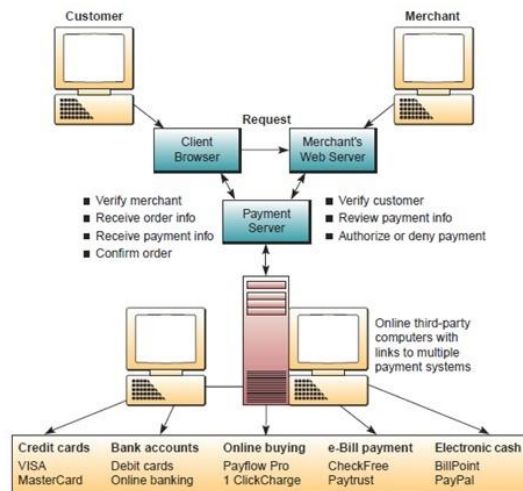
Figure 3. Payment process

An e-ticket contains the following fields:
1. Name of transportation Company
2. Booking code (PNR), this unique code is the reference of passenger data in the airline's database system.
3. Flight details: Time, route, flight number.
4. Passenger details: Name, ticket type, baggage info and ticket number.

On the day of departure, a consumer brings the e-ticket to the place of departure for the check-in process accompanied by an official photo ID such as ID card, driver's license (domestic route) or passport (international route). The boarding officer requires booking code (PNR) on the electronic ticket to then match the data in their database with the info in our official identity.
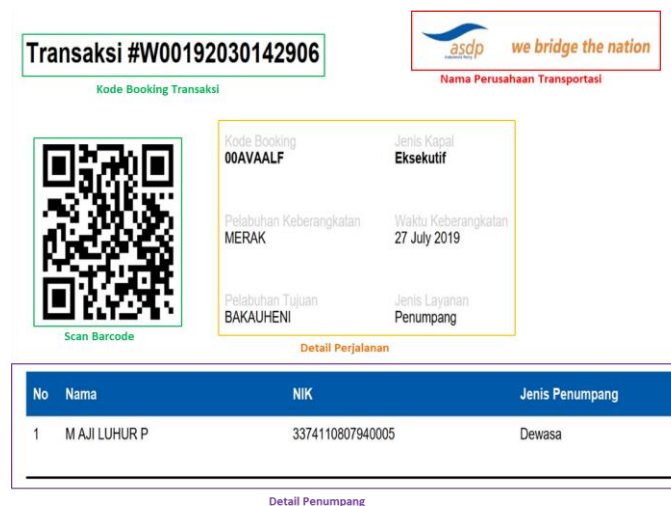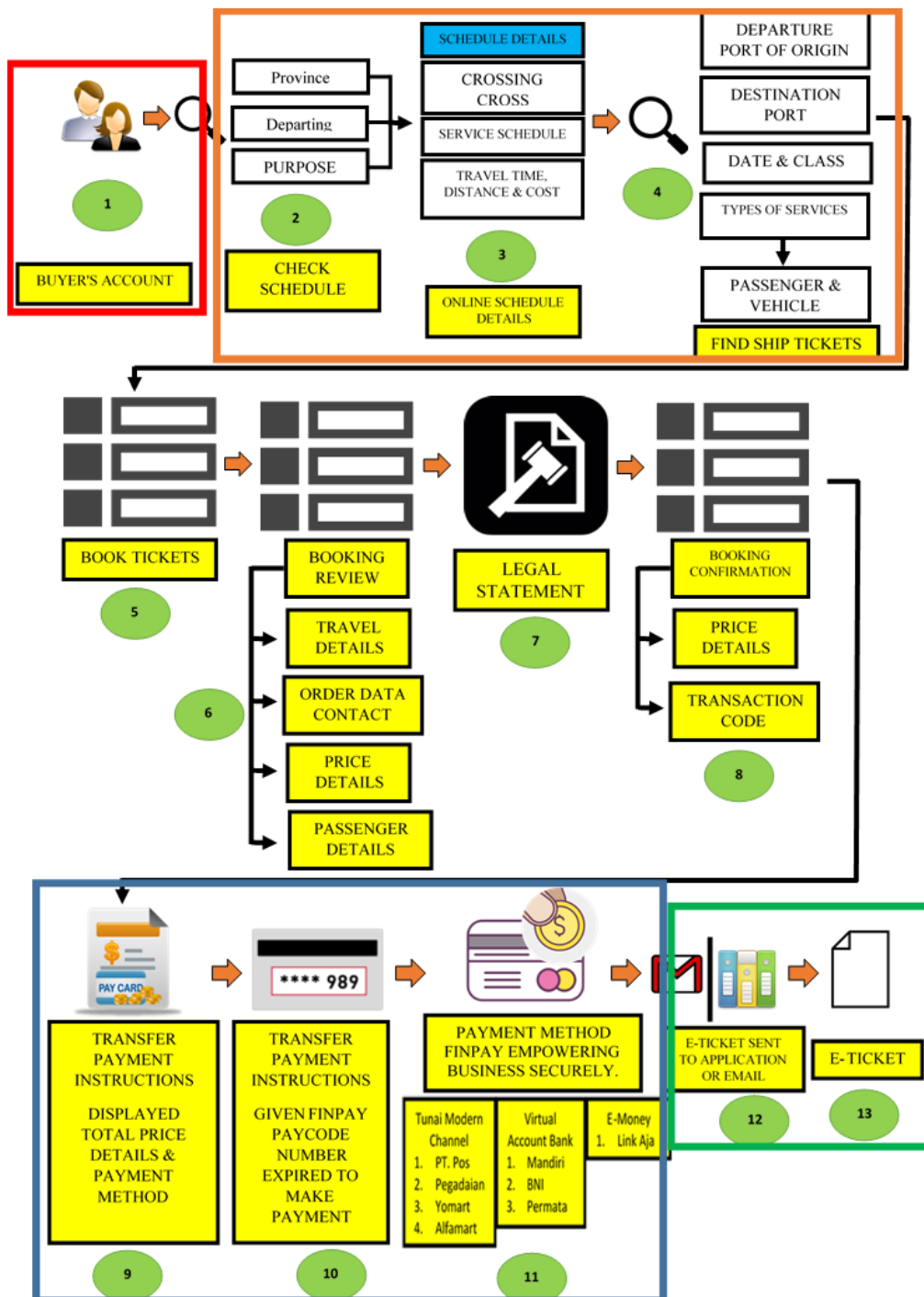

Figure 4. A hardcopy ticket

Figure 5. Process of purchasing an e-ticket

5. Integration into a Common e-Ticketing Platform

At present, an e-commerce platform already provides the public with huge online facilities to provide goods and services in a very convenient way and efficiently. Based on the same principle, a prominent e-ticketing platform provides a facility for purchasing tickets for nearly all modes of transport, namely bus, train, and airlines, except for ships and ferries. A consumer has a full liberty to select any transport provider, dates and time of departure and tariffs. A common e-ticketing platform integrates various

independent e-ticketing services, see Figure 6. The added value of this system is obvious, namely the ease, speed, and cost-effectiveness. A full ticket reservation process takes 12 minutes in average.
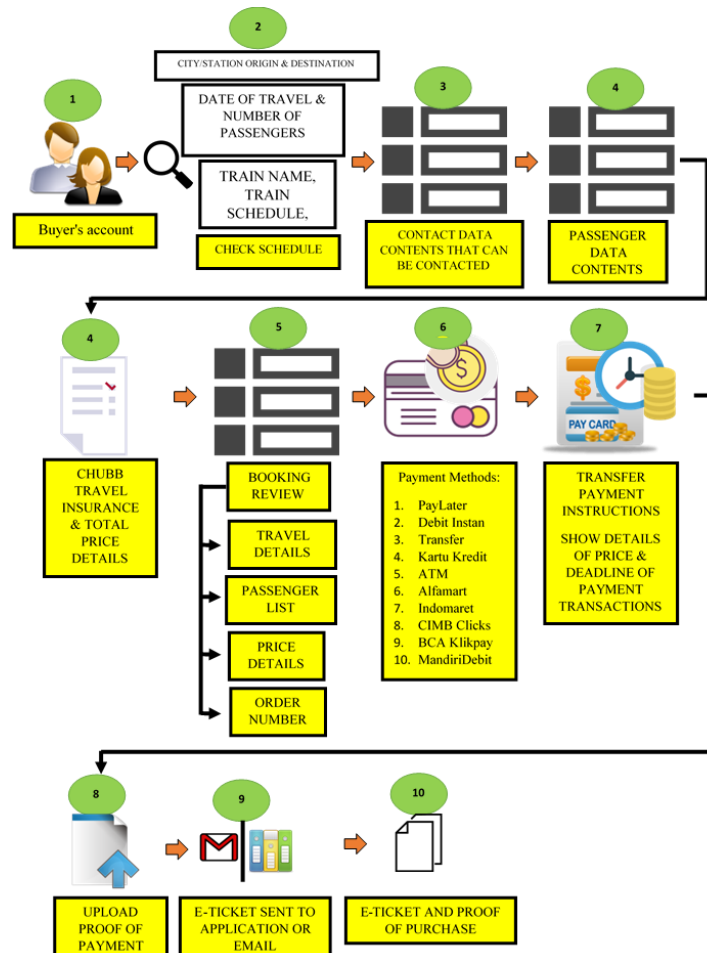

Figure 6. Purchasing *process* in a common e-ticketing platform [13]

The above fact is a primary trigger of nearly all transport providers to join a common e-ticketing platform. The study investigates how well an independent e-ticketing system fits into a common e-ticketing platform, and how to make it fit to join the platform.

A questionnaire distributed to transport users reveal six elements influencing his decision for using a transport, namely price, reservation time, accessibility, ship's schedule availability, payment system, see Table 1. At this point, there is no issue of concern related the importance of an e-ticketing system. Passengers are very keen to use an e-ticketing system, as they already benefit from it.

Table 1. Passengers's preference for e-ticketing system

CRITERIA	Priority Vector	RANK
Price	0.266	1
Reservation time	0.224	2
Accessibility	0.180	3
Ships' schedule availability	0.169	4
Payment system	0.086	5
Marketing	0.075	6

An investigation goes into the fitness between an independent e-ticketing system provider and a common e-ticketing platform. The following Table 2 shows the difference.

Table 2. The difference between common e-ticketing platform and independent e-ticketing system X

Indicator	Priority Vector	Rank	Facilities provided by:	
			Common e-ticketing platform	Independent e-ticketing system X
Payment system	0.247	1	Available	Available
Reservation time	0.241	2	Available	Available
Accessibility	0.222	3	Available	Available
Price	0.111	4	Available	Available
Marketing	0.092	5	Available	Available
Ships' schedule availability	0.088	6	Available	Not available

The independent e-ticketing system provider X lacks a ship's schedule. Apparently, this is an important issue in the area of ship operations. The ferry operator does not provide a real-time schedule. In common ship operations, this is very common, as both the operators and users are accustomed with the fact that ship movements are slow. Time scale is perceived different among transport modes. Ship is less strict in this respect. An improvement of a scheduling system into a real-time wone would solve the integration of its e-ticketing system into a common e-ticketing platform.

6. Conclusions

The current study on the integration of an independent e-ticketing system into a common e-ticketing platform in ferry services yields a number of outcomes as follows:

1. The demand to obtain benefits of utilizing ICT to enhance transport services through e-ticketing is obvious. The consumers are very keen to use it for the following reasons: ease of payment, shorter ticket reservation time, highly accessible including by mobile devices, transparent and fixed price, schedule availability. Its cost-effectiveness, transparency, speed, and practicability are the main benefits for both users and the transport operators, which become triggers for establishing an e-ticketing system.
2. An independent e-ticketing system, operated by a ferry operator, is projected to be integrated into a common e-ticketing platform. The push towards integrating it into a common e-ticketing platform is viewed as an added value for the existing system, where users have more liberty in selecting the transport mode, ports of origin and destination, date and time of departure and tariffs.
3. The study shows that the challenges do not lie with the IT technicalities of e-Ticketing system. Rather, it lies within the domain of ship operations, namely generating and conveying a real-time ship schedule. A real-time information of the ship's schedule is key to enable it to integrate into a universal e-ticketing marketplace system.

References

[1]   Ahmed, A.A., Dalbir, S. and Ibrahim, M. (2011). "Potential e-commerce adoption strategies for libyan organization". Int. J. of Information and Communication Technology Research.

[2]   Vladimir, Z. (1996). "Electronic commerce: structures and issues". Int. J. of Electronic Commerce, 1(1):3–23.

[3]   Prasad Bingi, A.M. and Khamalah, J. (2000). "The challenges facing global e-commerce: a multidimensional perspective". J. of Information Systems Management, 17(4):26–34.

[4]   Fariborzi, E. and Zahedifard, M. (2012). "e-mail marketing: advantages, disadvantages and improving techniques". Int. J. of e-Education, e-Business, e-Management and e-Learning, 2(3):232.

[5]   Iyas (2011). Implementasi Sistem Penjualan Online Berbasis E-commerce pada Usaha Rumahan Griya Unik Wanita. Universitas Islam Negeri Syarif Hidayatullah Jakarta.

[6]   Nugroho, S., Zulkarnaen, F. and Arizal, J.F. (2018). "Intellegent transportation system architecture to address challenges of traditional shipping operations (PELRA)". J. of Eng. And Applied Sciences 13:2114-2119.

[7]   Kelwulan, L. (2019). Peran Ketersediaan Informasi terhadap Kinerja Transportasi Laut Wilayah Kepulauan: Studi Kasus Provinsi Maluku. Institut Teknologi Sepuluh Nopember, Surabaya.

[8]   Frame Projects (2002). Planning an Intelligent Transport System A Guide To System Architecture Issue 2. European Communities.

[9]   Boardman, N. (2006). Cost-Benefit Analysis: Concept and Practice 3rd ed.. New Jersey: Prentice Hall.

[10]   Mulyono, Manfaat, D. and Achmadi, T. (2016). "Applying theory of constraint to identify the constraint of marine transportation system". Int. J. of Oceans and Oceanography 10(2):173-190.

[11]   Nur, H.I., Lazuardi, S.D., Hadi F. and Hapis M. (2018). "Determining domestic container shipping as an enforcement of Indonesian international hub port". IOP Conf. Series: Earth and Environmental Science 135:012012.

[12]   https://www.traveloka.com/id-id/

[13]   https://www.indonesiaferry.co.id/