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### Smart Drivers: Travelling Management for Smart Employees

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#### ABSTRACT

This research is a part of an initiative to improve the service for transportation of employees who work in Thai Industrial Estates. The study aims to find smarter transportation service by using internet-based technology. This kind of service serves employees who travel to work in any factory inside industrial estates, who typically live far from the capital and its public transportation system. For factories with a large workforce and maintain a large fleet of shuttle buses transportation, it is particularly important to set effective routes, transit points and "Pick Up" times, to make it convenient for employees when coming to work. In this study, an application called "Wherever" used on Smart Phone is introduced to address this problem of picking up and transporting employees from different areas, and come to work in the same location. This report demonstrates how useful this new application is, for this purpose.

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#### Introduction

Currently, there are many industrial estates in major cities of Thailand. Each has several factories established, depending on the size of the business and employees in their manufacturing. Most are large factories with more than 500 employees. In every working day, employees who live in area around factory or far away from the place need to come to work on time, by shuttle bus service, provided by the factories.

Although each factory provides transportation in major routes and destinations, there is uncertainty whether these buses are able to pick up the employees at appointed point and time schedules. This is dependent on ever-changing traffic conditions caused by road accidents, bus engine problems, and even weather conditions like heavy rain or flooding. All of these factors have huge impact on managing each route, and the bus drivers cannot inform employees who are waiting at each "pick up" point. Employees experience the same problems on how to ensure they arrive at the meeting points on time. There is no contact between drivers and employees, causing employees who miss their buses, since the drivers don't know where employees are, or when they can board the buses. Moreover, the drivers cannot wait at the meeting points for a long period or event employees who wait in some Lonely point for long period they have more risk with Robbery case in that point. Consequently, employees miss their buses and have to find alternative ways to go to the factory by themselves. And this means higher travel expenses and risks along the way.

The researcher has developed a Mobile Application to be installed into the mobile phones of drivers and employees to reduce these problems. This Mobile Application provides information on each service bus, so employees will know the location of the buses on their service route, and especially, what time the buses will be at the "pick up" points. This program allows employees to estimate when the shuttle buses will arrive, thereby helping them to manage their way to the

"pick up" points. In case they miss it, they can still find the nearest alternative route, or other buses, to economize and travel safely.

#### Literature review

The problems of getting goods and shipments (pickup and delivery problem, PDP) refer to the scheduling of vehicles and place of delivery. Each vehicle must travel from one location to another, where the operating cost on all routes will decrease through sharing the shortest path. However, PDP often makes errors, causing problems to salesmen. The problem is often due to mistakes in route planning for shipments (Vehicle Routing Problem, VRP). PDP is the starting point for determining the origin and destination points and all these routes should converge along the same path. It is about finding the group of travel routes which can reduce transportation costs while operating under certain restrictions and limitations, such as traffic conditions on the road, and others.

Today, the public transport system is more flexible. Employees can specify the desired point to get on the buses. Besides, the service buses can divert from usual routes, to get employees to where they want. This system demands a response system (Demand Response Transit, DRT). Although having fixed route is a good transport system, it is not flexible for travel and takes time. DRT system is more flexible but more expensive because the "pick up" or service points are specified by its customers.

The problem of DRT system has been extensively investigated and solutions have been proposed for more than three decades by Wilson et al (1970). They put details of passengers into the shuttle bus route to solve the problem of Mobile Allowance Shuttle Transit (MAST). This is an efficient operating system for managing travel expenses, which combines the flexibility of the DRT system with the low-cost static route service system.

One form of MAST deals with the problem of transporting employees.

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It is the problem of loading all the passengers waiting at the regular bus stations, and take them so they reach the factories ahead of their work schedule. Then, at the end of the day, passenger information are sent to the buses. Umit Yuceer offers a solution of formatting the service by dividing the distance of travel into sections.

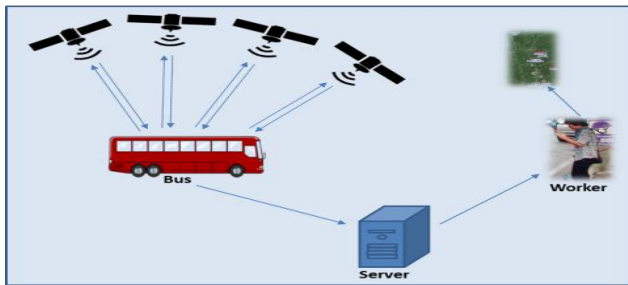
Other issues related to the problem of passenger transportation are the integration of equipment to receive internet transmissions (Internet of Things, or IOT) and sensors. The most important device is a GPS module that will facilitate the positioning of both buses and passengers together with the estimated arrival time (time arrival, TA) at the appointed “pick up” or service point.

To accomplish this mission, the team created an application to solve the problem of sending and receiving employees. This application allows the bus drivers to track and share travel information with their passengers on various routes. With it, passengers can see the status of the buses and can anticipate the arrival times at the “pick up” or meeting point.

**Implementing the “Wherever” Application**

The use of applications of tracking buses using smart phones was developed from Apache2 on the Ubuntu server, java, php, SQL and H2 database management system. They use viewers and controller programs developed by the Inventor II App and Android Studio, through the following principles:

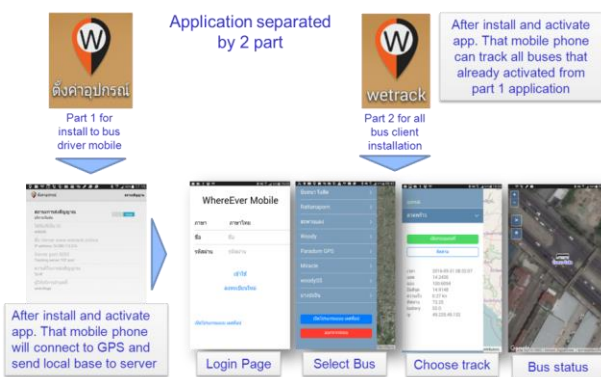
- 1.Application program for control the tracking which is installed on a mobile phone of the bus drivers.
- 2.Application for employees to monitor and view bus traffic (Bus viewer)
- 3.Server for information management with Internet connection.(www.wetrack.online:8082)



**Figure 1. The system operation.**

Employees can download the application from Google Play Store in the Android system or they can access in to Chrome browser in IOS system. When they turn the application on, it will be able to track the movement of the bus in each route.

**How Application work**



**Figure 2. The Application operation.**

It can calculate or estimate the time that the bus will arrive at each meeting point accurately, thus reducing the waiting time at each point. Moreover, it allows employees to choose the route or the meeting point with minimal time and cost.

To understand how the Application is used, the system must be explained to employees who currently use the bus service. Communicating about the application, the operating system and how to use it, will require a set of procedures as follows:

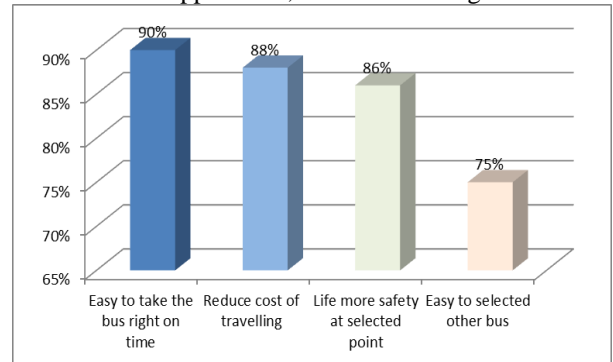
- 1 Training and educating human resource officers who control and supervise employees, the bus driver and the employees themselves. In this training, they are explained about current operation of the bus service system, before the new application is deployed.
- 2 Explaining the tracking system to the bus drivers and how the application can be installed into their phones.
- 3 Providing application manuals for the employees who currently take the shuttle buses, and how the use of this new application can benefit them.
4. Installing the mobile application for the employees and kick off the operation.
5. Monitor and summarize feedback from both employees and drivers.



**Figure 3. Workflow of implementation.**

After launch this application the researcher send questionnaire to the users 365 persons from 400 persons that is mean 95% of user of application and found result of usage as follow;

The survey found that most of the employees are satisfied with the application, for the following reasons:



**Figure 4. Feedback on Usage of the Application. For employees.**

1. Saves time waiting the buses because the application estimates the exact time of arrival. Moreover, the application is “user friendly”. Everyone can quickly learn how to use it.

2. Saves on travel expenses to get to the meeting point because employees can select the shortest and fastest route to get from their place of accommodations to each meeting point.

3. Prevent danger from waiting at some high risk areas, roaming late at night or at dawn, since employees can better manage their time when they get out of their home or accommodation.

4. Let the employees know whether they have missed the bus or not, so that they can decide to find the alternative ways to go to work

#### **For bus drivers**

The drivers simply turn on the application and monitor by GPS (GPS). Tracking control (GPS) is considered to be a complete system. Therefore, it does not interfere with their normal operation.

#### **Conclusions and recommendations**

The efficiency and performance of this application depended on these key factors:

1. Both drivers and employees must use smart phones with at least 3 G internet connection, which will be sufficient for the application.

2. The drivers must turn on GPS receiver to connect the signal for bus tracking application, otherwise, the data may be inaccurate.

There is common misunderstanding among bus drivers and employees that turning on the GPS signal or launching this application will consume much power from the phone and internet hours. In fact Both GPS and application launching use less than 2 KB per day. This must be explained to users, so they will have better understanding of the system.

Lastly, the drivers are worried that turning on GPS signal all the time will make them lose their privacy. Their movements can be tracked. To address this, the researchers will develop the GPS “turn on/turn off” switch system to run automatically at specific times, as this will likely result in better cooperation among the drivers.

For future development of this application, an integration of all information concerning this system will be communicated by the company to all its employees. This will be another important communication channel to explain the system.

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