

A STUDY ON THE REQUIREMENTS AND TOOLS FOR REAL TIME FLEET MANAGEMENT E-BUSINESS SYSTEMS IN THAILAND

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ABSTRACT

Real time fleet management (FM) systems have become another important component of some e-businesses that concern with logistics and transportation. This paper surveys real time FM systems around the world that deal with the management of a company's vehicles, and compares with FM systems used in Thailand. Such systems enable fleet managers to manage and track the vehicles in terms of their scheduling, maintenance, and fuel optimization. Real time FM systems need to have the flexibility to meet changes due to internal and external factors. The integration between internal and external data processing systems and network between suppliers and partners are essential to satisfy the needs and expectations of customers. While this study only explores the existing real time FM systems, future requirements are also discussed for ensuring the success of the company.

Index Terms— E-business, fleet management

1. INTRODUCTION

Fleet management concerns with the management of a company's vehicles which includes the purchase, maintenance, inventory, disposal and work scheduling. The main objective is to achieve efficiency and productivity for the organization [1]. Real time Fleet Management (FM) e-Business systems have grown rapidly in recent years. This has been due to changes in the business environments and advancement of information, computer and communication technology. This is particularly important for companies that are specialized in transport and logistic industries.

Many companies and fleet managers need to focus on how they can improve the performance of their organizations in the new business paradigm. Nowadays, local and international markets have been increasingly open and competitive. In logistic and delivery management, a key element in gaining the goal of better performance is the elaboration of efficient distribution systems where goods are delivered at the right place, with the right quantity, at the right time, and to the right receiver [2]. Information and Communication Technology (ICT) has become an important

backbone for the business that aims at reducing operational costs, and increasing customer satisfaction which in turn will gain higher levels of competitiveness. There are various aspects on how to improve the capability of the fleet and delivery systems. The key points are to provide real-time and dynamic tracking of vehicle movements, maintenance schedules, fuel and financial management. Dynamic FM systems provide fleet managers and users the tools to accomplish their tasks efficiently and effectively by using technology such as Internet and Global Positioning Systems (GPS).

Thailand is a development country and it has concerns on how to develop its logistic systems efficiently. Recognition of this need has grown and its importance is increasing continuously. Logistic management including fleet management requires advanced technologies to improve the logistic information system [3]. At present, most FM systems in Thailand are still based on a manual approach. However, fleet management firms in Thailand have already developed a fleet-tracking system using GPS and the Internet providing vehicle tracking information for fleet managers or users [4].

This paper reports a survey of the existing tools that form the basis of dynamic and real time fleet management systems. The objectives of this paper are to discuss the requirements of the real-time FM systems, and to report the existing tools that use advanced location based technologies and how they work. Moreover, this paper presents the status of real time FM system used in Thailand and future requirements of the dynamic real-time FM systems are also discussed.

2. REAL TIME FLEET MANAGEMENT

FM system is about the management and operation of vehicles and their related issues in an organization. Organizations may face internal and external factors which affect their operations. As such, the organizations need to be able to respond in the midst of market competition [5]. Transport and delivery services are parts of business of an organization and FM has become an important part of the organization's management system that can be affected by these changes. FM in a company may face dynamic

problems such as unplanned situations taking place during operations. The organizations and the fleet must react to solve the problems in real time. This calls for a dynamic and real-time fleet management system for decision making.

At present, many companies and logistic industries have attempted to improve their FM systems using modern communication technology and information systems. For example, GPS-based tracking tool and the Internet provide online vehicle tracking and dispatch in a location monitoring platform. GPS or wireless communication devices can transmit the vehicle details automatically to the central station [6]. By this, the vehicle's location can be monitored. The tracking vehicle system can also offer a communication channel between drivers and managers or supervisors. In addition to locating the vehicles in real-time, the system can also offer overviews of driver's activities. For example, the managers and supervisors can be informed of the location of the vehicles, check for speed for compliance purposes and routing destinations [7]. This can provide satisfactory services and updated information for customers at all time:

3. E-BUSINESS AND FM

E-business is related to the using of the Internet to conduct business internally and externally [5, 8]. From the organization's perspective, fleet management is an essential part of businesses that concern with logistics and deliveries. Incorporating advanced technology to improve the fleet operation system is an important strategy for such organizations. For example, Business Process Re-engineering (BPR) may be needed in some companies or the fleet departments to change their framework by incorporating advanced technology to their fleet management tasks. Moreover, customer services and satisfactory level could be improved by the adoption of Customer Relationship Management (CRM) systems, and Supply Chain Management (SCM) to ensure smooth and efficient movements of orders, stocks and finished products [5]. Advanced technologies and devices incorporated in new FM systems are able to report events in real-time. They can also assist the control and planning of operations, forecast analysis and in general, provide better facilities for fleet managers and to reduce the time for decision making [9].

4. EXISTING TECHNOLOGIES

4.1. Application service provider platform

Many organizations demand online software or applications that can automatically deliver key management decision making information. An Application Service Provider (ASP) platform hosts applications and offers Internet services to its customers [10]. ASP can be used via networks, and the servers located in a commercial data centre provide access for fleet managers to the system through the Internet. This refers to outsourcing of the

hosting of applications or online services. ASP also provides a modular solution by providing one or several services that can be polled remotely and integrated within the scope of applications.

In the FM environment, Web-enabled databases and information storages, e-mail, and wide-area networks are managed with connections to the Internet [11]. A FM system uses the functionalities of an ASP to host and service a Web site and its applications. ASP can provide key benefits for FM by allowing fleet managers to focus on their competency and mission to manage vehicles, equipment and serving fleet users. Many companies do not create their own applications and they use ASP to operate their fleet with the tools on the platform. Some of ASP provides customized functions and customers may manage the fleet by considering reports, fuel, services, employees, and orders management. With respect to these customized tools, they are also known as Web 2.0 technologies. Some of the technical foundation tools of Web 2.0 are XHTML, CSS, JavaScript, XML, server side programming, and a range of other tools. Web 2.0 can also be a definition as a collaborative Web where the content is created by customers or users [12]. FM systems may use ASP to operate their fleet based on information from the user's databases or information sources. By using specific log-in and security systems, Web technologies, and in particular Web 2.0, will enable real-time FM systems to be available worldwide as an essential element in the e-commerce paradigm.

4.2. Transport Telematics

In recent years, advancement of micro-electronics and manufacturing technologies have enabled the integration of computers and telecommunication devices for numerous innovative applications. These devices also form the basis of FM infrastructure focusing on information gathering and control of vehicles. This is known as "Transport Telematics". Today, transport telematics has become an important component for fleet operation and in particular, real time FM system. Existing technologies in real time FM system include wireless communication and positioning systems. Wireless communication is used for information exchange between vehicles or drivers and the control center. Wireless communication is an essential emerging technology because of the increasing availability of information [10]. Trunked radio is an example of wireless communication for use in short distance. This requires the reservation and use of radio frequencies by specific groups of users. For example, Terrestrial Trunked Radio (TETRA) is defined and managed by the European Telecommunication Standard Institute (ETSI). TETRA uses several frequencies which may be allocated to individual users on demand and FM providers can license specific frequencies for use in vehicle controls [6].

FM Messengers is another wireless communication that can send messages to drivers. The drivers can also reply to

the FM managers. In this manner, drivers can be managed and advised with local traffic conditions or speeding violations. Such system is built by mobile devices and communication system which is part of the digital mobile telephony system called the Global System for Mobile Communication (GSM).

On the other hand, the Global Positioning System (GPS) is able to provide fleet managers with the vehicle's information such as location, driver and vehicle condition, navigation and collective traffic observation [13]. GPS is an essential technology for real time FM system and the survey has found that many fleet companies or departments have decided to apply GPS in the fleet operation. The fleet managers may gain many advantages from using GPS to track vehicles and drivers and the information can be applied to other tasks such as fuel management, vehicle usage, wastage reduction, and scheduled maintenance etc.

5. SCOPE OF STUDY

In this study, a survey on the real-time FM systems and the available tools has been conducted. The objective is to analyze the future requirements in order to improve the FM system functions and utilities in Thailand. FM Websites have been searched and investigated on examples of application and implementation of advanced technology around the world and also in Thailand. From the scope of this study, the specific questions are:

- What are the tools that have been used for real time fleet management from other countries?
- What are the tools that have been used for real time fleet management in Thailand?
- What are the future requirements for fleet management in Thailand?

A range of diverse advanced technologies and their associated devices are already available for real-time FM systems. By addressing questions a and b above, this study aims to investigate the available existing real time FM systems used in Thailand and other countries. Questions a and b also aim to present the status and utilities of real time FM systems in Thailand. This is linked to the analysis and prediction of the future requirements for FM systems in Thailand in question c.

6. SURVEY RESULTS

In this survey, six websites from Thailand and twenty websites from other countries have been studied. The result found that these websites have used real time FM in their organizations in both back-office and front-office operations, and such systems are also used by their customers. The websites of other countries studied are mainly from USA, Australia and United Kingdom. This is due to the fact that English was only used in the search and

the study has been limited due to time constraints. Examples of the technologies and tools are described in the following sections

6.1. Tools of Existing Real Time FM

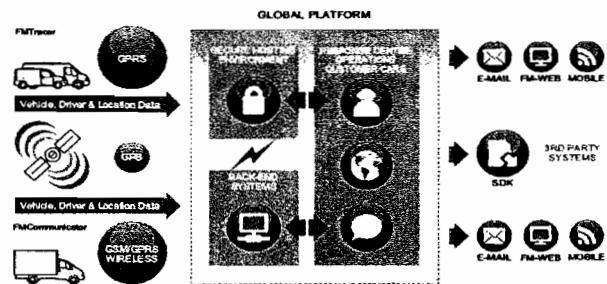


Fig. 1 An example of real time FM system platform [11]

Figure 1 is an example of the real time FM system used currently. The centre operation can track to vehicles during operation and it can also contact the customers and third parties. There are several real time FM tools found in this study and they are identified as follow:

6.1.1. Vehicle acquisition

Most major vehicle purchasers today have developed an extensive network of relationships with major vehicle manufacturers to assist with fleet vehicles acquisition in a cost effective and efficient manner. This requirement includes vehicle procurement and vehicle delivery management. It is necessary for the system to provide the best value on fleet vehicles. The system should offer the manufacturers and nationwide network of dealers with a variety of vehicles to choose from, and they can also negotiate value-enhanced agreements to the satisfaction of all parties [14]. Some of the existing systems also provide tracking of the status of the order online until delivery to the customer. Moreover, legacy system integration has also been included in some applications. For example, search function helps to identify vehicles with the lowest cost and similar application could be applied for identifying cars with lowest carbon emission and fuel consumption.

6.1.2. Fleet financing

Fleet financing involves a variety of decisions such as repayment terms, interest rate, depreciation, fixed and variable costs. Most FM systems have developed a vehicle acquisition plan that makes the most of company's capital either to buy or lease the vehicles. A tailored fleet management program may provide better financed purchase including cost analysis, accounting integration, and also taking into account of government policy or regulations in the corresponding country. The tool allows managers to use

assumptions or real data as regard to the current fleet vehicle costs, driver downtime, projected resale values and funding options. The calculated results could be compared to other potential Enterprise solutions. The real-time FM system may also prepare the answers in different currency to be used in any country. Charts, graphs and calculate modules may also be provided in order to make analysis easier.

6.1.3. Fleet maintenance

Fleet Maintenance Management Program is a comprehensive solution to FM needs which involve authorization and recording of the history of the vehicles. The fleet maintenance system provides information on every vehicle in the organization covers all the vehicles expenses and repair covering cars, trucks, and vans [15]. From this aspect, fleet managers will be able to budget all fleet maintenance costs. An automated maintenance operation FM tracks the vehicles and their parts plus planned maintenance of the vehicles. This makes the tasks of repairing and maintaining fleets easier. Besides, barcode reader can be used to store the vehicle's information in the database. This enables easier scheduling of maintenance of the vehicles. This has been shown clearly in this survey that the tool for maintenance planning has the highest percentage among the existing tools in real time FM systems.

6.1.4. Fleet insurance services

Dynamic fleet insurance service is another tool noted among the real time FM systems. Fleet insurance services provide fast turnaround on claims as they liaise automatically with the fleet insurance coordinators and enable the claims to be managed locally. However, some real time applications found in this survey only record the insurance schedules of vehicles as a means of control to achieve a higher level of service. In addition, real time FM systems also provide warranty tracking tool to support fleet managers with a comprehensive list of services.

6.1.5. Fleet fuel management

Real time fuel management system could make fleet fuel optimization simpler. Purchase controls, data collection and reporting tools allow fleet managers manage fleets more efficiently and economically. The cost of fuel is changing rapidly nowadays. FM in every organization has to deal with this situation. Therefore, fuel management in dynamic FM system has been an important tool in the vehicle operation. An example is the use of customized cards which are used to all fuel related activities. This card is authorized for using at most stations around the country and can be tracked online. This helps to protect against irregular or unauthorized activities. This also allows the collection of all relevant information such as date, time, location, odometer reading, driver name, product type, unit and cost per unit,

and total cost. Real-time Data Access system is used to conduct fleet fuel card account information in real time via the Internet. Online Electronic Bill Presentment can be added in the real time FM systems to allow more time to process and pay invoices. These make fleet fuel management simpler and easier.

6.1.6. License and registration

License and registration tool manages the tasks of license renewal and tracking. This includes vehicles as well as drivers data and driver licenses. Online systems are able to ensure the drivers' licenses are valid and keeping the fleet's licenses and registrations up to date.

6.1.7. Vehicle disposal

Vehicle disposal tool is found having the least percentage in this survey. The tool shows the vehicles' history and relevant information. This will assist in the selling and disposal of retired vehicles. Online electronic auction systems also enable negotiation of the vehicles' prices between the vendors and the buyers.

6.1.8. Vehicle tracking

Global Positioning System (GPS) is a crucial technology for dynamic FM systems. This study has found that real time FM systems have used specialized and advanced GPS for real-time web-based vehicles and asset tracking. This has proven to be a cost effective solutions for the transport and logistics industries [16]. This allows managers or supervisors to locate the vehicles in real time, view driver activities and monitor vehicle management [17]. These can be accessed from computer with internet capability and connection. All tracking data can be analyzed and planned for fleet operation as part of the Decision Support System (DSS). In addition, this could include accident tracking, mileage tracking, and speed tracking. These could be related to better driver and car engine management. The ability to locate the vehicles will also provide navigational information and co-ordination by the control centre.

6.1.9. Reporting and work order management

Reporting functions will provide presentation for overall fleet management. This could include online and/or offline reports on all aspects of the vehicles and the fleet. These reports can be distributed on regular basis and could be reviewed to help for better management of time and maintenance considerations of the vehicles. In addition to saving time, customized reporting provides various tools which could be used to give specific overviews of the entire fleet for viewing, printing, and downloaded reports at any time.

6.2 Real time FM systems from other countries

From the result of this survey, there are many existing tools used for FM today and they have been specifically designed for decision makers. These tools are designed for maintenance, leasing management including accounting packages such as tracking and financing. Fig. 2 shows the percentages of the functionalities and tools that are found among the systems in the websites being investigated. It is obvious from Fig. 2 that not all tools are being included and the utilization of the tools are not balanced. For example, "Disposal" is the least function being used with only 25% of the websites having included this function. On the other hand, "Vehicles Tracking" is the highest percentage of functions being included and "Fleet Maintenance" is the second most popular function among the dynamic FM systems. Other functions are Fleet Financing, Vehicle Acquisition, and the rest. Their corresponding percentages are found in Fig. 2. A description of their functions is given in the subsequent sections.

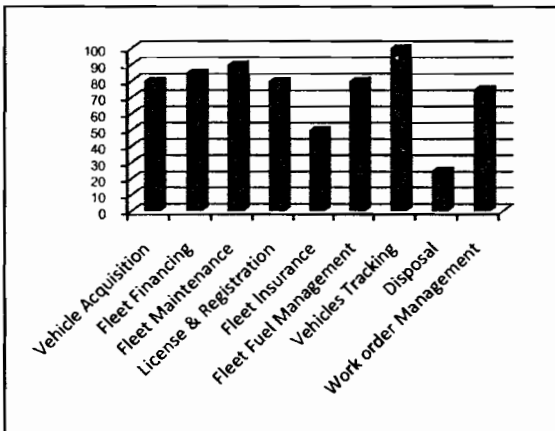


Fig. 2. FM tools in dynamic FM system from other countries

6.3. Real time FM systems in Thailand

It was found that there are six websites are providing real time FM system for the fleet. From the survey of existing real time FM tools in Thailand, Fig. 3 shows that there are two real time FM tools available for fleet management of supervisors which are vehicle tracking and reports tools. However, the tool for reporting management only presents the summary of daily usage of vehicles such as locations, distances, and total time travelled. These daily reports can provide a summary of the recorded history from the vehicle tracking tools. This may implies that the other tasks are still done manually. Moreover, the survey found that fuel cards are used to manage the fuel cost, but this tool is used individually. For example, Shell Thailand has provided fuel cards and related tools that can summarize the total fuel

usage for each vehicle. This tool however does not integrate with other real time FM tools.

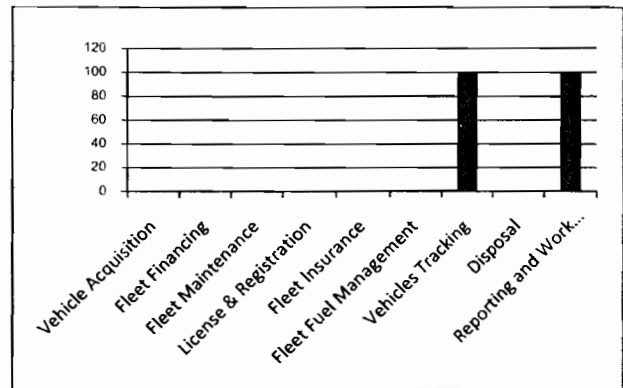


Fig. 3. FM tools in existing dynamic FM system in Thailand

7. CONCLUSION AND DISCUSSION

With respect to the growth of e-commerce and technological development, this study investigated the existing tools that are available in real time FM systems from over twenty websites. These tools include fuel management, license and registration, vehicle tracking, work order and report management, insurance services, fleet financing, maintenance, vehicle acquisition, and disposal. Using Internet technologies, these tools can work via the Internet and wireless communication enabling a communicate channel between drivers and fleet managers or the control centre. Moreover, GPS technology enables the managers to locate the drivers and vehicles for better control and planning. This study has shown that FM systems are capable to improve fleet operation and management with higher performance. This brings the benefits of reduction in cost and increase profit by improving efficiency and flexibility in responding to changes. However, FM applications still need to be developed continually as the global market and technology are changing rapidly. Moreover, transport safety authorities in many countries are demanding more functions from the online applications. In the foreseeable future, FM is expected to focus on the use of Information and Communication Technology to enable the external activities and relationships of the business with individuals, groups, or other businesses [8]. E-business FM links internal and external data processing systems to work closely with suppliers and partners, and to better satisfy the needs and expectations of customers. Fig. 4 shows a possible e-business framework for real time FM systems. Supply Chain Management (SCM) provides the management and coordination with customers, suppliers, such as insurance companies, vehicle manufacturers and all parties involve with trading and services. On the other hand, an important task is to build and enhance customer satisfaction through Customer Relationship Management (CRM). This also

involves the management of work orders, marketing and services to meet customers' needs efficiently. Back office operations should also cooperate with FM, such as recording and tracking driver's licenses and over time working. Government policy is another important factor that FM must not ignore as the fleet managers and companies need to be kept updated with the rules, regulations and transport policies. Another important issue on the horizon is the global awareness on the environment due to climate change. Thus, it is essential to improve FM in order to minimize car usage and carbon emission from the vehicles. This will also include consideration of managing suitable weight for cars' size and optimization of the travel routes, connecting the system to online traffic monitoring and weather. Consequently, real time FM systems need to coordinate with internal and external environment and form an integral part of the online e-business environment.



Fig 4. E-Business and fleet management

8. APPENDIX

8.1 List of websites for real time FM system in Thailand

- <http://www.itsthailand.org/>
- <http://www.mappointasia.com/>
- <http://www.dtc.co.th/>
- <http://www.jsiamgps.com/>
- <http://www.eastinnovation.com/>
- <http://www.mobileinnovation.co.th/>

8.2 Example List of websites for real time FM system around the world

1. www.jett-track.com
2. www.collectivedata.com
3. www.navtrak.net
4. www.chevinfleet.com

5. www.telogis.com

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