DESIGNING E-LEARNING MODEL TO LEARN ABOUT TRANSPORTATION MANAGEMENT SYSTEM TO SUPPORT SUPPLY CHAIN MANAGEMENT WITH SIMULATION PROBLEMS

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Abstract

Focus of this research is designing Transportation Management System (TMS) as e-learning media for logistic education. E-learning is the use of Internet technologies to enhance knowledge and performance. E-learning technologies offer learners control over content, learning sequence, pace of learning, time, and often media, allowing them to tailor their experiences to meet their personal learning objectives. E-learning appears to be at least as effective as classical lectures. Students do not see e-learning as replacing classical training but as a complement to it. TMS are one of many system that will be completed the supply chain. To support interoperable machine-to-machine interaction over a network we can use a web service. By using web service, TMS software can communicated with Supply Chain Management (SCM) software and completed the supply chain. In previous research about logistic problems, still limited to the modul design of SCM application without TMS support. We created this e-learning media by using PHP, SOAP, SQL and HTTP connection protocol. The result of the research is web-based e-learning application to learn about transportation with simulation problems to complete the purpose of supply chain on logistics.

Key Words: Transportation Management System, Supply Chain Management, Logistic, e-learning media, Web service.

Abstrak

Fokus dari penelitian ini adalah untuk mendesain sebuah e-learning media mengenai Transportation Management System (TMS) sebagai media pembelajaran untuk mempelajari masalah logistik. E-learning adalah penggunaan teknologi internet untuk meningkatkan pengetahuan dan kinerja. E-learning menawarkan kontrol atas konten, urutan pembelajaran, kecepatan pembelajar, waktu pembelajaran, dan media yang digunakan, untuk memenuhi tujuan dari pembelajaran. Dibandingkan dengan metode pengajaran klasik, e-learning memiliki nilai keefektifan yang sama besar dengan metode pengajaran klasik. E-learning bukan merupakan pengganti dari metode pengajaran klasik melainkan merupakan pelengkap dari metode pengajaran klasik. TMS merupakan satu dari beberapa system yang ada dalam kajian rantai pasok. Dengan menggunakan teknologi web service maka sebuah system dapat berkomunikasi dengan sistem yang lain dalam sebuah jaringan. Dengan menggunakan teknologi web service, TMS dapat berkomunikasi dengan software Supply Chain Management (SCM) untuk melengkapi rantai pasok. Dalam penelitian yang sebelumnya pernah dilakukan hanya terbatas pada pembuatan aplikasi SCM tanpa adanya dukungan dari TMS. Pembuatan e-learning untuk TMS ini adalah dengan menggunakan PHP, SOAP, SQL dan HTTP connection protocol. Hasil dari penelitian ini adalah sebuah e-learning berbasis web untuk mempelajari masalah transportasi dengan menggunakan masalah simulasi untuk melengkapi rantai pasok dalam logistik.

Kata kunci: System manajemen transportasi, Supply Chain Management, Logistik, media e-learning, Web service.

INTRODUCTION

SCM focuses on the inter-organisational management of goods flows between independent organisations in supply chains, such as raw material winners, component manufacturers, finished product manufacturers, wholesalers and retailers(M.Verwijmeren, 2004). This integrative approach to planning, control and monitoring of product flows, from suppliers

to end users, aims at improved customer service at reduced overall costs (M.Verwijmeren, 2004). In the SCM the flow of goods and data provided in the local management and will be done by the Enterprise Resource Planning (ERP), Warehouse Management System (WMS) and Transportation Management System (TMS) (M.Verwijmeren, 2004). To complete the supply chain, materials must be transported to part manufacturers, parts must be transported to component manufacturers, components must be transported to finished product manufacturers, and finished products must be transported to customers (Randolph.W.H., 2003).

One way to learn about logistic problems is using simulation software related to logistics.

This paper is organized as follows, In Section 1, we propose the background of our research. Then, we discuss several special cases of the educational tools, in which it is by develop TMS to e-learning application to learn about TMS to support SCM on logistic by using simulation problem. In Section 2, we provide the methodology for solving the problem. In Section 3, we design web-based application. And in section 4, we using simulation problem to introduce TMS application.

POSITIONING

In previous research about logistic problems, only limited to the modul design of SCM application.

1. *Analysis and design of Application Web and Mobile Supply Chain Management For Distribution Comodities of After-harvest paddy (Case Study SAPA System in Sukabumi)* (D.S.Wiyono, 2009). (written in Bahasa Indonesia).
2. *Designing m-SCM Application by Using FOSS to Improve the Pedagogic Approach for Learning Distribution* (D.S.Wiyono, M.C.Maliki, W.Sutopo, 2010).
3. *An Interactive Web-based Application as Educational Tool for SCM Course by Using FOSS* (W.Sutopo, B.Putra, D.S.Wiyono, 2010).

Focus of this research is designing TMS as e-learning media for logistic education.

RESEARCH METHODOLOGY

We proposed a TMS application as dynamic learning media so that the inter-relation among SCM and TMS can be conveyed, realized, learned, and experienced by the students. The problem was solved using three stages as shown in Figure 1.

1. Case study TMS aplication to support SCM with Web service.
2. System Analysis e-learning model for TMS
   - Customize content of TMS e-learning model by simplify real system to illustrate transportation problem.
   - Describe inter-relation between SCM dan TMS.
3. Simulation
   Simulation problems on e-learning model TMS.

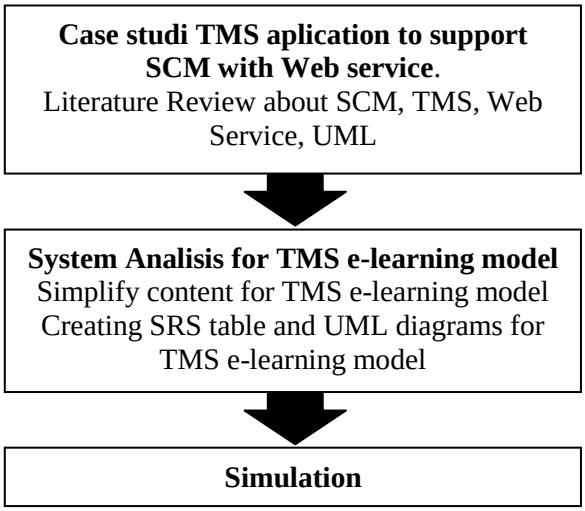


Figure 1 Research Methodology

LITERATURE STUDY

E-learning

e-Learning is another way of teaching and learning. In its broadest definition, e-Learning includes instruction delivered via all electronic media including the Internet, intranets, extranets, satellite broadcasts, audio/video tape, interactive TV, and CD-ROM. All efforts to implement e-Learning will eventually move towards total

automation of administrating the teaching and learning processes by means of a software known as Learning Management Systems(T.Govindasanny, 2002). Most of the pedagogical principles that apply to the traditional classroom delivery method also apply to e-Learning (T.Govindasanny,2002).

E-learning provides fastest learning at reduced cost, increasing access to learning, and clear accountability for all participants in the learning process. In today's fast-paced culture, organizations that implement e-learning provide their workforce with the ability to turn change into an advantage (A.Gunasengkarang, R.D.McNeil, D.Shaul, 2002). E-learning delivers accountability, accessibility and opportunity. It allows people and organizations to keep up with changes in the glogal economy that occur on Internet time. E-learning will be great equalizer in new century (A.Gunasengkarang, R.D.McNeil, D.Shaul, 2002). By eliminating barriers of time, distance and socio-economic status, idividuals can now take charge of their own lifelong learning (A.Gunasengkarang, R.D.McNeil, D.Shaul, 2002).

Supply Chain Management Architecture(M.Verwijmeren, 2004)

The fundament of a system architecture for SCM is constituted by ERP systems, WMS and TMS (see Figure. 2). These information systems can be either standard software packages with parameter configuration or software programs tailor made to company specific needs. The basic systems in a supply chain provide specific functions for typical users (M.Verwijmeren, 2004).

ERP, Enterprise Resource Planning systems:

- functions: purchase, materials management and sales.
- users: manufacturers and trading companies.

WMS, Warehouse Management Systems:

- functions: receipts put-away, bin management and order picking.
- users: logistics service providers and wholesalers

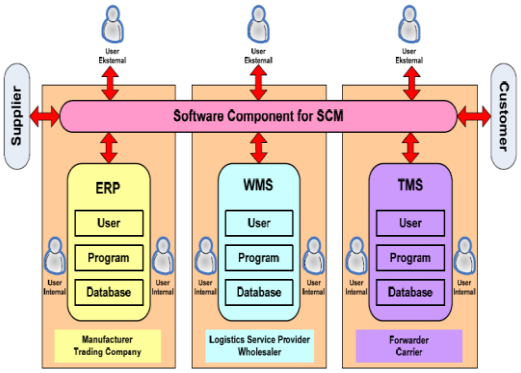


Figure 2 ERP, WMS and TMS in the supply chain management architecture. (D.S.Wiyono,2009)

TMS, Transportation Management Systems:

- functions: transport booking, planning and monitoring.
- users: forwarders and carriers.

Transportation Management System in a Supply Chain

To complete the supply chain, materials must be transported to part manufacturers, parts must be transported to component manufacturers, components must be transported to finished product manufacturers, and finished products must be transported to customers (Randolph.W.H., 2003). Transportation also occurs in the name of material handling within each production facility (Randolph.W.H., 2003). Transportation is an inevitable result of specialization in manufacture (Randolph.W.H., 2003). So long as a single individual is not producing the entire product, parts and components must be moved from individual to individual, or firm to firm (Randolph.W.H., 2003). Distribution also entails storage and warehousing of materials, parts, components and finished products, along with the use of independent retailers and distributors to reach the consumer (Randolph.W.H., 2003).

The discipline of SCM is highly centered on distribution, and not as much on product manufacture, though they are naturally inter-related. The economics of manufacturing strongly influence the scope and scale of distribution (Randolph.W.H.,2003).

Transportation Performance Indicator

Transportation typically is the second highest cost component in a supply chain (Z.Rahman, 2003). To make sure the system going well, transportation performance indicator must be implemented, apllied and measured (J.Zeitsman, L.R.Rillet, 2008).

List of Transportation Performance Indicator:

1. On-Time Delivery Performance (D.S.Wiyono, 2009)
2. Percentage damage delivered product (Dr.G.Marsden, 2008).
3. Transportation quality of service (Dr.G.Marsden, 2008).
4. Minimize Travel Cost (J.Zeitsman, L.R.Rillet, 2008).
5. Minimize Travel Time (J.Zeitsman, L.R.Rillet, 2008).
6. etc.

Web Service

"A Web service is a software system designed to support interoperable machine-to-machine interaction over a network. It has an interface described in a machine - processable format (specifically WSDL) .Other systems interact with the Web service in a manner prescribed by its description using SOAP messages, typically conveyed using HTTP with an XML seriali-zation in conjunction with other Web-related standards" (M.Verwijmeren, 2004).

Web Services connect computers and devices with each other using the Internet to exchange data and combine data in new ways, usually using Web Service Definition Language (WSDL). WSDL defines services as collections of network endpoints or ports (D.Fensel and C.Bussler). In WSDL the abstract definition of endpoints and messages is separated from their concrete network deployment or data format bindings.This service work on the HTTP protocols (D.Fensel and C.Bussler). In SOAP (Simple Object Access Protocol) message. SOAP is a message layout specification that defines a uniform way of passing XML-encoded data (D.Fensel and C.Bussler).

Unifield Modelling Language (UML)

UML is the primary modeling language used to analyze, specify, and design software systems using visual modelling (G.Booch, Robert A., M.W.Engle, B.J.Young, J.Conallen, K.A.Houston, 2007). Visual Modeling is a way of thinking about problems using models organized around real-world ideas. Models are useful for understanding problems, communicating with everyone involved with the project (customers, domain experts, analysts, designers, etc.), modeling enterprises, preparing documentation, and designing programs and databases. Modeling promotes better understanding of requirements, cleaner designs, and more maintainable systems (T.Quatrani).

There are eight diagrams in UML (T.A.Fender) :

1. Use Case Diagram
2. Class Diagram/ Object Diagram
3. Sequence Diagram
4. Collaboration Diagram
5. State Diagram
6. Activity Diagram
7. Component Diagram
8. Deployment Diagram

Eight UML diagrams above can be divided into three parts according to a programming point of view (T.A.Fender):

1. Static view
2. Dynamic view
3. Functional view

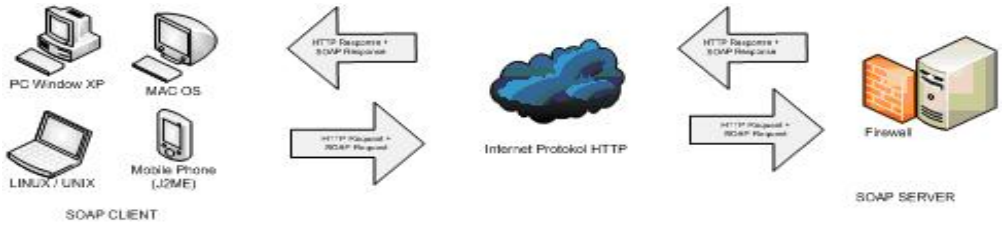
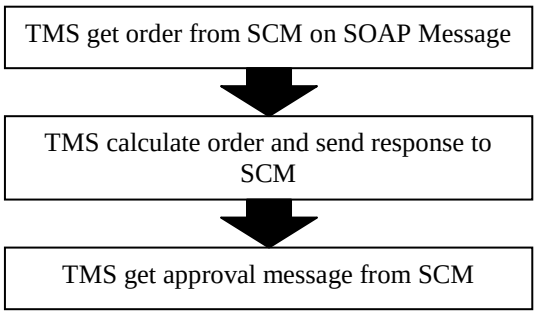


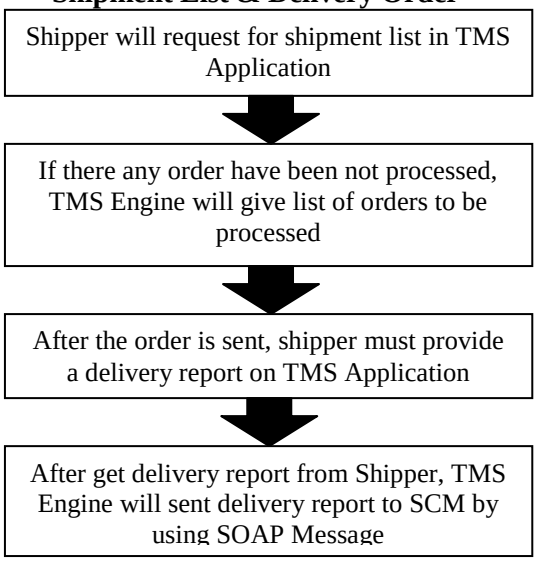
Figure 3 Web Service Flow (D.S.Wiyono,2009).

ANALISIS SYSTEM FOR TMS E-LEARNING MODEL

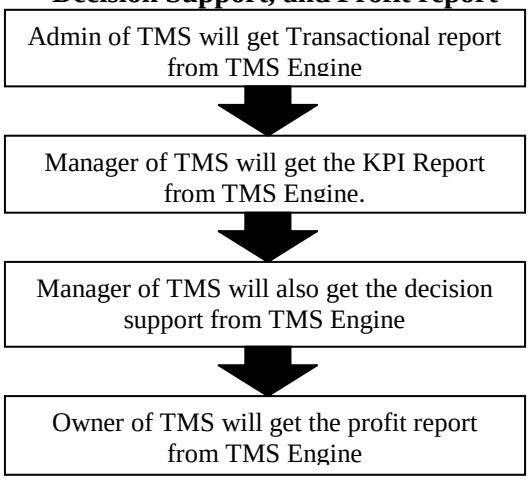
Problem Base Learning get order from SCM



Shipment List & Delivery Order



Transactional Report, KPI Report, Decision Support, and Profit report



Software Requirement Specification (SRS)

Functional Requirement

Code	Functional Needs
SRS-TF01	SCM set order
SRS-TF02	TMS Engine Calculate Order
SRS-TF03	TMS Engine Determine delivery time
SRS-TF04	TMS Engine route selection
SRS-TF05	TMS Engine get transport cost
SRS-TF06	TMS Engine carier selection
SRS-TF07	SCM get order detail from TMS Engine
SRS-TF08	SCM tracking order
SRS-TF09	Other TMS get delivery report
SRS-TF10	Other TMS over shipping service TMS Engine
SRS-TF11	Other TMS get shipping service from TMS Engine
SRS-TF12	Other SCM make order report to TMS Engine
SRS-TF13	Shipper, Admin get shipment list from TMS Engine
SRS-TF14	Admin get Transactional Report from TMS Engine
SRS-TF15	Manager set External information to TMS Engine
SRS-TF16	Manager get Decision support from TMS Engine
SRS-TF17	Owner get profit report from TMS Engine

Non Functional Requirement

Code	Non Functional Needs
SRS-TNF01	User do login

Use Case Diagram

Use case diagram for e-learning application for TMS divided by two diagram:

- use case for system requirement
- use case for user requirement

Sequence diagram

The next stage of design e-learning media is created sequence diagram. By using seqeunce diagram we can know when to call class, and what the method to be call.

Database Design

The next stage is designing database by creating schema diagram. By using schema diagram, we can know relation among table on relational database.

System requirement

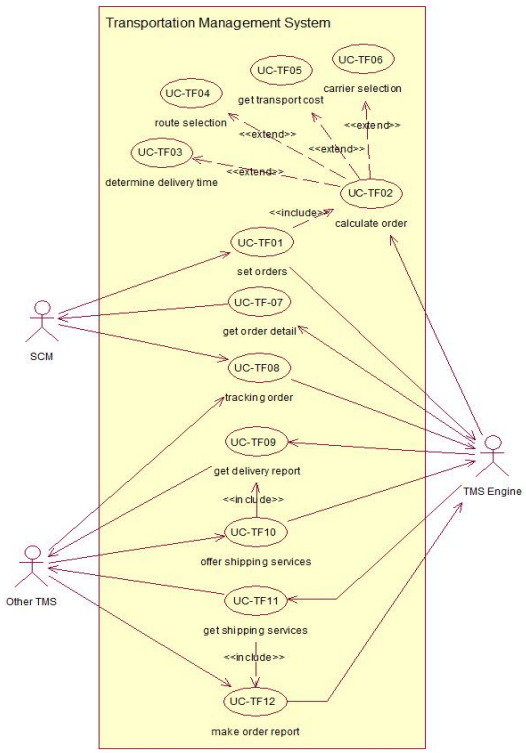


Figure 4 Use Case Diagram for system requirement

User requirement

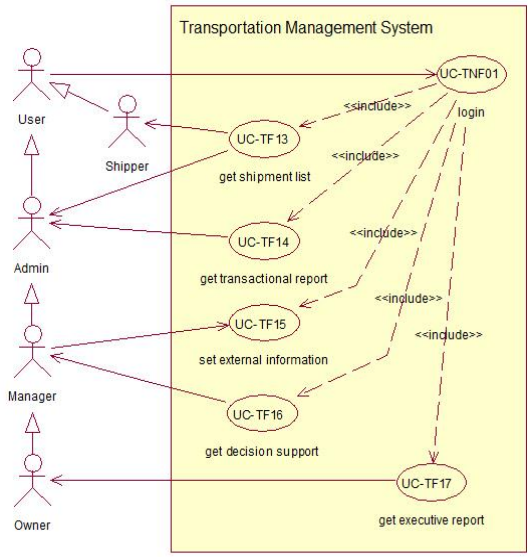


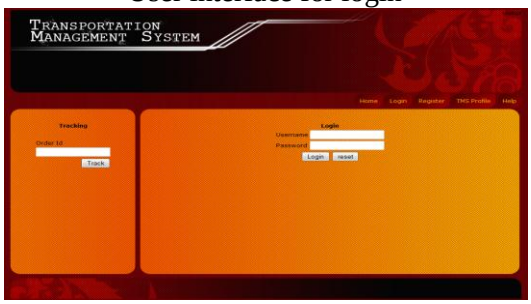
Figure 5 Use case Diagram for user requirement

In this research we use two interface: user interface and system interface. On this e-learning media, we created system interface:

- SCM set Order.
- SCM tracking order.
- SCM get order detail.
- Other TMS get delivery report.
- Other TMS get shipping service.
- Other TMS offer shipping service.
- Other TMS make order report.

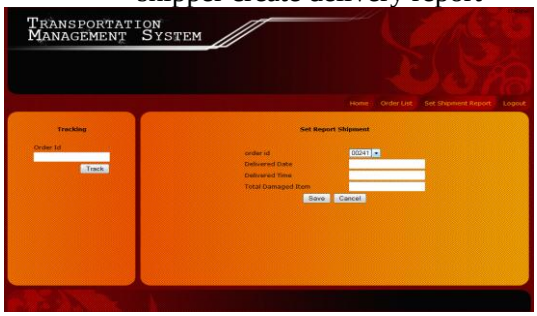
SIMULATION

User interface for login

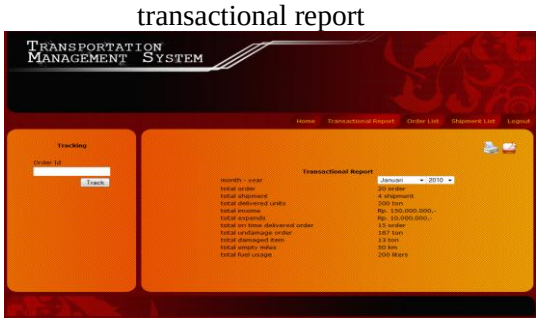


Simulation when admin or shipper request shimpent list

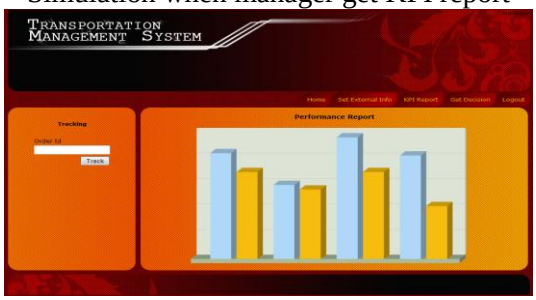
Simulation when admin or shipper create delivery report



Simulation when admin get transactional report



Simulation when manager get KPI report



Simulation when owner get profit report

CONCLUSION

This e-learning application of TMS presented a new dimension of transportation course. The TMS application can be used as a dynamic learning tool to explain college students about inter-relation between SCM and TMS to students. This TMS application can be used as dynamic learning media. We can capture the inter-relation among SCM and TMS, so that the phenomena can be conveyed, realized, learned, and experienced by the students.

Sequence diagram: Login

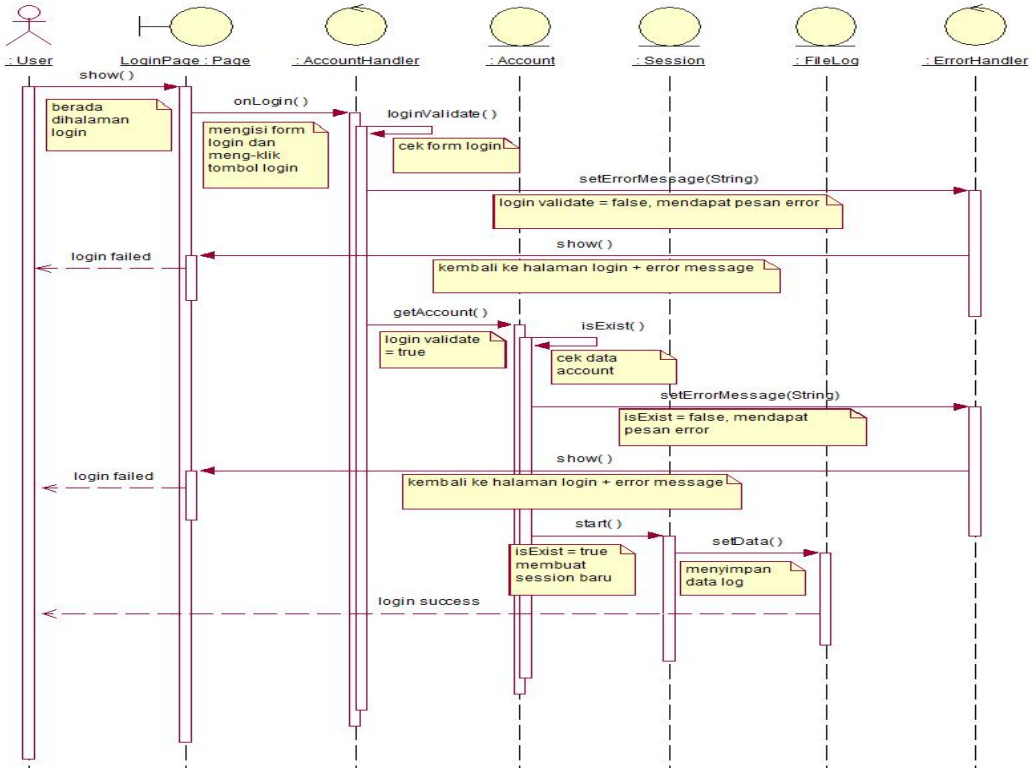


Figure 6 Sequence diagram when User do login

Sequence diagram: set order

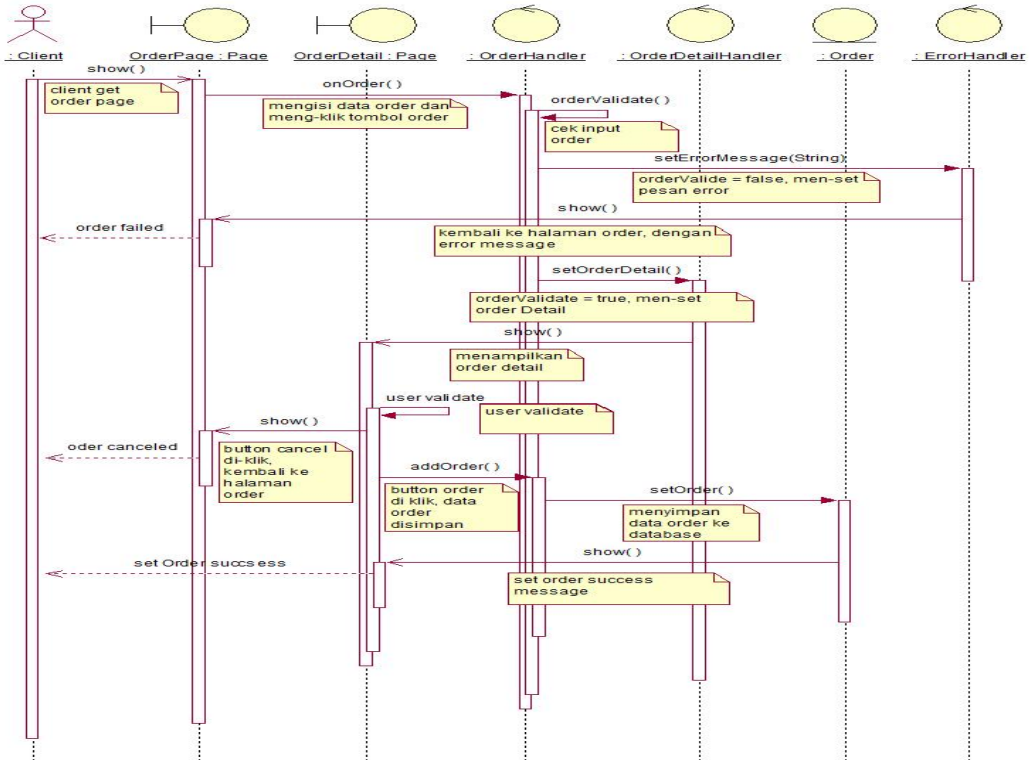


Figure 7 sequence diagram when client set order

Sequence diagram: tracking order

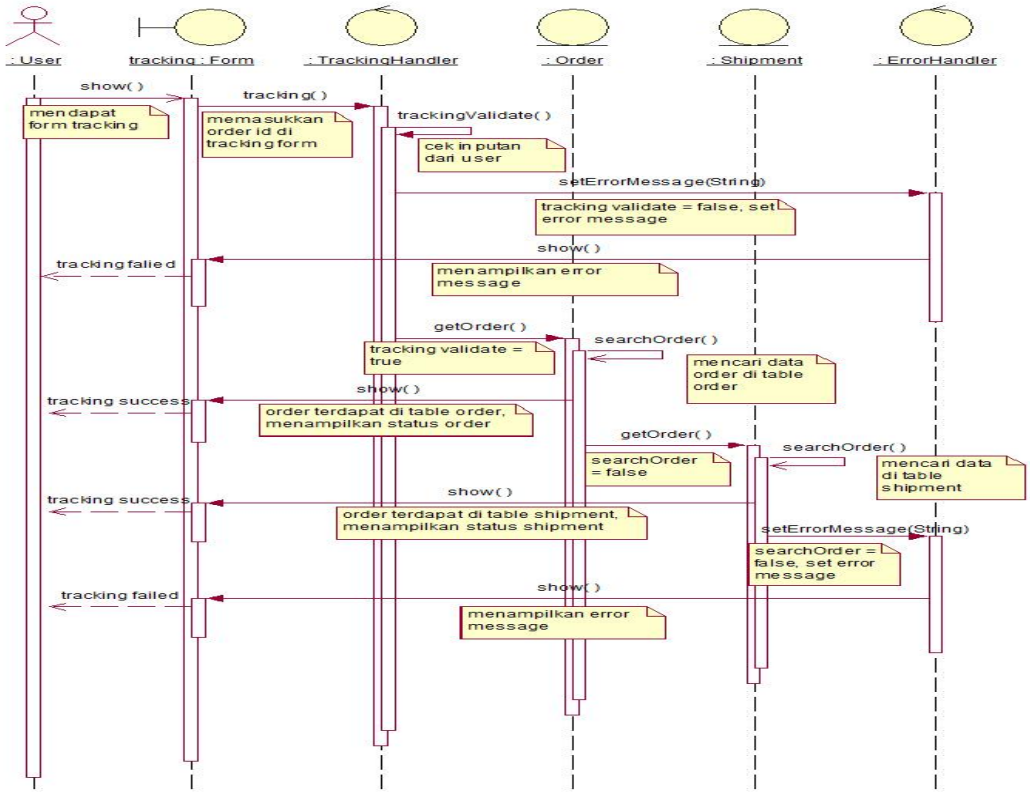


Figure 8 sequence diagram when user tracking order

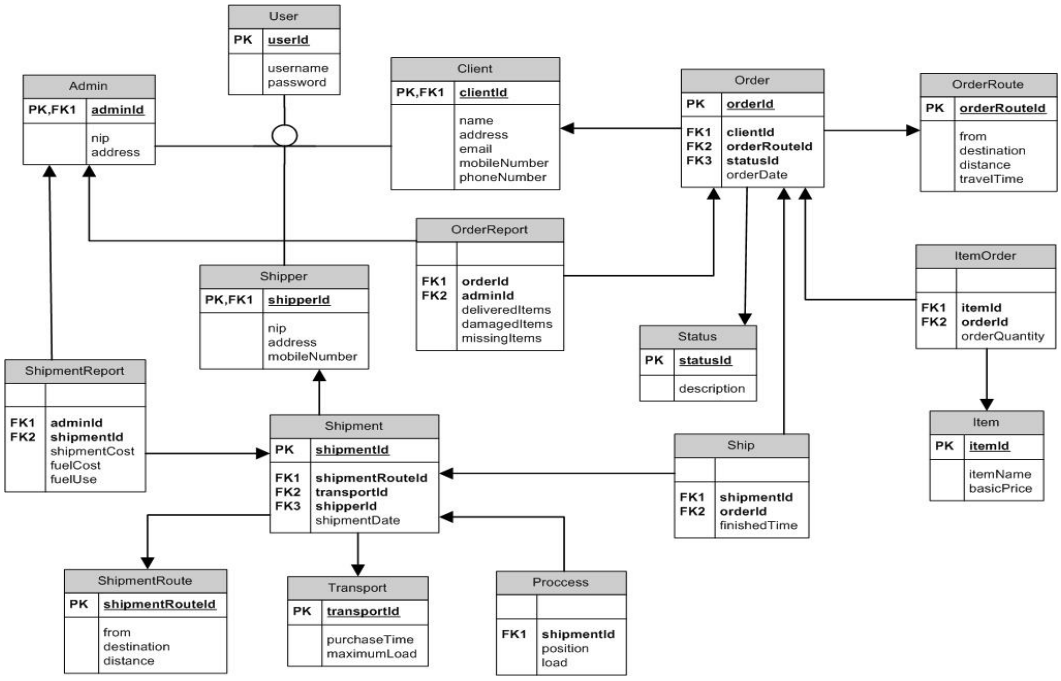


Figure 9 TMS schema diagram.

ACKNOWLEDGMENT

The authors are grateful to the anonymous referees for comments and recommendations that improved the paper, Sebelas Maret University in Research Program 2010/2011, Department of Informatics Engineering Sebelas Maret University, Informatics and Network Study Group (Finest Group) Departement of Informatics Sebelas Maret University and all of people who read this paper.

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