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Feasibility Study on The Readiness Level of Internet of Things (IoT) in Aerospace Industry Related to Industry Revolution 4.0 in Malaysia

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Abstract. This study is to evaluate the readiness of aerospace companies in Malaysia towards Industry Revolution 4.0 through technology readiness level methodology. Probability of progress measurement towards industry 4.0 could accelerate this process, thus, the use of suitable maturity models could show the direction of the company in the Industrial revolution 4.0. Data has been amassed through questionnaire and face to face interview. This study showed that most of the respondents were almost ready on Industry Revolution 4.0 knowledge and awareness. However, from the perspective of data and analytic readiness, most of the respondents were unlikely ready to handle and manage the data analysis resulting from Internet of Things huge data mining.

1. Introduction

Internet of Things (IoT) is defined as smart interaction between humans and objects to exchange information and knowledge for the creation of new value. IoT is a smart device convergence that generates data through sensors to generate new information and knowledge to enhance human intelligence, effectiveness, and productivity to improve the quality of life. This feasibility study on the readiness level of IoT in the aerospace industry in Malaysia could give an initial picture of the readiness level of this industry in adopting the Industrial Revolution 4.0 evolution.

2. Internet of Things (IoT)

The phrase "Internet of Things" was created 10 years ago by the founders of the original MIT Auto-ID Center. The term "Auto-ID" has been referred to any broad identification technology used in the industry to automate, reduce errors, and improve efficiency [1]. The IoT can be addressed as a set of smart items or objects handled by matchless addressing schemes and connected to the Internet through this integrated framework and the framework may be cloud computing.

In the era of Industry 4.0 and the transformation of digital manufacturing, the manufacturing industry is a market where the most IoT projects are realized and so far where the most IoT are made. As the manufacturing industry is experiencing a dramatic transition centered on new technologies that offer greater promise of efficiency, speed, and quality. The main component of the switch towards Industry 4.0 is the IoT, which serves as the forefront of data capture in modern factories. If firms are able to manage the delivery model, this can lead to improving their external operations, cost and waste reductions making the company more flexible and meeting the clients' expectations faster, ultimately achieving a sustainable competitive advantage [2] [3].

Technology Readiness Level (TRL) assessment concept has been as a method to measure the maturity of Critical Technology Element reviewed the program concept, technology requirements, and technological capabilities. The innovation readiness level intended to help in implementing innovation over the lifecycle of new technology effectively [4].

In TDWI's IoT Data Readiness Assessment Tool, there are one or more questions per metric, thus there are several questions per dimension. These are the IoT Organizational Readiness, IoT Data Readiness, IoT Data Infrastructure Readiness and IoT Analytics Readiness

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[5]. The company that achieves high maturity in the 4.0 industry will be the smart company offering smart products and smart services to be delivered in a smart manufacturing environment and smart economy. Probability of progress measurement towards industry 4.0 could accelerate this process, therefore, the use of appropriate maturity models could show the direction of the company in the Industrial revolution 4.0 [6].

3. IoT Opportunities In Malaysia

It is estimated that Potential early Internet potency in Malaysia will record RM9.5 billion by 2020, which enhances values on the traditional ICT industry and leveraging on existing economic initiatives such as the Economic Transformation Program (ETP), the Government Transformation Program (GTP), Digital Malaysia (DM) and Digital Lifestyle Malaysia (DLM). Supported by ongoing promotional campaigns and reinforced with market value appreciation, the IoT in Malaysia is expected to experience exponential growth beyond 2020 and achieve RM42.5 billion in 2025. [7]

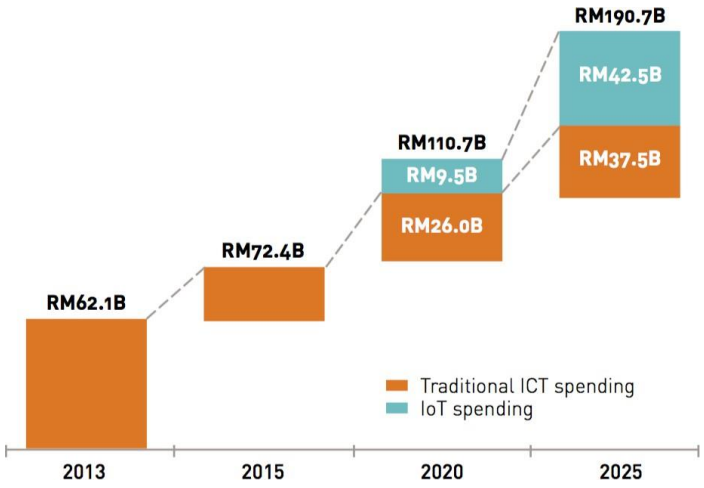

Figure 1 : Malaysia IoT opportunities (2020-2025) [7]

IoT growth in Figure 1 will outpace the traditional ICT market by 2025 and further redesign the behaviour of Internet use and generate Internet growth in Malaysia. This assumes that the IoT growth rate in the Asia Pacific region is 34.1 percent. Technology opportunities that can be created by the IoT in Malaysia are concentrated in applications and services, and analytical-related technologies, with forecast technology opportunities amounting to RM34 billion.

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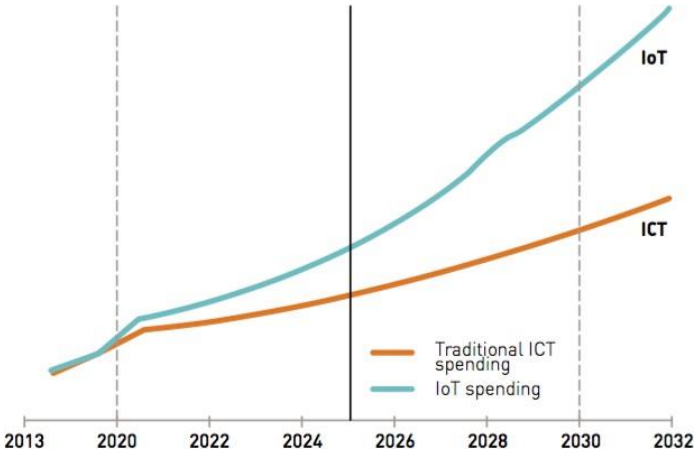

Figure 2 : Malaysia IoT Spending [7]

The growth of the IoT in the Malaysian market is projected to generate a total of 14,270 high-skilled employment opportunities by 2020 (Figure 2). Entrepreneurs who create unique value on top of commodity hardware, connectivity and cloud services will reap profits in the IoT. The demand for IoT technology will not come from a single killer app, but from thousands of unexpected new use cases by solution developers who pull intelligence from data which is fundamental in making IoT a big profitable market.

4. IoT data readiness assessment tool

There are various components in IoT application which consists of sensors, routers, network infrastructure, gateways, devices, clouds, local servers, analytical platforms, analytical algorithm, as well as big data and cyber securities. Companies should imbark IoT according to their nature of business and services. The surveyed questioned generally focus on the readiness of Aerospace and aviation-related companies in Malaysia which consist of organizational readiness, data readiness, infrastructure readiness, and analytic readiness.

4.1 Organisation readiness

Based on Figure 3 most of the respondents were classified at level four where they have defined the business case use for their organisation. Success metric, which most of the respondent were at the level four of 61% however 19% of the respondent still at the level one of the stages where they still did not identify the IoT related metrics and KPI. In term of IoT project budget allocation, 46% of the respondent have their executive sponsorship which is at the level four, but 40% correspondence did not have the executive sponsorship. Management is some sort of supporting the IoT project as 47% are encouraging and 34% being positive. In addition, an organisation that has deployed IoT road map were at the level three which is 47% where they were starting to do it followed 19% respectively and 16% not yet but totally aware that they have to. For identifying an internal and external expert, 37% respondents scored at the level four which they identified their partners followed closely 36% where they have identified but yet did not engaged yet with them, 23% did not identify and 4% were looking for where to start. Most of these companies have a good track record on emerging technologies but the team expectation on company's implementation of IoT are moderate and low as they still in calculating the cost of implementing and implication on current scope or works and services. The second last dimension is the IoT alignment where most respondents 39% have already had an alignment of the IoT with IoT analytics while others were trying to work on this. More than half of the companies have already had the enterprise-scope program for data governance.

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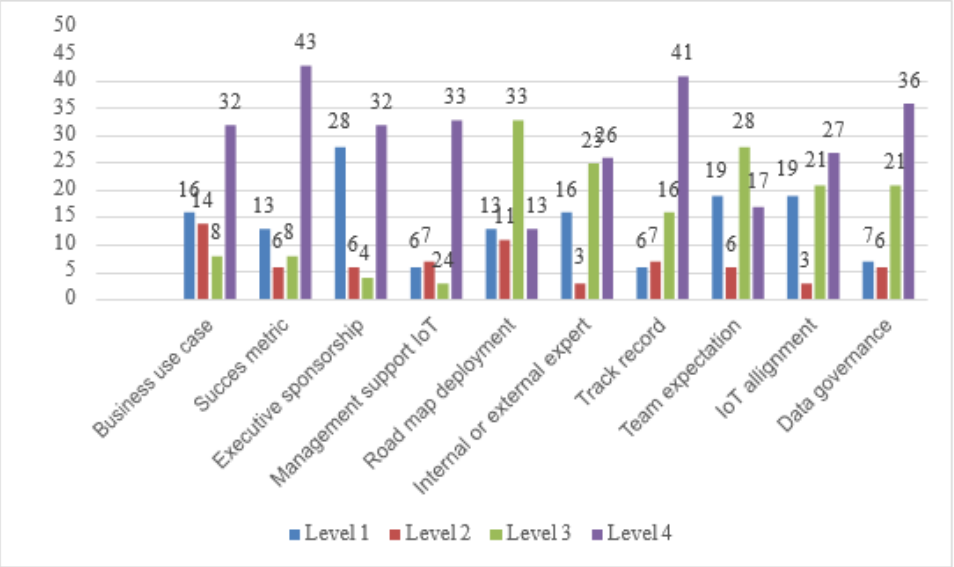

Figure 3 : Organisation readiness

4.2 Data readiness

53% of the respondents rank at level four where they have already possessed IoT data while in contrast, 26% at the level one stated that they did not follow the IoT technology. For data volume, 40% of the respondents' data range was terabytes followed by 23 33% megabytes, 16% petabytes and 11% gigabytes. Most of the correspondence is still do not fully understand data frequency and patterns. More than half of the correspondence does not see the relevancy of IoT statistical methodology and big data on their technical hands-on the scope of work.

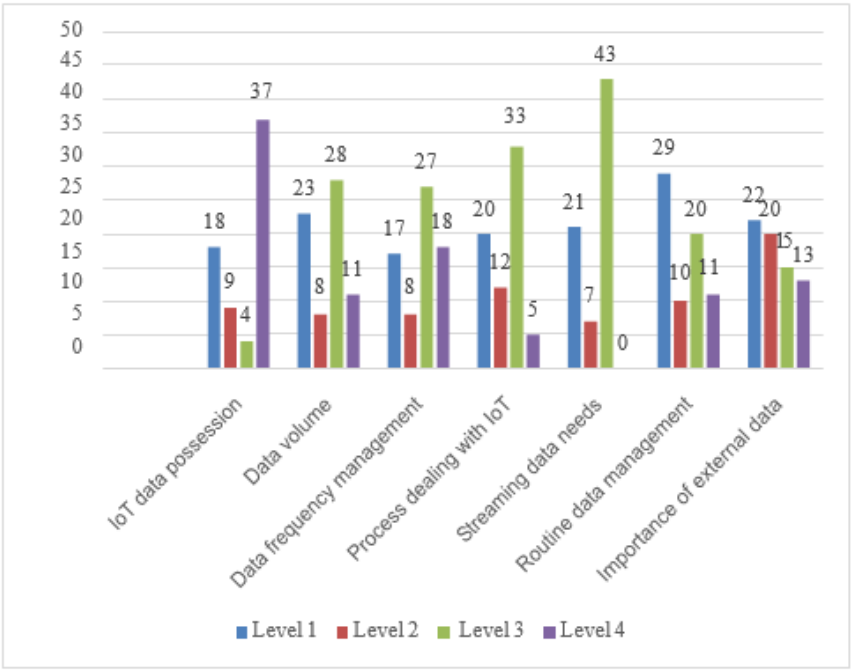

Figure 4 : Data Readiness

4.3 Infrastructure readiness

Most of the correspondence agreed that their organisation infrastructure could handle

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massive dispersed data and their organisation infrastructure has determined how to deal a number of server for IoT 46% of the respondents in the level four agreed that they have already tested the solution to get whereas 14% were not sure but will think about it. From a storage perspective, most of the respondents have the ability to predict the amount of storage. 6% of the respondents in the level for having tested to identify the level of compression they can get from the IoT data while most of the other companies were thinking of implementing IoT technology in their operation and scope of work. Most of the organisations have the technical know-how person to deal with quality, reliability control and security of the IoT data.

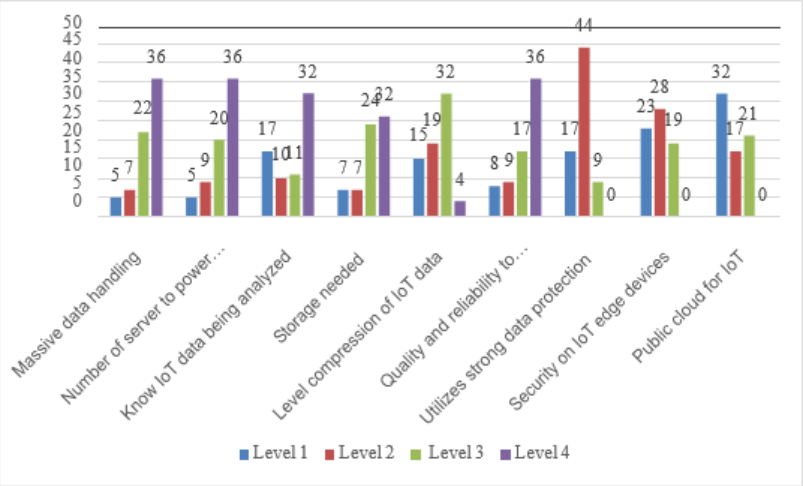

Figure 5 : Infrastructure Readiness

4.4 Analytic readiness

Most of the correspondence is not ready on analytical readiness as shown in Figure 6. Only 20% of the respondents have the expertise to develop the data whereas 51% of the respondents have experience in with pairing data with multiple data sources but with disparate data followed by 9% with the same disparate data but with streams, 33% did not experience in pairing multiple data and 7% also did not have the experience but already start thinking to do. For data integration, 40% of the respondents can integrate IoT data together with their existing analytics data followed by 37% did not have the ability to do the integration but they were planning it and only 23%did not have the ability to do the integration fully. Not only that, 39% of the respondents agreed that their data analytic is nearly automated. Most of the companies do not take serious action on analytics results did not perform analytics in a distributed environment but they were planning to do it soon.

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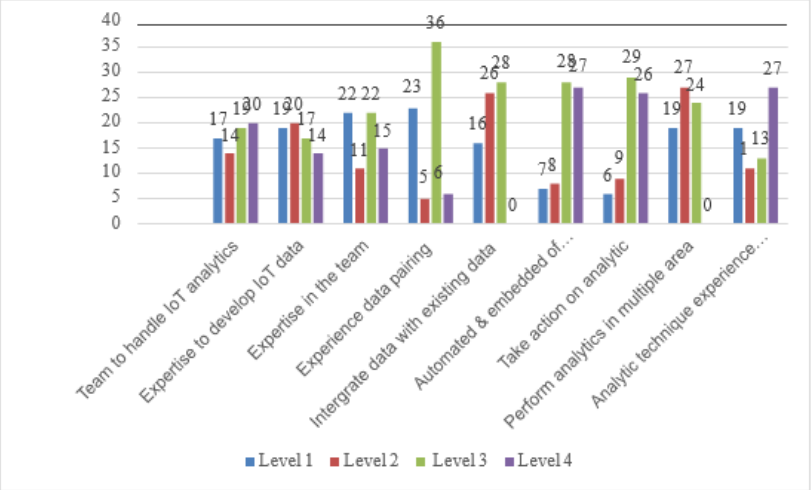

Figure 6 : Analytic Readiness

4.5 Organisation focus on IoT initiatives

Based on Figure 7, 9% of the respondents would focus on requirement to facilitate companies with very strong internet whilst another 9% weight on acquiring some funding to implement IoT program.11% of the respondents would collaborate with other company to implement IoT and 22% of the respondents agreed that their company should do something to create awareness on IoT. Last but not least, most of the respondents would focus on staff training.

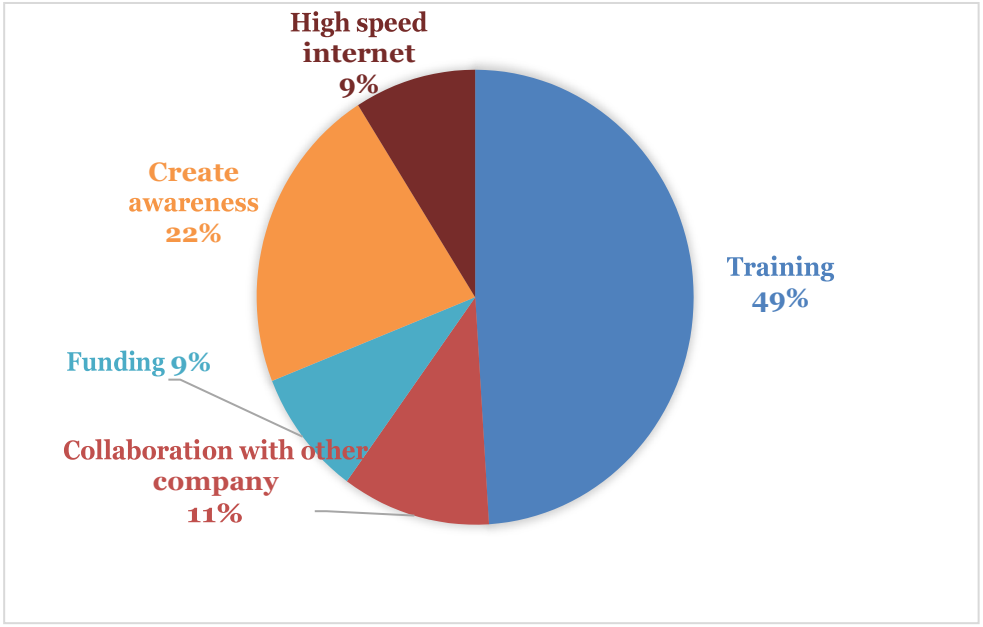

Figure 7 : Respondents Recommendations

5. Result and Discussion

Based on Organisation readiness, 73% of the respondents were classified at level three of the IoT readiness level. In order for any organization to be ready to implement IoT, they should identify their business use case and their success metric to define their IoT success projects and

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should have good alignment between the enterprise and IoT analytics. This is also supported by Al-Shboul (2017) [2] where he stated that if any organization has the ability to identify their business process successfully they can improve their organization IoT performance. Half of the respondents score at level three of the readiness level. Most of organisation have not possessed the IoT data totally but it is coming to be ready to implement. Majority of the classified in level three and two in the IoT readiness level on infrastructure whilst most of the organization analytics are often automated and embedded as part of their business process. However, most of them stated that they were about to start to do what are should be done in order to automate or embedding Internet of Thing data analytics and this is why they are classified in the level three and two. Collecting IoT data is very important but analysing and acting on it is where the largest value lies. Most organization need to upgrade their the ability to analyse data and patterns where the ability to automate the solution will provide optimum solution and must have good analytics handling.

6. Conclusion

Readiness level of IoT in aerospace and aviation industry in Malaysia is in level two or three (Figure 8). Organisational and infrastructure readiness, most of the respondents were classified in level three while from analytic and data readiness, most of the respondents were at the level of two. Nevertheless, in order for the respondents to be ready enough to implement the IoT, most of the respondents stated that their organisation should provide training for the staff more on the IoT. Other than that, some respondent also stated that their company should have a high-speed internet connection and should provide analytical training and functions in the organisation.

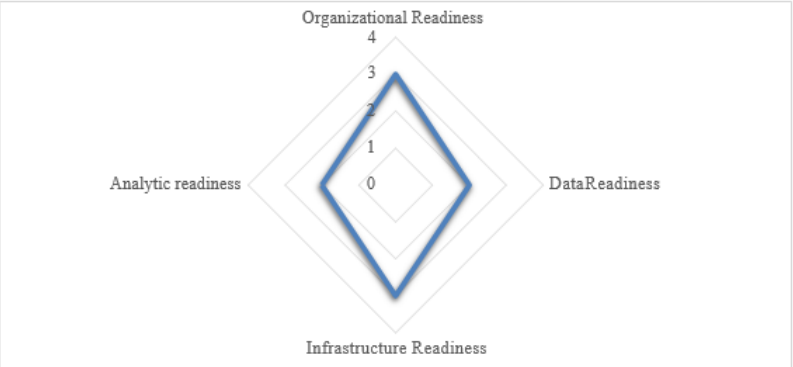

Figure 8 : Overall Readiness

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