Journal of Critical Reviews

ISSN- 2394-5125 Vol 7, Issue 8, 2020

INFORMATION REAL-TIME DELIVERY (IRTD) SYSTEM BASED INTERNET OF THING (IOT) IN FORWARDING INDUSTRY

Rahimah Kassim*[1], Hasnah Mustapa[2], Fauziah Abdul Rahman[3], Helmi Adly Mohd Noor[4], Zirawani Baharum[5]

[1,2,3,4,5]Universiti Kuala Lumpur, Malaysian Institute of Industrial Technology
E-mail: *[1]rahimahk@unikl.edu.my, [2]hasnah.mustapa@yahoo.com.my, [3]fauziahar@unikl.edu.my, [4]helmiadly@gmail.com/helmiadly@unikl.edu.my, [5]zirawani@unikl.edu.my

Received: 28.04.2020 *Revised: 30.05.2020* *Accepted: 21.06.2020*

Abstract
Logistic sector, particularly in the container haulage industry, is dealing with million shipments of cargo every day, origin and destination, size, weight, content, and location are all tracked across the global delivery network. The container in and out at the port causes congestion and effectson truck late delivery. This issue resulted incontainer haulage invariably received lots of complaints by the customer concerning the cargo delay without the customer grasp precisely situation.The cargo delays happen caused by waiting time at the port terminal, customs clearance, road congestion, bad weather, the breakdown of truck and shortage of driver.Thus, this study seeks to explore the related issues towards further improvements on delays notification. The qualitative research was adopted in the study and data were collected from related expert participants in three different areas, namely haulage, forwarding agent and technology service provider. This research focuses on the current process of delivery notification status to the customer and redesigns a new model of information real-time delivery system based Internet of Thing (IoT) at the haulage industry. Furthermore, this research will determine the expected benefits of the IRTD system inthe haulage industry. This study is about the Information Real-Time Delivery Systems (IRTDS) through the Internet of Things (IoT) for real-time monitoring and updated delivery systems to the stakeholders. Business Process Re-engineeringemployed in this study to provide holistic guidance about a development model of IRTDSthrough the Internet of things as innovation in a haulage industry environment.

Keywords--IoT, Real-Time, Haulage industry, Business Process Redesign

DOI: http://dx.doi.org/10.31838/jcr.07.08.165

INTRODUCTION

With the rapid growth of industrialization in Malaysia, it contributes totheincreasing volume of international trade using containerization for import and export purposes. The container haulage industry is vitally important due to that role as the backbone of the industry growth economy that can give value-added service to the country. According to Zaid & Shah, (2007), the haulage industry is one of the key parts in crucial the efficiency and effectiveness of their customer, which general meaning the whole supply chain of the Malaysian industry.

Dealing with million shipments of cargo every day, origin and destination, size, weight, content, and location are all tracked across the global delivery network resultedin congestion at the port and delays delivery of the container to the destination. Late to send information to the customer regarding the delay of their shipment show the inefficiency of the hauler in meeting the demand and requirements of the customer.

The delay of the shipment may occur due to the waiting time, customs clearance, road congestion, bad weather, maintenance of truck and shortage of drivers that affect the capabilities of the haulage industry to sustain their performance. According to Wang & Potter, (2007), the customer always complaint about the delay of the shipment without exactly know the real situation faced by the truck driver in delivering their shipment.

The immediate solution needed after the delay occursandan improvement onthebottleneck of the haulage industry required to ensure smooth operation. The implementation of Information Real-Time Delivery Systems (IRTDS) supporting by the Internet of Things (IoT) application is one of the solutions to improve the current problem faced by the haulage industry.

Internet of Things (IoT) is an element in Industrial 4.0 that is a solution idea of the digital connection of object via the internet, creating a network which enables this object to gather and exchange data. IoT will enable users to share information in real-time and store the massive quantity of data to be accessed anywhere and anytime is wanted, although it is essentially good security software to protect all this information (Ibarra et al., 2017). IRTDSpotential to help the haulage industry to give the real-time notification status of delivery to the customer in real-time.Furthermore, the customer always updated every second of the movement of their shipment regarding the condition, location, and situation faced by the driver to deliver their goods. Furthermore, customers will be notified toreceive emergency alerts in real-time for any incident that happened such as accident, waiting time at port, road congestion and other else constraint.

This kind of systemwasable to increasethevisibility for carrier, shipper and driver. It will be resulting in better inventory and vehicle management and improved customer service due to a lot of proactive approaches to managing deliveries because delay is known earlier. Other than that, it will improve information accuracy between shippers, carrier and as well customers(Wang & Potter, 2007). In brief, this study aims to investigate the current process of delivery notification status to the customer at Haulage Company. This study also aims to redesign the IRTDS model forthehaulage industry and identify thepotential benefits of the implementation of IRTDS.

LITERATURE REVIEW

Although there were many researches discussedthetechnology of IoT, only a few studies in the literature that deal with real-time delivery systems embedded with advanced technology Internet

of Things (IoT). The study by Macaulay et al., (2015)examined that Transport and Logistics companies are more focused on implemented IoT technologies on track-and-trace applications, meaning to diminish arrange intricacy. For instance, Geographical Positioning System (GPS) asset tagging can be utilized to improve operation by plotting the ongoing areas of trucks and deliveries and using analytics to draw the shortest or most fuel-efficient route between them. In another study Kuritika.et al (2014) presents the intelligence food cargo that using GPS tagging to tracing food product during transportation. In the study, the perishable products are needed to be delivered at the desired quality at the right time and lack of monitoring of the product during the shipment contributes towards the food wastage during the transportation phase.

The technology of the Internet of Things refers to the system that connecting things to the internet and using the connection to produce some kind of helpful remote monitoring or control of all the things (Ibarra et al., 2017). The adoption of IoT in logistic operation promises a substantial impact in way of monitoring the status of assets, parcel and people in real-time throughout the worth chain (Macaulay et al., 2015). Applying the IoT in the logistic will make smooth information can be transformed. It starts from IoT will monitor the real-time status of assets, parcel and people and as well it will measure how these assets are acting and result in a modification in what they are presently doing. Through IoT, we can automatically eliminate manual intervention, improve quality and predictability. On top of that, we can optimize how people, systems, and assets can work along, and coordinate their activities. And eventually, we can apply analytics to the whole value chain to identify extensive improvement opportunities and best practices (Conner & Conner, 2018; Macaulay et al., 2015).

The IoT allows tracking of the product until that product delivered to the customer (Kalbag et al., 2014& Shamsuzzoha, 2011). Real-time weather and traffic data are obtainable to the logistic carrier to work out optimum routes for delivery and changes during a truck's delivery plans will be communicated directly to the carrier and if appropriate to the customer. IoTenabledassetstracking can provide business with a centralized view of all assets, whether in transit or not and this allows customers to monitor the status of goods during transit, providing them with peace of mind that their goodwill arrives at the right place and right condition (Oracle Corporation, 2015). Figure 1 shows the Real Time Product Tracking from Order to the DeliveryReal time location and if the truck stuck in traffic or breakdown, the system will update immediately to the customer.

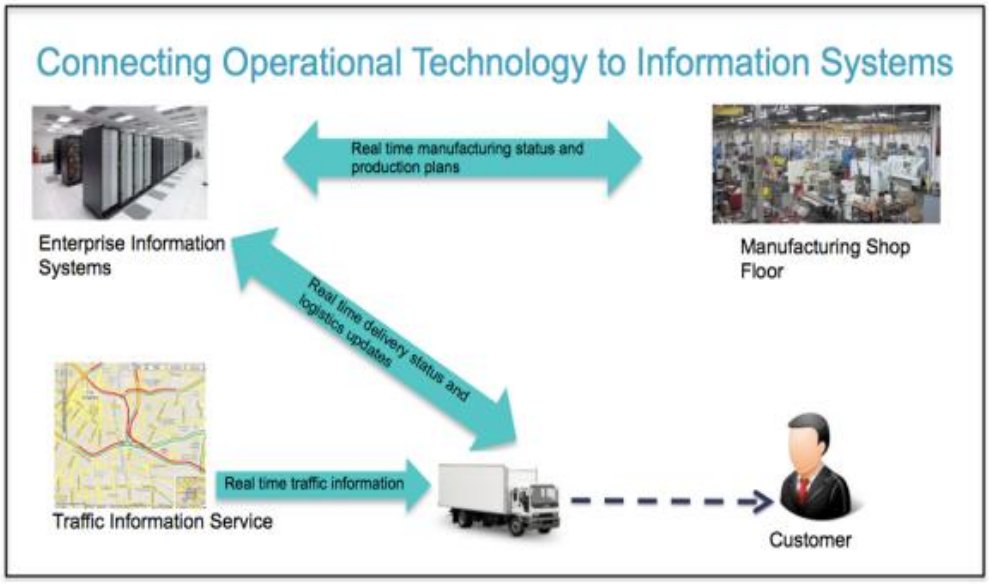

Figure 1. Real Time Product Tracking from Order to Delivery Source: (Shamsuzzoha& Helo, 2011)

Real time information gathered via traffic sensing element will facilitate guide the vehicle to an optimal route (Shamsuzzoha & Helo, 2011). Previous study ha shows that specified application of IoT include the real time tracking of cargo, warehouse-capacity improvement, prophetic assets maintenance, route improvement and improved last mile delivery (Perego et al., 2011 & Tadejko, 2015). This real-time visibility can enable transport and logistics providers to explore much more of effectively and intelligent their rich and complex database, resulting in a lot of efficient use of resources, better engagement with customer and more informed decision making (Tadejko, 2015).

Since the truck driver already aware that they will constantly monitored, they will be careful while driving and take shortest possible route to reach destination on right time and minimize delay (Ahmed et al., 2015). Based on research conducted by (Computing, 2015 & Maurya et al., 2012), overall productivity of fleet management operation will be improved by assistance of advanced technology. Other than that, better scheduling and proper route planning could be manage securely with better communication medium and performance monitoring to ensure the operation smoothly with implementation real time tracking.

RESEARCH METHODOLOGY

This section describes the research methodology that has been used in this study. This study aims to identify the current process of delivery notification status to the customer at one selected company forwarding industryand validation of new process and benefits of Information Real Time Delivery System (IRTDS) proposed model. The research initiated by preliminary investigation of recent issue related the topic discussed. Qualitative data collection and analysis conducted to evaluate respondent's opinions. This study emphasizing the nature of the interviews done and the selection criteria of the experts to this case study. At all times, the theoretical perspective that underpins the process is reported.

Table 1. Research design

Objective	To investigate current process of delivery notification status to the customer at Southern Forwardtrans Sdn Bhd.	To re-design model of information real time delivery systems at forwarding industry	To determine the utilization of benefit information real delivery systems at forwarding industry.
Research Question	1. How the current process of information delivery systems to the customer can affect performance of Southern Forwardtrans Sdn Bhd? 2. What the current problem involved in current process of information delivery systems?	1. How the process new business model can support haulage industry to improve their information delivery systems? 2. What the architecture of new business process information delivery system at haulage industry? 3. What is tool or element that involved in the interface of information notification systems?	1. How the benefit of information real time delivery system can improve the performance of forwarding industry? 2. Is there are other new additional benefits of IRTDS?
Method	Interview Qualitative method	BPR Process; Verification interview; literature review; Just mind tool	Literature review; Conceptual Analysis; interview and validation
Output Result	Flow Chart of current process of delivery notification status to the customer at southern forwardtrans SDN BHD	New process of IRTD system; verification of New process IRTD System; architecture and Infrastructure of IRTDS; Interface of IRTD System	Benefits of IRTD System; New Benefits of IRTD System

Data collection

The process of data collection consists of identifying and selecting the experts involved and conducting semi-structured and structured interviews to achieve all research questions for this case study. Good criteria for expert selection for these studies is necessary. Therefore, a careful expert selection process must be adopted to prevent bias, uncertainty and incompleteness to the maximum extent possible (Freimut et al., 2015).

There are five different segments of the respondent involved in this research. Respondent is being chosen for the interview is due to their expertise in the research area. The first group is forwarding Manager (Respondent A) at one selected Forwarding company at PasirGudang that responsible for in charge of the in and out haulage container. Respondent Aisknown and understanding the current process delivery notification status to the customer and also the problem that faced by his company.

Other than that, the researcher also interviews Haulage Manager (Respondent B) at the same company as Respondent A to get data regarding the problem faced by the driver to deliver the goods to the customer. The third respondent is the manager of port operating Johor Port (Respondent C). Respondent C was chosen due to the researcher need to get information regarding the truck problem at the port that leads to a delay in delivering the goods to the customer.

In the second section, to confirm the constructed model, the second interview conducted to the same expert's respondents A,B, and C for model verification purposes. Two new respondents were added in this process which is technology expert (Respondent D) and academician expert (Respondent E). All 5 respondents were interview to getanopinion onthebenefit of IRTD System and additional new benefits of implementation IRTD System in the forwarding Industry.

Table 2. Respondent of Study

Respondent	Position	Specialist	Length of experiences in industry (Year)
Respondent A	Forwarding manager	Forwarding	15
Respondent B	Haulage manager	Haulage	16
Respondent C	Port operator manager	Port operation	22
Respondent D	IoT vendor	IT	22
Respondent E	Academia	Education	17

Interview

In the first round of the interview, the respondent was asked regarding how the current process of delivery notification status to the customer by the driver in their company. After the first round of interviews, the corresponding results were analyzed and the process was modified to become real-time information using the Business process redesign.

To verify and validate the new process improvement of information notification, the researcher conducted a second round of interviews as a peer-review consisting of five semi-structured interviews with different experts. There are five experts from the different backgrounds involved in the verification and validation new process of information notification status by the driver.

Additionally, the researcher also wanted to validate the benefits of the internet of things implementation on the information real-time delivery systems. To do so, the researcher conducted a structured interview. There are twelve closed question and four open questions enabled the experts to freely state their opinions on the benefits of IRTDS implementation based IoT.

Business Process Redesign (BPR)

The redesign process needs to improve the current notification delivery status to the customer. Business process design is launched in the early 1990s in Harvard Business Review Article by Michael Hammer and is one of the many management concepts adopted by the organization to improve the efficiency of their business operation (Burges, 2011).

BPR is concerned with the fundamental rethinking and radical redesign of business process to enhance dramatic improvement in the current process activity in the organization (Burges, 2011; Gunasekaran, 2002 &Khan, 2000).

A BPR framework isguidance to improve the current information delivery system to the customer intheforwarding industry. The proposed BPR framework are suggest structured around 3 basic phase and all the phase are the combination of different phase by researcher like (Davenport & Short, 1990; Grover & Malhotra, 1997; Harrington, 1998; Hayes, 2002; Kettinger & Teng, 1998; Lockamy & Smith, 1997; Love & Gunasekaran, 1997) as explained through figure 2.

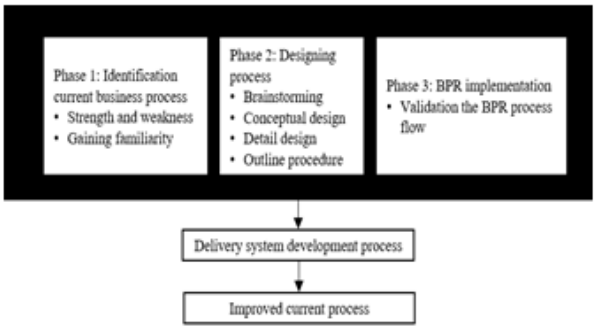

Figure 2. Proposed BPR Frameworks

FINDING

The result interpreted by referring to the interview session totheexpert's panel. From the interview data, analyze and forecasting of the data collected will be done by the researcher starting from the beginner stage or an early stage. The result from the interview analyze used to develop a flow chart of the current process of delivery notification status to the customer and from that result, it will transform into the real-time information notification system by developingthebusiness model of IRTDS.

Current Process of Notification Delivery System

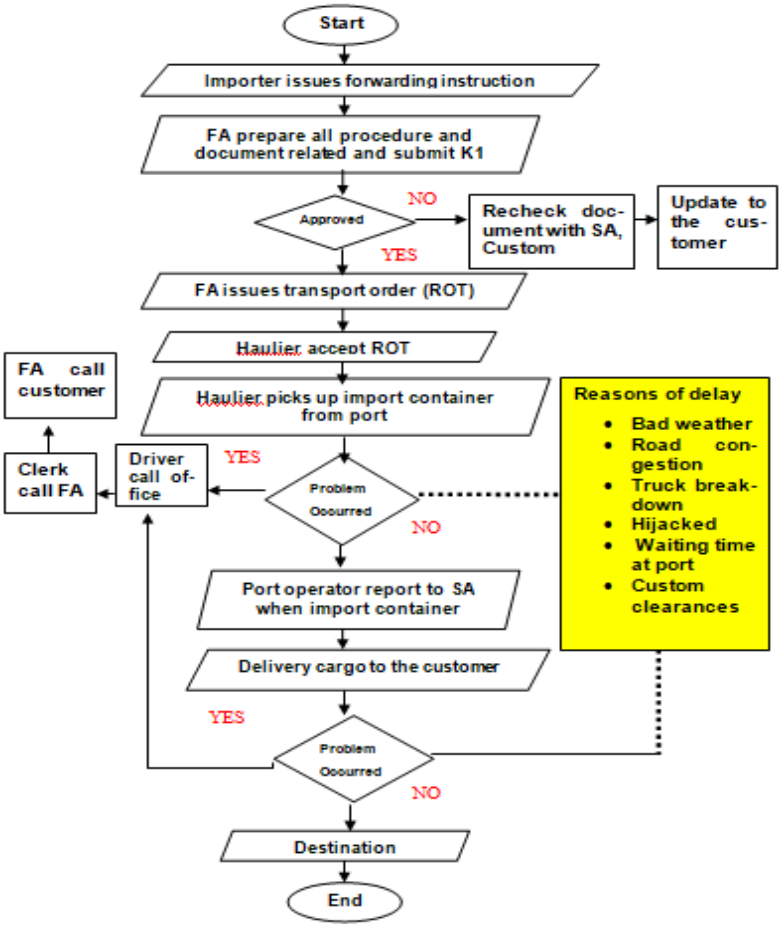

Figure 3. Current notification delivery information to the customer at the forwarding industry

In the current notification system, the driver will be picking up the import or export goods once all the documents prepared by the forwarding agent are settle and valid. The total amount shipment by that company in one day is 60 trips. The possibility of a problem occurs such delay happened due to several reasons as shown in figure 3. From the interview, the researcher found that the haulage driver isstill using the manual process to deliver the information regarding the shipment by using the phone call and the process is not on a real-time basis.

On the other hand, waiting time at port always happen due to several reasons such equipment at port, not enough or broken to handle the cargo has resulted in the delay of the delivery cargo to the customer. Other than that, the possibility to driver goes back to their premise due to incompletesrelateddocument. It also will result to delay in the delivery of the customer's goods.

"Traffic jam, truck breakdown, bad weather that is a normal problem that faced by the driver. Waiting time at the port is mostly will take one or half hours and sometime will drag until three hours. Sometimes, the document details carried by the driver are not tally with the system so that the document needs to correct first so then that container can enter the port. Seal number is the most important detail that needs to be the same between actual and system. When the truck is stuck in port so it will affect the time to deliver the goods to the customer" (Respondent A).

IRTDS based IoT Proposed Model

The basis constructed model concept with verification process involved 3 deference related users which are truck driver, hauler, and customer. For model verification, 5 respondents have been structurally interviewed. The model verification result shows in APPENDIX A. The process of the IRTD notification system starts with the when truck driver required to install the application using the smartphone to run this system. When the truck starts its journey, the drivers have to turn on the application. At first, the drivers need to be logged in to the application.

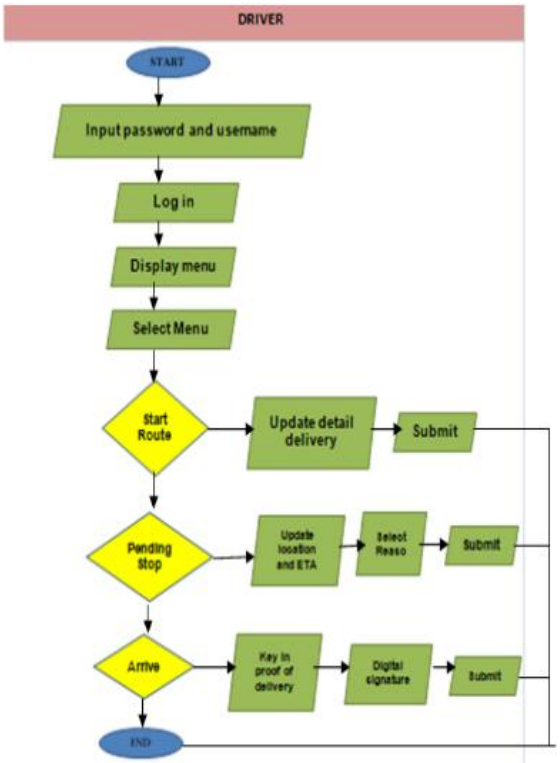

Figure 4. New process Model of IRTDS (Driver)

The process of activities in IRTDS showedin figure 4, presented the side of truck drivers.Afterthe login process, truck driverant on "start route" and all detail required for her journey need to be updated. In every moment the application updates its location using GPS and Google map API. The location is stored in an online server located in the company data center. The data uploaded by the vehicle application are vehicle ID, latitude and longitude of the live location of the vehicle currently, time and the date.

Any delays incident happens such accident, truck breakdown, traffic-jammed, waiting time at the port or other situation that caused delay to deliver the goods to the customer, the driver has to update the "pending stop" processes. They need to update the reasons and ETA of pending through the application. Afterthetruck driver arrived at the destination of delivery goods,the "arrive" button will be updated. All information updated with verification of digital signature as proof of delivery. Information stored on the webserver.

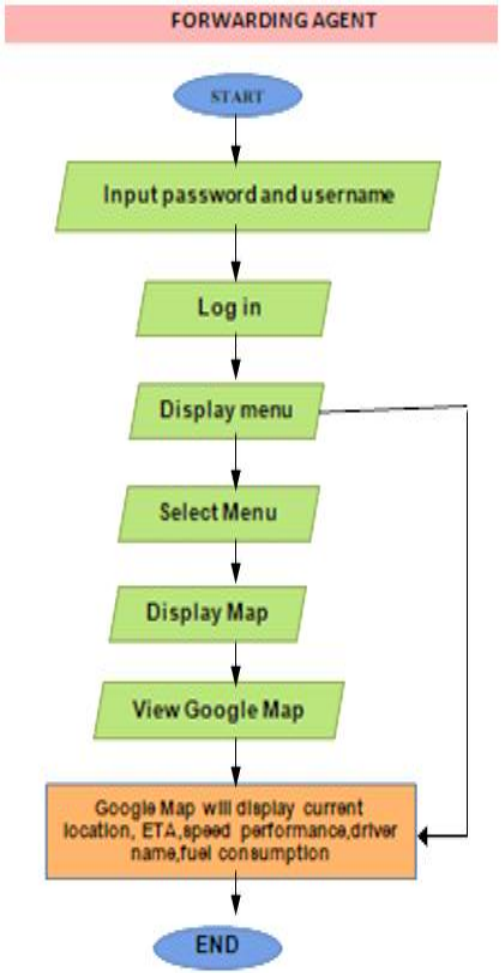

Figure 5. New process Model of IRTDS (Forwarding agent)

The forwarding agent acts as an administrator for IRTDS and retrieves the data uploaded by the truck application. By the latitude and longitude, the application determines the live location of the truck. In the case of the truck on the "pending stop route", the emergency alert will be notified on the Google map with the red symbol. If the "truck on the track", the truck will be display according to the color of green on the Google map. The distance and estimated time to reach the destination point will display on the Google Map.

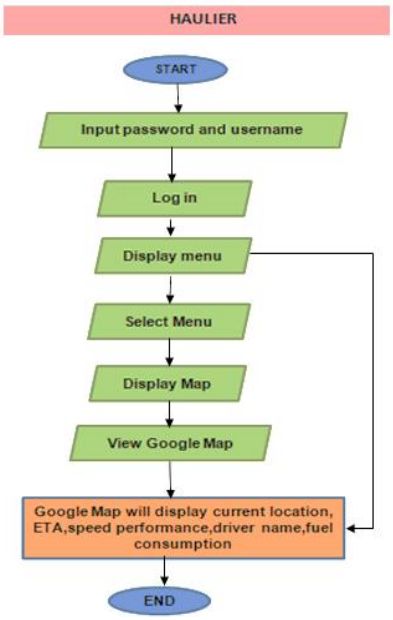

Figure 6. New Process Model of IRTDS (haulage)

Figure 6 shows how the haulage organization performs the IRTDS. User login needed and optional menu displayed on the dashboard. It is including "container" and "notification with map". To trace the truck location, the haulage needs to select "notification with map" and it will display two options either click "map" or "history". The system will appear in the current location, estimated pending of the truck delivery on the Google Map. When the truck on the "Stop Pending Route" the red symbol will show on the Google Map and Immediate action was taken on the truck breakdown.

Shipper and buyer ability to view the status of delivery on IRTDS in their view side.For new customers, sign up activity needed and the dashboard will display the menu. The menu includes "Trace deliver" and "Proof of delivery". The delayed truck will notify the status "Pending Stop Route" together with the reason**.**

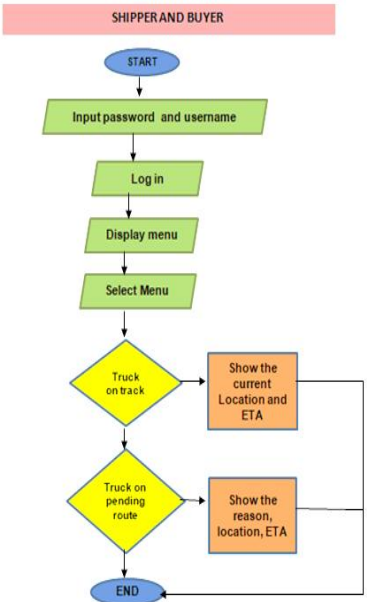

Figure 7. New process Model of IRTDS (Shipper and buyer)

IRTDS Framework and Architecture

Figure 5 showsthe IRTDS architecture model onhow communication takes place between driver, forwarding, haulage, and customers (shipper and buyer). The communication between a driver, forwarding, haulage, and customer occurs when the web server act as a medium for data exchange.

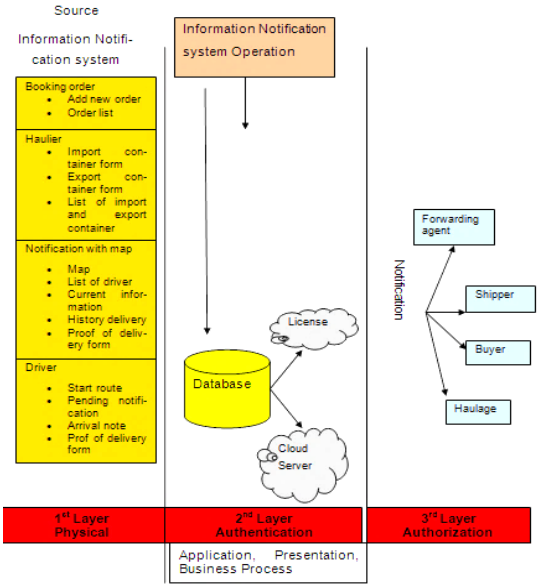

Figure 8. IRTDS Framework and Architecture

As shown in the IRTDS architecture model, the element of safety is the priority when the security and privacy layer included in the model.

Benefits of IRTD System Based IoT

IoT represents a significant innovation in the industries' ecosystem. It follows the digitalization trend which is driving the changes inside modern companies, permitting a better control and understanding of processes and product features. In chapter 2, the benefits and strengths of IoT technology in the implementation ofreal-time delivery information to the customer at the forwarding company have been identified. The structured interview question has been developed where expert respondents (five respondents) could quickly respond to the benefit (IRTDS) implementation. There are twelve structured interviews about the benefits of (IRTDS) implementation.

*Efficiency***:** Four of the respondents agreed that the (IRTDS) will provide a reduce response time of safety, breakdown and security. They also agreed to the fact that IoT technologies can help customers to get faster information status about their shipment. The communication between all the parties involved will be smooth and eliminating any unwanted process within the flow of operation with the IRTDS. However, respondent D pointed out that, the driver may refuse to use this system duetoseveral factors such as lack of knowledge about technology so the objective to provide real-time information to the customer may not be achieved.

"Our driver is not the same as the driver at oversea that welcomes innovation and technology in their daily life. They more prefer to use manuals because it's easier for them. And we need to know, the age of our driver mostly in 30 above so they not exposed in technology" (Respondent D).

Verification/notification: Due to the use of conventional storage tools like server or cloud systems, the information received a

higher level of transparency, enhancing the sharing process. Thus, by doing so all the respondents agreed that the organization can provide better management of all business processes in terms of arrival and proof of delivery in real-time by the driver. Having a smart application, communicating and transmitting can be done in real-time.

"Nowadays all the information in the fingertips. Just need one Smartphone with internet coverage. The notification from the driver will receive immediately with only one click to the parties involved" (Respondent E)

Integrity: Since the driver is being aware of the fact that the truck is constantly being monitored so they would be careful while driving. Four of the respondent agreed that IRTDS will monitor the behavior of the driver. They also agreed the driver will more motivate to do their work due to their leader can monitor them from distance. Other than that, they agreed that valid information regarding the status of the customer's shipment will know in real-time using the IRTDS. However, respondent A stated that may it is not a good solution to monitor the behavior of the driver because mostly the driver is an aged person that hasalack of knowledge about the technologies.

"It will look so hard to ensure all the workers always keep update their activities in the system. Maybe they just will update when they start and when there arrived at their destination while others their will skip. If the entire drivers are young person, it will work" (Respondent A)

Ease of use: Three of the respondent which is respondent C, D and E agree that IRTDS is user friendly where any parties involved easy accessing this system and performing the operation at that system. The users just need the Smartphone and internet coverage to operate. While two of the respondent which is Respondent A and B agreed that it will hard for the driver to use this system due to a lack of knowledge about the technology.

Performances: IRTDS will help the fast information delivery received by the customer. All the respondents agreed that it will help to minimize the complaint from the customer about the delay or late information status receive by them. With this system, they also agreed it will improve the performance of the haulage industry to take the fast action if suddenly the truck is breakdown.

"*No matter what business we run, customers' satisfaction always became our priority. We need to try hard to minimize complaints from the customer so for me, we need this system to increase the level of performance". (Respondent C)*

Reliability: All the respondents agreed that the goods will arrival based on the time display on this system due to the driver will be updated on the real-time of ETA. Since the driver knows, they are monitored so they will take the shortest possible route to reach the destinationat the right time.

Some other benefits recommended by several respondents regarding the implementation Information Real-Time Delivery System (IRTDS):

Respondent D (Technology expert)
"As we know, customers always want the latest information update for their shipment. They always will keep asking regarding their shipment until the shipment arrived in front of their premises. So for me, with the implementation, this kind of system will lead to a reduction of customer queries".

Respondent B (Haulage expert)
"*For me, this system will give benefits to the hauler to keep maintain their truck performance. As I understood, this system will give the real-time emergency alert to the haulage if the truck is a sudden breakdown, so we can immediately* do maintenance of that truck"

Respondent A (Forwarding Expert)
"Sometime the drivers will take advantage while work like take a long time to break or lunch maybe they stop at another area to do something else. We cannot trace all their activities but maybe using this system it will help to mitigate this issue"

DISCUSSION

Through this study, the researcher provides such an alternative for the problem arises that had been stated clearly in the problem statement. Within this chapter, the researcher also will analyze all the data that had been collected using a specific tool in the methodology to extract a kind of a productive recommendation or solution based on the problem statement.

The issues arise in this project regarding too much manual notification by the forwarding agent to sending to the customer and took a long time to customer received the notification of status delivery of their goods. Even though every truck is equipped with the GPS but that it cannot provide the real-time notification status to the forwarding agent and to the customer. The drivers still need to call forwarding agent and their offices to inform their current status of their route.

Furthermore, this study is potential for the further project of simulation development for IRTDS based IoT and reference model for future research in related areas and perspectives to support the haulage industry in the real-time tracing delivery environment.

CONCLUSION

This writing made a review of the literature a few determinants toward the implementation of the Internet of things at the various organization and business levels. The student conducted to analyze and redesign the current process delivery information in the haulage industry and will be using the strategic model of BPR as a guideline to develop a new model of Information Real-Time Delivery System (RTIDS).

REFERENCES

1. Ahmed, S., Rahman, S., & Costa, S. E. (n.d.). *Real- Time Vehicle Tracking System A Thesis Submitted to the Department of Electrical and Electronics Engineering Supervised by Department of Electrical and Electronic Engineering*. (12121163).
2. Burges, R. (2011). *Article information : Avoiding supply chain management failure: lesson from business prosess reenginering*. https://doi.org/http://dx.doi.org/10.1108/MRR-09-2015-0216
3. Computing, M. (2015). *Design and Implementation of Real Time Vehicle Tracking System*. *4*(7), 55–60.
4. Conner, M. K., & Conner, M. (2018). *Dynamic Logistics Enabled by IoT*.
5. Davenport, T. H., & Short, J. E. (1990). *The New Industrial Engineering: Information Technology And Business Process Redesign*.
6. Freimut, B., Denger, C., & Esp, B. G. (2015). *An industrial case study of implementing and validating defect classification for process improvement and quality management An Industrial Case Study of Implementing and Validating Defect Classification for Process Improvement and Quality*

Management. (October). https://doi.org/10.1109/METRICS.2005.10

7. Grover, V., & Malhotra, M. K. (1997). Business process reengineering: A tutorial on the concept, evolution, method, technology and application. *Journal of Operations Management*, *15*(3), 193–213. https://doi.org/10.1016/S0272-6963(96)00104-0
8. Gunasekaran, A., & Kobu, B. (2002). Modelling and analysis of business process reengineering. *International Journal of Production Research*, *40*(11), 2521–2546. https://doi.org/10.1080/00207540210132733
9. Harrington, H. J. (1998). Performance improvement : the rise and fall of reengineering Performance improvement : the rise and fall of reengineering. *The TQM Magazine*, *10*(2), 69–71.
10. Hayes, J. (2002). *The Theory and Practice of Change Management author*.
11. Ibarra-Esquer, J. E., González-Navarro, F. F., Flores-Rios, B. L., Burtseva, L., & Astorga-Vargas, M. A. (2017). Tracking the evolution of the internet of things concept across different application domains. *Sensors (Switzerland)*, *17*(6), 1–24. https://doi.org/10.3390/s17061379
12. Kalbag, B. A., & Silverman, G. (2014). Enriching Business Processes through Internet of Everything. *Cisco Systems, Inc.*, (June), 1–15.
13. Kettinger, W. J., & Teng, J. T. C. (1998). Aligning BPR to strategy: a framework for analysis. *Long Range Planning*, *31*(1), 93–107. https://doi.org/http://dx.doi.org/10.1016/S0024-6301(97)00094-0
14. Khan, M. R. R. (2000). Business process reengineering of an air cargo handling process. *International Journal of Production Economics*, *63*(1), 99–108. https://doi.org/10.1016/S0925-5273(99)00003-1
15. Lockamy, A., & Smith, W. I. (1997). A strategic alignment approach for effective business process reengineering: linking strategy, processes and customers for competitive advantage. *International Journal of Production Economics*, *50*(2–3), 141–153. https://doi.org/10.1016/S0925-5273(97)00038-8
16. Love, P. E. D., & Gunasekaran, A. (1997). Process reengineering: A review of enablers. *International Journal of Production Economics*, *50*(2–3), 183–197. https://doi.org/10.1016/S0925-5273(97)00040-6
17. Macaulay, J., Buckalew, L., & Chung, G. (2015). Internet of Things in Logistics. In *DHL Trend Research* (Vol. 1).
18. Maurya, K., Singh, M., & Jain, N. (2012). *Real Time Vehicle Tracking System using GSM and GPS Technology- An Anti-theft Tracking System*. (April 2016).
19. oracle corporation. (2015). *Asset Tracking : Keeping Track of Business Value*.
20. Perego, A., Perotti, S., & Mangiaracina, R. (2011). ICT for logistics and freight transportation: a literature review and research agenda. *International Journal of Physical Distribution & Logistics Management*, *41*(5), 457–483. https://doi.org/10.1108/09600031111138826
21. Shamsuzzoha, a, & Helo, P. (2011). Real-time tracking and tracing system: Potentials for the logistics network *of the 2011 International Conference* 242–250.
22. Tadejko, P. (2015). Application of Internet of Things in Logistics – Current Challenges. *International Society for Manufacturing, Service and Management Engineering*, *7*(4), 54–64. https://doi.org/10.12846/j.em.2015.04.07
23. Wang, Y., & Potter, A. (2007). The application of real time tracking technologies in freight transport. *Proceedings - International Conference on Signal Image Technologies and Internet Based Systems, SITIS 2007*, (January), 298–304. https://doi.org/10.1109/SITIS.2007.65
24. Zaid, Z. M., & Shah, M. (2007). Performance measurement in Malaysian container haulage industry: A critical evaluation. *Eprints.Utm.My*, *1*(1), 1–14.

AUTHORS

First Author – Rahimah Kassim, Master of Science (Information System), Universiti Kuala Lumpur, Malaysian Institute of Industrial Technology. Email: rahimahk@unikl.edu.my, 0177798614

Second Author-HasnahMustapa, Bachelor of Industrials Logistics, Universiti Kuala Lumpur, Malaysian Institute of Industrial Technology. Email: hasnah.mustapa@yahoo.com.my

Third Author– Fauziah Abdul Rahman, Msc(Information Technology), UniKL MITEC. Email: fauziahar@unikl.edu.my

Forth Author- Helmi Adly Bin Mohd Noor, Doctor of Philosophy (PhD), Information & Communication Technology (Multimedia), Universiti Kuala Lumpur, Malaysia Institute of Industrial Technology, Johor, Malaysia.
Email: helmiadly@gmail.com/helmiadly@unikl.edu.my

Fifth Author– Zirawani Baharum, Doctor of Philosophy in Computer Science, Universiti Kuala Lumpur, Malaysia Institute of Industrial Technology, Johor, Malaysia.
Email: zirawani@unikl.edu.my