

Information Asymmetry and Industry 4.0 among Small and Medium Enterprise (SME) in Malaysian Halal Industry

(Informasi Asimetri dan Industri 4.0 di kalangan Perusahaan Kecil dan Sederhana (PKS) Industri Halal Malaysia)

Ng Suat Thing
Mohd Hasimi Yaacob
Norazlan Alias

(Faculty Economics and Management, Universiti Kebangsaan Malaysia)

ABSTRACT

This study attempts to investigate the participant(s) halal industry information asymmetry issues and their intention, if any, to mitigate it. Additionally, this study also investigates the moderating effects of their perceptions towards industry 4.0 adoption and their intentions of using industry 4.0 to mitigate information asymmetry. This research is exploratory research. We adapted the questionnaire based on “Agency Theory and the Technology Acceptance Model” by combining management and technology literature into single-sourced literature. The research using the SmartPLS software “Partial Least Squares (PLS)” modelling and the 2-step approach to test the model development. The concepts of private information, hidden information, and the lack of perfect information have facilitated these companies’ top management intentions to mitigate these information asymmetry issues. The results also show that the top management of halal industry has the intention to reduce information asymmetry through industry 4.0 adoption as they perceived industry 4.0 is useful, easy to use, is cost affordable, and provides a high system and content quality.

Keywords: Information asymmetry; industry 4.0; blockchain; small and medium enterprises; corporate governance; hoarding information

ABSTRAK

Kajian ini bertujuan mengkaji masalah informasi asimetri yang sedang dihadapi oleh industri halal Malaysia, serta niat mereka untuk menyelesaikan masalah tersebut. Selain itu, kajian ini juga menyiasat persepsi mereka terhadap penggunaan industri 4.0 sebagai moderator dalam hubungan masalah informasi asimetri yang telah dihadapi dan niat mereka untuk menyelesaikan masalah tersebut. Kajian penerokaan ini menggabungkan daripada teori Agensi dan Model Penerimaan Teknologi dalam pembinaan soal selidik. data yang dikumpulkan dianalisis menggunakan perisian SmartPLS. Konsep informasi peribadi, informasi tersembunyi, dan kekurangan informasi yang berguna telah meningkatkan niat pengurusan atasan dalam industri halal untuk menyelesaikan masalah informasi asimetri yang mereka dihadapi. Hasil kajian juga menunjukkan bahawa pengurusan atasan berniat untuk menyelesaikan masalah informasi asimetri melalui penggunaan industri 4.0, apabila mereka menganggap industri 4.0 mendatangkan pelbagai manfaat. Antaranya adalah kebergunaan, kemudahan untuk digunakan, kos yang berpatutan dan meningkatkan sistem kualiti dan kandungan yang bermaklumat tinggi.

Kata kunci: Informasi asimetri; industri 4.0; blok rantai; perusahaan kecil dan sederhana; tadbir urus korporat; penimbunan maklumat

INTRODUCTION

Malaysia has a comprehensive halal ecosystem, and this advantage the nation to position itself as the halal hub in the Asian region and the rest of the world. The Malaysia External Trade Development Corp (Matrade) reports that Malaysia was ranked No.1 in the halal economy during 2019. Furthermore, Malaysia emerged as the highest in the annual Global Islamic Economic Indicator (GIEI) 2020/21 (Malaysia Halal Industry Report 2020). Based on HDC’s proprietary data sources and analysis for 2020, in terms of bilateral trade, Singapore emerged as Malaysia’s biggest importer of halal products in 2020, with a total export value of RM4.10 billion, compared with our

neighbours, Thailand (RM1.48 billion) and Indonesia (RM1.34 billion). These statistics show that even during the covid pandemic, Malaysia achieved RM30.5 billion for the whole of 2020. Therefore, we concluded Halal industry is a vital contributor to Malaysia’s economy. According to Halal Development Corporation (HDC), the government acknowledges the importance of the halal industry and hopes to increase from 7,000 to 70,000 SMEs in halal-promoted businesses because increasing the number of companies will increase the number of exporters (Ayob & Dana 2017).

However, prior studies found that the halal industry faces many challenges, such as halal issues in Malaysia (Sharif & Ghani 2019; Ali et al. 2016). According to

Halal Hub Division JAKIM (2017), the veracity of information shared on social media, standardisation, coordination, and irresponsible halal industrial parties receiving late input and dealing with new viral concerns for personal gain are among the issues. All these halal issues relate to information asymmetries, such as the concept of different information and hidden information. Prior studies declared that the halal issue caused by information asymmetry is becoming uncontrollable in Malaysia, and become quite difficult for the government to contain, especially JAKIM (Sharif & Ghani 2019). Besides that, another challenge facing the halal industry is they are unable to meet the demands of the global halal market. The CEO Matrade, explained the reason of unable to meet the demands are due to there is about 98% of the halal industry facing information asymmetry (lack of perfect information) regarding investments, skills, global alignment, and rationalisations of halal standards. Now, Matrade is working with SIRIM Berhad to assist the halal industries to meet the demands of the global market. HDC and Bank Islam also launch RM100 Million GO Halal Fund to assist Halal SMEs. Therefore, we concluded that the government acknowledged the existence of information asymmetry in the halal industry, and they are ramping out efforts to solve these challenges (Ayob et al. 2016).

To mitigate the challenges mentioned earlier, HDC plans to capitalise on the immediate need for SMEs to transform their businesses online by employing technology and Industry 4.0 (IR4). The disruptive technologies of IR4, such as blockchain and the Internet of Things (IoT), can solve the challenges faced by the halal industry and add value to the overall halal ecosystem. The definition of IR4 is based on the integration and interconnected systems through the actions of data volume use and the emergence of analytics and business-intelligence capabilities. It will generate new forms of human-machine interaction and improvements in transferring digital instructions to the physical world to bring a new value in the organisational value-chain and management across the product lifecycle (Baur & Wee 2015; Kagermann 2013). There is a correlation between IR4 and the halal industry. Prior studies emphasised blockchain mitigates information asymmetry by introduces a new way of governing groups in a decentralised manner (Shermin 2017; O'Leary 2017). IR4 will disrupt the traditional governance structures by reducing the transaction costs and agency problem of moral hazard (Ayob et al. 2021; Tapscott & Tapscott 2016; Shermin 2017). Besides that, some researchers explained that IR4 decentralises the corporate governance structure, and the disclosed information would have high transparency, is traceable, and is tamper-proof (Ayob et al. 2021; Yu et al. 2018). Therefore, HDC declared they would invest in IR4 technology that helps to address the challenges mentioned earlier (information asymmetry), and realized the objectives of increasing the quantities of halal industries to transforming them into digitalization

industries. The government hopes that by investing in IR4, the halal industry will understand it is a priority to gain business intelligence, information, and knowledge. The action of investing in technology to helps the halal industry is fulfills the Malaysia Digital Economy Blueprint. This 10-year road map aims to transform Malaysia into a digitally-driven, high-income nation and a regional leader in the digital economy.

As mentioned above, the Malaysian government is investing in IR4 to the digitised halal industry should mitigate the information asymmetry problem and improve them to meet the global demand markets. However, despite the effort of the Malaysian government, the adoption rate of IR4 is relatively slow. According to Penang Skills Development Centre (PSDC), only about 15 to 20 percent of SMEs, including the halal industry adopting IR4. FNM-Malaysian Institute of Economic Research Business Conditions (2016) revealed low awareness of IR4 among SMEs, including the halal industry. The Malaysian government announced that out of 5000 SMEs, including the halal industry, only 500 companies intend to adopt IR4. Prior studies proved that the main reason for the slow adoption of IR4 is the lack of perfect information and having different information on how the adoption of technologies could enhance the operation of the halal industry and benefit them in the long term (Rusly et al. 2020). The halal industry having the slow adoption of IR4 is related to information asymmetry. As explained by Rusly et al. (2020), SMEs lack perfect information and have different information on the adoption of IR4. Meanwhile, they are less intended to adopt technologies due to a lack of a digital mindset. Therefore, the slow adoption of IR4 indicates that the halal industry faces a hurdle to move towards digitalising their businesses. Hence, the objectives of increasing halal industries' quantities and transforming them into the digitalisation industry are hard to achieve.

The prior studies indicated that information asymmetry and their intention is the main reason to cause slow adoption of IR4 among the halal industry. According to Bergh et al. (2019), information asymmetry is classified into five concepts: private information, different information, hidden information, lack of perfect information, and informational impactedness. While research in the adoption of IR4 among the halal industry is gaining increased attention, however research gaps still exist. The lack of empirical studies on how information asymmetry exists in the halal industry caused the challenges mentioned earlier. This creates a research opportunity to fill in the research gaps on exploring how's the information asymmetry (the concepts of private information, different information, hidden information, lack of perfect information, and informational impactedness) exist in the halal industry and their intention of mitigating it by adopting IR4. Besides that, we intended to shade some of the Malaysian government concerns mentioned above, investigating the moderator role of adoption IR4 (perspectives towards

adoption IR4) in the relationship between information asymmetry and their intention of mitigating information asymmetry in the halal industry.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

INFORMATION ASYMMETRY AND THE INTENTION OF ADOPTING IR4 TO MITIGATING INFORMATION ASYMMETRY

Information asymmetry pertains to incongruence information between one party and another party in a relationship (Akerlof 1970). Bergh et al. (2019) defines a new conceptual framework of information asymmetry, which including the concepts of private information, different information, hidden information, lack of perfect information, and informational impactedness. We adopted bergh's conceptual framework to study the information asymmetry exist in the halal industry. Information asymmetry generally related with agency theory. Agency theory explains the relationship between principal and agent, which the principal has employed the agent to act on their behalf (Mahaney & Lederer 2003). However, the cooperating parties do not inevitably share the same interest (Eisenhardt 1989). Therefore, the agent tends to gain better information than the principal and this provides an opportunity for the information-rich party to engage with self-serving benefits (Schieg 2008). Hence, when one party gains more or better information than another within this, they will engage with self-serving interests or activities, this problem known as information asymmetry (Akerlof 1970). In accordance with agency theory, the halal industry will withhold discretionary intention and behaviors in the form of mitigating information asymmetry when they perceived information asymmetry is an opportunity to advantages them. On the contrary, if the halal industry treats information asymmetry as a severe issue (lack of involvement into the concept of private information, different information, hidden information, lack of perfect information and informational impactedness) in their organization, they will intend and engage in mitigating information asymmetry by adopting IR4. Thus, we hypothesized that:

H₁ The information asymmetry faced by the halal industry is positively related to the intention of mitigating information asymmetry.

PRIVATE INFORMATION AND THE INTENTION OF MITIGATING INFORMATION ASYMMETRY

Information asymmetry often conceptualized as a piece of information which top management treat it proprietary, be legally protected, and not to be claimed for reporting purpose (Bergh et al. 2019). Private information perceived as the information which top

managements need to withhold in accordance to follow the organizations standard of procedure and confidential issues. The private information creates an opportunity for the top management to have better performance than their competitors and secure their position. Simply put, the top management's intention of mitigating information asymmetry will be low if they perceived private information can achieve personal benefits. On the contrary, if the top management treat private information as a serious issue, then they will tend to have high intention of mitigating information asymmetry and will opt for sharing private information to their subordinate to improve corporate performance.

H_{1a} The concept of private information is positively related to the intention of mitigating information asymmetry.

DIFFERENT INFORMATION AND THE INTENTION OF MITIGATING INFORMATION ASYMMETRY

Information asymmetry can be perceived as a condition wherein different understanding regarding information within different people (Bergh et al. 2019). The top management tends to hide and provide different information for personal benefits or to realized organization's goals. The top management choose to share different information intentionally as they do not want the relevant, useful information helps their colleagues to get a promotion. Besides, some of the top management twist the facts to suit their own needs or often leave out pertinent information when communicating with their colleagues. Therefore, we know that the top management will involve themselves in sharing different information for competitive advantages. Thus, they will have a low intention on mitigating information asymmetry. However, being ethically became a critical core value to the top management in the organization, especially in the situation of most of the top management had higher education qualifications and good moral value. Hence, the ethical top managements are encouraged to share full information to the colleagues. Therefore, we could conclude that they have higher intention on mitigating information asymmetry.

H_{1b} The concept of different information is positively related to the intention of top management on mitigating information asymmetry.

HIDDEN INFORMATION AND THE INTENTION OF MITIGATING INFORMATION ASYMMETRY

Hidden information tends to exist in a horizontal and vertical organization, wherein this application often leads to pre- or post- opportunism (Bergh et al. 2019). The top managements intentionally hide the useful information for personal benefits with expecting something. For instance, the top management only willing to share useful

information with their colleagues when they able to get some rewards such as increment, bonus or promotion. Besides, some relationship-oriented or people-oriented leaders only willing to share useful information when they perceive sharing information will improve the sense of self-worth (Fullwood et al. 2013; Lin 2007). Therefore, we can conclude that hidden information generally leads the top management involve in the moral hazards, which also serve as signal of low intention on reducing information asymmetry (Vanhaberbeke et al. 2002). Thus, we have proposed hypothesis as below.

H_{1c} The concept of hidden information is positively related to the intention of mitigating information asymmetry.

LACK OF PERFECT INFORMATION AND THE INTENTION OF MITIGATING INFORMATION ASYMMETRY

The concept of lack of perfect information depicts how top management in a relationship navigate their lack of perfect information with another party (Bergh et al. 2019). Prior studies examined that the top management need more information and advice from colleagues to make a decision and perform their job well. However, some of the top management able to deal with imperfect or incomplete information to do decision making based on their experience (Van der Vegt et al. 2000; Lin & Lee 2004). Meanwhile, some of the team-oriented top management encourage the employees to share information and knowledge with colleagues and discuss with each other about work-related issues (Van der Vegt et al. 2000). Hence, it enables to make a better decision and achieve organization goals. Simply put, in the situation of lack of perfect information, the top management who put the priority on their organization will have the higher intention of mitigating information asymmetry. On the contrary, the self-oriented top management will have a low intention of mitigating information asymmetry for the purpose of fulfil their benefits.

H_{1d} The concept of lack of perfect information is positively related to the intention of mitigating information asymmetry.

INFORMATIONAL IMPACTEDNESS AND THE INTENTION OF MITIGATING INFORMATION ASYMMETRY

Informational Impactedness defines as a resolution to act when the top leadership in the organizations facing the problem of lack of perfect information. Prior studies demonstrated that some organizations would take advantages of superior data and hence forcing honest organizations to leave the market due to the problem of lack of perfect information (Williamson 1975). However, prior study argues that the issue of lack of perfect information will compel the top managements in the organization choose to an alliance with others in the

organization to gain the useful information (Balakrishnan & Koza 1993). Ultimately, recent studies show the organization will prefer to adopt technology to mitigate the problem of lack of perfect information. Thus, we can perceive the intention of the top management on mitigating information asymmetry from the response of the top management given when facing the problem of lack of perfect information. In conclusion, informational impactedness have a correlation with the intention of mitigating information asymmetry.

H_{1e} The concept of informational impactedness is positively related to the intention of mitigating information asymmetry.

THE MODERATOR ROLE OF INDUSTRY 4.0

There is no universally adopted definition of IR4 to date. IR4 perceived as a revolution of industries which is the development towards the fourth-stage of industrialization based on the uses of cyber-physical systems. Previous research has also demonstrated that adoption of IR4 decreases the adverse effects of work-related consequences including fraud and information asymmetry; further improves corporate performance and sustainable industrial (e.g., Yin & Kaynak 2015; Tonelli et al. 2016). The trend of IR4 had gained enormous attention from researchers. Although the concept of IR4 has been examined explicitly, to the best of our knowledge, there are lacked studies demonstrate that IR4 moderate the relationship between information asymmetry and work-related outcomes.

According to the Technology Acceptance Model (TAM), the factors of perceived usefulness, perceived ease of use, perceives system quality, perceived content quality, and perceived cost will influences the individual's intention to use a new technology (Davis 1989). Prior studies emphasize that perceived usefulness is perceived as "the degree to which a person believes that using a particular system would enhance their job performance" (Davis 1989). In contrast, perceived ease of use defines as "the degree to which a person believes that using a particular system would be free of effort" (Davis 1989). Besides that, perceived system quality refers as "the perception of the users about the technical performance of the system in the form information retrieval and delivery" (Teo et al. 2008; Chandra et al. 2015) meanwhile perceived content quality is defined as users' perception of quality of information (accurate, valid, and timely information) presented on a particular system (Teo et al. 2008; Chandra et al. 2015). Ultimately, perceived cost defines as "the unit cost which a consumer thinks they incurs by undertaking a particular system" (Neuburger 1971). This five factors serves as a useful general framework and is consistent with several investigations into the factors that influence the older adult's intention to use new technology (Braun 2013). Drawing on the TAM, IR4 contains some primary factors

which will affect an individual's intention to use modern technology and further reflect work-related outcomes. We argue that when organization player adopts IR4, they are more intent to mitigate information asymmetry problems to improve corporate performance. For instance, it can be improve by enable the open information transaction, decentralized governance and provide faithfulness of financial reporting (e.g. O'Leary 2017; O'Leary 2018; Reinsberg 2018).

In other words, the top management in the organization who adopted IR4 technology may perceive the information asymmetry problems are serious as an anomaly which reflects their intention of mitigating information asymmetry problems. Hence, the information asymmetry issues faced by the top management is more likely to influence the adoption of IR4. Furthermore, the adoption of IR4 will positively impact the intention of the top management of mitigating information asymmetry. In conclusion, IR4 moderate the linkage between information asymmetry faced by the halal industry and their intention of adopting IR4 to mitigating information asymmetry.

H₂ Industry 4.0 positively moderating the linkage between information asymmetry faced by the top management and their intention of mitigating this information asymmetry issue.

METHODOLOGY

This study focused on the top management of the halal industry Malaysia under the Halal Industry Development Corporation (HDC). The top management tends to involve themselves in managing information. For instance, the top management is the first person who receives information from the horizontal and vertical organization. Then, they will share the received information by sending it to subordinates. Besides, the information is important to them in the decision-making process. This study was conducted using cluster random sampling, which randomly choose the halal industries are Small and Medium Enterprises (SMEs) located in the Selangor state. The questionnaire, which was adapted from prior studies (e.g., Demirkasimoglu 2016; Singh 2019; Serenko & Bontis 2016; Fullwood et al. 2013; Lin 2007; Van der Vegt et al. 2000; Lin & Lee 2004; and Bergh et al. 2019) is divided into four sections, from Sections A to D. Section A consists of questions about demographic background, such as gender, age, ethic, education level, position, business model, sales turnover, and employment rate. Section B examines the issues of information asymmetry faced by the top management in the halal industry Malaysia. These issues are divided into several dimensions: private information, different information, hidden information, lack of perfect information and informational impactedness. Section C investigate the moderator effect of IR4. The

factors are including perceived usefulness, perceived ease of use, perceives system quality, perceived content quality, and perceived cost. Section D investigate the top management's intention of mitigating information asymmetry by adopting IR4. The questions in Section B and Section D were measured through 5-point Likert-type rating scale. A total of 100 questionnaire were distributed through walk in, approaching the secretary of the halal industry to make an appointment, or email the questionnaire to the top management of the halal industry. We distributed more than 200 questionnaires, but we only able to collect 100 respondents. This study used partial least squares (PLS) modeling using the Smart PLS 3.2.8 version (Ringle et al. 2005) as the statistical tool to examine the measurement and structural model. The data analysis and results will be discussed in the following section.

RESULTS

The sample consists of 100 respondents. When we investigate the demographic background of the respondents, almost all the respondents are manager (81%), and others are the director (19%). Only 7 percent of the respondents have master's degree, majority of the respondents have a bachelor's degree (45%) and remaining have diploma (34%) or other qualification certified (14%). Majority of the respondents work in the current position more than seven years (31%), following 1 to 3 years (30%), other respondents are work between 4 to 7 years (28%) and less than a year (11%). The respondents are all from SMEs Halal industry, including the manufacturing sector, and service and others sector. From the perspective of the manufacturing sector, 21 percent have the sales turnover between RM300,000 < RM15 mil and only 7 percent have the sales turnover between RM15 mil < RM50 mil; 17 percent of the respondents have the employment rate from 5 to < 75 and 11 percent of the respondents have the employment rate from 75 to < 200. From the perspective of the service and others sector, 60 percent have the sales turnover between RM300,000 < RM3 mil and only 12 percent have the sales turnover between RM3 mil < RM20 mil; 60 percent of the respondents have the employment rate from 5 to < 30 and 12 percent of the respondents have the employment rate From 30 to < 75. More than half of the respondents have more than one location (68%) and only have one location (32%). Almost 75 percent of the respondents doing online business and 25 percent of the respondents no doing online business. Finally, 56 percent of the respondents serving business to both consumer and business, 36 percent of the respondents serving business to consumer and 8 percent only serving to business.

The data of information asymmetry, adoption of IR4 and the intention of mitigating information asymmetry in the research questionnaire was collected using a single source. Thus, we first tested the issue of Common

TABLE 1. Full collinearity testing

PI	DI	HI	LPI	II	I
1.266	1.539	2.366	1.805	1.594	1.741

Note: PI= Private Information, DI= Different Information, HI= Hidden Information, LPI= Lack of Perfect Information, II= Informational Impactedness, I=Intention of Mitigating Information Asymmetry

Method Bias by following the suggestions of Kock and Lynn (2012), and Kock (2015) by testing the full collinearity. As shown in Table 1, in this method all the variables will be regressed against a common variable and if the $VIF \leq 3.3$ then there is no bias from the single source data. The analysis yielded VIF less than 3.3 thus single source bias is not a serious issue with our data.

We followed the suggestions of Anderson and Gerbing (1988) to test the model developed using a 2-step approach. We tested the measurement model to test validity and reliability of the instruments used following the guidelines of Hair et al. (2019) and Ramayah et al. (2018). For the measurement model we assessed the loadings, average variance extracted (AVE) and the composite reliability (CR). The values of loadings should be ≥ 0.5 , the AVE should be ≥ 0.5 and the CR should be ≥ 0.7 . As shown in Table 2 and Table 3, the AVEs are higher than 0.5 and the CRs are all higher than 0.708 (Hair et al. 2019). Then in step 2, we assessed the discriminant validity using the HTMT criterion suggested by Henseler et al. (2016) and updated by Franke and Sarstedt (2019). The HTMT values should be ≤ 0.85 according to the stricter criterion. As shown in Table 4, the values of HTMT were all lower than the stricter criterion of ≤ 0.85 as such we can conclude that the respondents understood that the constructs are distinct. Taken together both these validity test has shown that the measurement items are both valid and reliable.

INFORMATION ASYMMETRY AND THE INTENTION OF MITIGATING INFORMATION ASYMMETRY

We followed the suggestions of Hair et al. (2019) to reported the path coefficients, the standard errors, t-values and p-values for the structural model using a 5,000-sample re-sample bootstrapping procedure (Ramayah et al. 2018). Also based on the criticism of Hahn and Ang (2017) that p-values are not good criterion for testing the significance of hypothesis and suggested to use a combination of criterions such as p-values, confidence intervals and effect sizes.

Table 5 shows the summary of the criterions we have used to test the hypothesis developed. In this study, the direct hypotheses are developed between the constructs. Table 5 illustrated that the standardized estimates for H1 is positive relationship ($\beta = 0.594$, $p < 0.05$, t-value ≥ 1.645). Therefore, H₁ indicated the direct relationship between information asymmetry to the intention of mitigating information asymmetry by adopting technology, was supported. We tested the 5 information asymmetry concepts on the intention of mitigating

TABLE 2. Measurement model for the variable constructs

Constructs	Items	Loadings	CR	AVE
Private Information	P12	0.833	0.860	0.673
	P13	0.765		
	P14	0.861		
Different Information	DI8	0.891	0.965	0.799
	DI9	0.864		
	DI10	0.925		
	DI11	0.914		
	DI12	0.833		
	DI13	0.952		
	DI14	0.874		
Hidden Information	HI17	0.907	0.919	0.699
	HI18	0.902		
	HI19	0.913		
	HI21	0.789		
	HI22	0.633		
Lack of Perfect Information	LPI23	0.608	0.876	0.590
	LPI24	0.648		
	LPI25	0.881		
	LPI26	0.816		
	LPI27	0.848		
Informational Impactedness	II29	0.719	0.842	0.640
	II30	0.831		
	II31	0.845		
Intention	I1	0.770	0.885	0.526
	I2	0.758		
	I3	0.734		
	I4	0.735		
	I5	0.603		
	I6	0.646		
	I7	0.807		

Note: P1, P5, P6, P7, H15, H16, H20 and II28 were deleted due to low loadings.

information asymmetry, the R² was 0.885 which shows that all the 5 concepts explained 88.5% of the variance in the intention of mitigating information asymmetry. Private information ($\beta = 0.166$, $p < 0.05$, t-value ≥ 1.645), hidden information ($\beta = 0.389$, $p < 0.05$, t-value ≥ 1.645) and lack of perfect information ($\beta = 0.199$, $p < 0.05$, t-value ≥ 1.645) were positively related to intention of mitigating information asymmetry, thus H1a, H_{1c} and H_{1d} were supported. However, different information ($\beta = -0.037$, $p > 0.05$, t-value ≤ 1.645) and informational impactedness ($\beta = 0.117$, $p > 0.05$, t-values ≤ 1.645) were negatively related to intention of mitigating information asymmetry, thus H1b and H_{1e} were not supported.

Overall, the results appeared to partly support the conceptual model of information asymmetry suggested by Bergh et al. (2019) in agency theory. Information

TABLE 3. Measurement model for the moderator construct

Constructs	Items	Loadings	CR	AVE
Perceived Usefulness	PU1	0.902	0.980	0.829
	PU3	0.921		
	PU4	0.935		
	PU5	0.932		
	PU6	0.854		
	PU7	0.938		
	PU8	0.882		
	PU9	0.923		
	PU10	0.907		
	PU11	0.909		
	Perceived Ease of Use	PEU12		
PEU13		0.935		
PEU14		0.912		
PEU15		0.952		
PEU16		0.864		
PEU17		0.924		
Perceived System Quality	PSQ18	0.889	0.974	0.787
	PSQ19	0.893		
	PSQ20	0.730		
	PSQ21	0.903		
	PSQ22	0.932		
	PSQ23	0.921		
	PSQ24	0.937		
	PSQ25	0.928		
	PSQ26	0.867		
	PSQ27	0.855		
Perceived Content Quality	PCQ28	0.915	0.983	0.892
	PCQ29	0.927		
	PCQ30	0.969		
	PCQ31	0.969		
	PCQ32	0.970		
	PCQ33	0.970		
Perceived Cost	PC35	0.950	0.970	0.890
	PC36	0.918		
	PC37	0.955		
	PC38	0.949		

Note: PU2, PC39, PC40 and PC41 were deleted due to low loadings.

asymmetries (combination of the concepts of PI, DI, HI, LPI and II) have a positive relationship to the intention of using technology to mitigating information asymmetry. Accordingly, in the research, the top management tend to withhold private information as follow the organization standard of procedure and confidential issues. This result

supported the argument of prior studies which related the concept of information asymmetry as a condition wherein the top management have the authority to gain private information and holds the information for personal benefits (Bergh et al. 2019; Connelly et al. 2011; Makadok 2011; Ecker et al. 2013). However, the result shows that top management has a high intention of mitigating private information. They thinks that the private information that follows the organization’s standard of the procedure is actually limited to the decision-making process and the development of the organizations. We can conclude that the stricter the standard of policy, the more serious the problem of private information in the organization. Hence, the top management will have a higher intention of mitigating it as they think that private information brings negative consequences to the organization. This result shows that the current top management prefers to share private information within the organization as they think it can improve the subordinate’s sense of self-importance. It hence enhanced the loyalty of the subordinates and mitigate the rate of information asymmetry happened in the organization. Therefore, we suggest the organization should adopt disruptive technologies as it decentralized governance (Shermin 2017; O’Leary 2017; Cong & He 2018; Eling & Lehmann 2018).

On another hand, the results supported the conceptual model of information asymmetry as the top management of the halal industry involved in sharing information with expecting a return (Linz & Semykina 2012; Vanhaverbeke et al. 2002). Our results also supported those findings of top management will only share useful information if they perceived it is beneficial for them. Moreover, the results also show that the top management agree that sharing useful information will create strong bolds and bring positive vibes in the organization, hence improving the sense of self-worth as a motivation to work harder to improve the organization (Fullwood et al. 2013; Lin 2007). In a simple explanation, the top management encourage that we adopt the concept of hidden information to enable a new strategy to mitigate information asymmetry. It means the top management have a higher intention on mitigating information asymmetry. Therefore, we suggest the organization should implement a set of rewarding systems to encourage employees involve themselves in

TABLE 4. Discriminant validity

	1	2	3	4	5	6
Different Information						
Hidden Information	0.615					
Informational Impactedness	0.463	0.577				
Intention	0.292	0.586	0.486			
Lack of Perfect Information	0.303	0.586	0.787	0.521		
Private Information	0.141	0.468	0.244	0.379	0.298	

sharing information within the organization. Besides, we suggest the organization to adopt disruptive technologies such as industry 4.0 as it representational faithfulness of reporting (McCallig et al. 2019; Yu et al. 2019). Thus, it will mitigate the fraud in rewarding system.

Besides, the results proved that the issue of lack of perfect information is positively related to the intention of mitigating information asymmetry. The top management intend to mitigate the lack of perfect information issues in their organization as they prefer complete or perfect information to make a decision and help business growth. Therefore, we suggest that the organization should adopt disruptive technologies to improve the information system. For instance, adoption industry 4.0 enable higher information transparency. Besides, adoption industry 4.0 represent faithfulness of financial reporting and enable smart contracts (McCallig et al. 2019; Yu et al. 2019; Reinsberg 2019). Thus, it can fulfil the intention of top management on mitigating information asymmetry to have a perfect information for decision making.

Surprisingly, the two conceptual models of information asymmetry, which are different information and informational impactedness, are not significant related to the intention of mitigating information asymmetry. The results disagree the argument of Hambrick and Mason (1984) and Schimidt and Keil (2013) that the market participants tend to provide different information to all organizations in the market for the personal benefits. Being a part of the halal industry, the top management need to follow the regulations of the Syariah and Malaysia Halal institutions to running their business. It is unethical to share different information

according to the Syariah (Ismaeel & Blaim 2012). Thus, different information will not influenced the intention of mitigating information asymmetry in the halal industry. The last concept of information asymmetry, informational impactedness explains as a resolution to act when market participants were facing a lack of information. The results showed that halal industry prefers to use technology infrastructure to improve its business when facing information asymmetry. Therefore, the abovementioned discussion suggesting adoption of disruptive technologies to achieve their intention of mitigating information asymmetry. However, it is more relevant to a solution to mitigating information asymmetry instead of factor which will influence the intention of mitigating information asymmetry, thus informational impactedness is negatively relevant to the intention of mitigating information asymmetry.

MODERATING EFFECT OF ADOPTION INDUSTRY 4.0

Two-stage approach (Henseler & Chin 2010) was used to test the moderating effect of adoption IR4 on the relationship between information asymmetry and the intention of mitigating information asymmetry. A two-stage approach is advocated as a more appropriate method for determining whether a variable has a moderating effect on the relationship between two other variables when formative measures are involved in the model (Henseler & Chin 2010). In applying the first step analysis, the variable in data is categorized into three kinds of variables. Firstly, the variable in data, Intention on Mitigating Information Asymmetry -I (I1 to I7) as

TABLE 5. Hypothesis testing direct effects

Hypothesis		Std Beta	Std Error	T-values	P-values
H ₁	Information Asymmetry -> Intention	0.594	0.037	15.859	0.000
H _{1a}	Private Information -> Intention	0.166	0.096	1.739	0.041
H _{1b}	Different Information -> Intention	-0.037	0.107	0.344	0.365
H _{1c}	Hidden Information -> Intention	0.389	0.090	4.326	0.000
H _{1d}	Lack of Perfect Information -> Intention	0.199	0.094	2.120	0.017
H _{1e}	Informational Impactedness -> Intention	0.117	0.115	1.014	0.155

Note: We use 95% confidence interval with a bootstrapping of 5,000.

TABLE 6. Hypothesis testing indirect effects

Hypothesis		Std Beta	Std Error	T-values	P-values
H ₂	Information Asymmetry*Adoption IR4 -> Intention	0.054	0.025	2.153	0.016

Note: We use 95% confidence interval with a bootstrapping of 5,000

TABLE 7. Effect size results

	Included	Excluded	F-squared	Effect Size
R-squared	0.936	0.353	9.1094	Large

reflective exogenous variables. Secondly, information asymmetry (Combination of the variables of (PI, DI, HI, LPI and II) will be endogenous variables, which also known as formative measurement. Lastly, Adoption IR4 (PU1 to PC38) will play a significant role in a moderator variable, which also known as reflective measurement.

In the second step, R^2 and F^2 values play a significant role to present the moderator effect (Ramayah et al. 2018; Kenny 2016). In the case of where a positive moderator effect is present, a technique which known as effect size result was applied to show the moderator's outcome in the relationship between the predictors and criterion variable. Therefore, this research will follow ramayah et al. (2018) 's suggestions to analyse the R^2 changes to test the interaction effect and follow the interpretation of the F^2 by following the guidelines of Kenny (2016).

Table 6 present the bootstrapping results of the moderating effect of adoption IR4 on the relationship between information asymmetry and the intention of mitigating information asymmetry. The results show a statically positive on the moderating effect of adoption IR4 on the relationship between information asymmetry and the intention of mitigating information asymmetry ($\beta = 0.054$, $p < 0.05$, $t\text{-value} \geq 1.645$). Thus, H_2 were supported.

The positively moderating effect of adoption IR4 on the relationship between information asymmetry and the intention of mitigating information asymmetry was also further analysis by using the calculation of effect size results. Table 7 show the previous R^2 change for the primary effect model is 0.353, and now in the interaction effect model, the R^2 is 0.936. The R^2 change of 0.583 indicated that with the addition of one interaction term, the R^2 had increased by about 58.3% (additional variance). Based on the effect size result, the F^2 of 9.1094 marks indicated a large effect size, as Kenny suggested (2016). Thus, hypothesis 2 were also supported.

This research revealed that adoption IR4 moderates the relationship between the information asymmetry issues faced by the top management and their intention of mitigate information asymmetry. Implicitly, the findings suggested that the top managements of the halal industry will be intended to alleviate the problem of information asymmetry in their organization as they perceived adoption IR4 is usefulness, easy to use, affordable cost, provide high system quality and content quality. Indeed, the effect size results, which has been explained earlier suggested that the adoption IR4 leading to the higher intention of managers or directors on mitigating information asymmetry. In a more general perspective, there is evidence that adoption IR4 can mitigate the problem of information asymmetry as the enabling technologies of IR4 open information transactions, decentralized governance, representational faithfulness of financial reporting, enable smart contracts and enhance market competitiveness and social welfare (e.g., O'Leary 2017; O'Leary 2018; Reinsberg 2018). Specifically, the findings are consistent with technology

acceptance theory which views that market players will accept and adopt a new technology (e.g., IR4) when the factors of perceived usefulness, perceived ease of use, perceived system quality, perceived content quality, and perceived cost can provide benefits to the market players (Davis 1989; Braun 2013). On the other hand, the enabling technologies of IR4 such as blockchain, cyber-physical system, internet of things and cloud computing evolve the corporate governance especially from the aspect of information sharing (e.g., Xu et al. 2018; Viryasitavat et al. 2018). It will increase the top management of the halal industry's intention of mitigate information asymmetry indirect relationships or non-direct relationships. Therefore, IR4 positively moderates the relationship between the information asymmetry issue and the top management's intention of mitigate information asymmetry.

MANAGERIAL IMPLICATION

This study contributed to the knowledge by adopting the TAM into the perspective of agency theory to build a theoretical framework to understand the mechanism by which the information asymmetry issue influences the halal participant(s)' intention of mitigating information asymmetry by adopting IR4. There is still a lack of emperical studies about the correlation of IR4 and information asymmetry. The study of information asymmetry and IR are dealt seperately. For instance, some earlier studies investigated information aysmmetry towards corporate governance (e.g. Connelly et al. 2011; Ishak et al., 2013). In construct, other studies mainly focused on introducing IR4, research and development of IR4 (e.g. Zhou et al. 2015; Ghobakhloo 2018; Muktadir et al. 2018). Therefore, this study provided a model that links the theory related to technology into management studies. Lastly, this study expected to assist the government to perspectives of halal industry towards adoption IR4 and transforming them into the digitalisation industry in order to achieve the Malaysia Digital Economy Blueprint.

CONCLUSION

This study fulfils all the objectives that were set out in the previous chapter. Results show that the information asymmetry issues faced by the top management in the halal industry Malaysia influence the intention of mitigating information asymmetry. We hereby suggested that the adoption of disruptive technologies enable to mitigate information asymmetry effectively. As abovementioned, the disruptive technologies such as industry 4.0 enable informational transparency, represent faithfulness of reporting and decentralized governance. Thus, it will mitigating information asymmetry effectively. This result supported the second research

objective, which the adoption of industry 4.0 moderate the relationship between information asymmetry and the intention of mitigating information asymmetry. Last but not least, the findings suggested that the top management of the halal industry will be intended to reduce the problem of information asymmetry in their organisation as they perceived adoption IR4 is usefulness, easy to use, affordable cost, provide high system quality and content quality.

ACKNOWLEDGEMENT

The researchers would like to thank Universiti Kebangsaan Malaysia and Yayasan Tun Ismail for grant code EP-2020-007 and EP-2020-077

REFERENCES

- Ali, M.H., Tan, K.H., Makhbul, Z.M. & Ngah, A.H. 2016. Augmenting halal food integrity through supply chain integration. *Jurnal Pengurusan* 48: 21-31.
- Akerlof, G.A. 1970. The market for "lemons": Quality uncertainty and the market mechanism. 84Q. *J. ECON* 488: 489-90.
- Ayob, A.H., Shahiri, H.I. & Yaacob, M.H. 2016. Kesan program promosi terhadap aktiviti eksport syarikat kecil dan sederhana di Malaysia: Satu pendekatan ekonometrik. *Jurnal Pengurusan (UKM Journal of Management)* 46: 3-12.
- Ayob, A.H. & Dana, L.P. 2017. Product strategies for export ventures: An empirical investigation among SMEs in an emerging economy. *Jurnal Pengurusan (UKM Journal of Management)* 50: 25-33.
- Ayob, A.H., Musadek, B.F.M. & Hussain, W.M.H.W. 2021. Measuring the effectiveness of e-government in Malaysia: Does information literacy matter? *International Journal of Sustainable Society* 13(1): 1-15.
- Balakrishnan, S. & Koza, M.P. 1993. Information asymmetry, adverse selection and joint-ventures: Theory and evidence. *Journal of Economic Behavior & Organization* 20(1): 99-117.
- Baur, C. & Wee, D. 2015. Manufacturing's next act. Available at http://www.mckinsey.com/insights/manufacturing/manufacturings_next_act
- Bergh, D.D., Ketchen Jr, D.J., Orlandi, I., Heugens, P.P. & Boyd, B.K. 2019. Information asymmetry in management research: Past accomplishments and future opportunities. *Journal of Management* 45(1): 122-158.
- Braun, M.T. 2013. Obstacles to social networking website use among older adults. *Computers in Human Behavior* 29(3): 673-680.
- Chandra, P. 2015. The influence of perceived system quality and perceived information quality towards continuance intention of tax e-filing system in Malaysia. *Journal of Technology and Operations Management* 10(2): 52-63.
- Cong, L.W. & He, Z. 2019. Blockchain disruption and smart contracts. *Review of Financial Studies* 32(5): 1754-1797.
- Connelly, B.L., Certo, S.T., Ireland, R.D. & Reutzel, C.R. 2011. Signaling theory: A review and assessment. *Journal of Management* 37(1): 39-67.
- Davis, F.D., Bagozzi, R.P. & Warshaw, P.R. 1989. User acceptance of computertechnology: A comparison of two theoretical models. *Management Science* 35(8): 982-1003.
- Demirkasimoglu, N. 2016. Knowledge hiding in academia: Is personality a key factor? *International Journal of Higher Education* 5(1): 128-140.
- Ecker, B., van Triest, S. & Williams, C. 2013. Management control and the decentralization of R&D. *Journal of Management* 39(4): 906-927.
- Eisenhardt, K.M. 1989. Agency theory: An assessment and review. *Academy of Management Review* 14(1): 57-74.
- Eling, M. & Lehmann, M. 2018. The impact of digitalization on the insurance value chain and the insurability of risks. *The Geneva Papers on Risk and Insurance-Issues and Practice* 43(3): 359-396.
- Franke, G. & Sarstedt, M. 2019. Heuristics versus statistics in discriminant validity testing: a comparison of four procedures. Internet Research.
- Fullwood, R., Rowley, J. & Delbridge, R. 2013. Knowledge sharing amongst academics in UK universities. *Journal of Knowledge Management* 17(1): 123-136.
- Gomez-Mejia, L.R. & Balkin, D.B. 1992. Determinants of faculty pay: An agency theory perspective. *Academy of Management Journal* 35(5): 921-955.
- Hagedoorn, J. 2006. Understanding the cross-level embeddedness of interfirm partnership formation. *Academy of Management Review* 31(3): 670-680.
- Hair, J.F., Risher, J.J., Sarstedt, M. & Ringle, C.M. 2019. When to use and how to report the results of PLS-SEM. *European Business Review* 31(1): 2-24
- Hambrick, D.C. & Mason, P.A. 1984. Upper echelons: The organization as a reflection of its top managers. *Academy of Management Review* 9(2): 193-206.
- Healy, P.M. & Palepu, K.G. 2001. Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature. *Journal of Accounting and Economics* 31(1-3): 405-440.
- Henseler, J. & Chin, W. W. 2010. A comparison of approaches for the analysis of interaction effects between latent variables using partial least squares path modeling. *Structural Equation Modeling* 17(1): 82-109.
- Henseler, J., Hubona, G. & Ray, P.A. 2016. Using PLS path modeling in new technology research: Updated guidelines. *Industrial Management & Data Systems* 116 (1): 2-20.
- Kagermann, H., Helbig, J., Hellinger, A. & Wahlster, W. 2013. Recommendations for implementing the strategic initiative INDUSTRIE 4.0: Securing the future of German manufacturing industry; final report of the Industrie 4.0 Working Group. Forschungsunion.
- Kenny, D. A. 2016. Moderation.
- Kock, N. 2015. Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration (IJEC)* 11(4): 1-10.
- Kock, N. & Lynn, G. 2012. Lateral collinearity and misleading results in variance-based SEM: An illustration and recommendations. *Journal of the Association for Information Systems* 13(7):546-580.
- Lie, E. 2005. On the timing of CEO stock option awards. *Management Science* 51(5): 802-812.
- Lin, H.F. & Lee, G.G. 2004. Perceptions of senior managers toward knowledge-sharing behaviour. *Management Decision* 42: 108-125.
- Lin, H.F. 2007. Knowledge sharing and firm innovation capability: An empirical study. *International Journal of Manpower* 28(3/4): 315-332.
- Linz, S.J. & Semykina, A. 2012. What makes workers happy? Anticipated rewards and job satisfaction. *Industrial*

- Relations: *A Journal of Economy and Society* 51(4): 811-844.
- Mahaney, R.C. & Lederer, A.L. 2003. Information systems project management: An agency theory interpretation. *Journal of Systems and Software* 68(1): 1-9.
- Makadok, R. 2011. Invited editorial: The four theories of profit and their joint effects. *Journal of Management* 37(5): 1316-1334.
- McCallig, J., Robb, A. & Rohde, F. 2019. Establishing the representational faithfulness of financial accounting information using multiparty security, network analysis and a blockchain. *International Journal of Accounting Information Systems* 33: 47-58.
- Neuburger, H.L.I. 1971. Perceived costs. *Environment and Planning A* 3(4): 369-376.
- O'Leary, D.E. 2017. Configuring blockchain architectures for transaction information in blockchain consortiums: The case of accounting and supply chain systems. *Intelligent Systems in Accounting, Finance and Management* 24(4): 138-147.
- O'Leary, D. E. 2018. Open information enterprise transactions: business intelligence and wash and spoof transactions in blockchain and social commerce. *Intelligent Systems in Accounting, Finance and Management* 25(3): 148-158.
- Parker, D.W., Dressel, U., Chevers, D. & Zeppetella, L. 2018. Agency theory perspective on public-private-partnerships: International development project. *International Journal of Productivity and Performance Management* 67(2): 239-259.
- Ramayah, T., Cheah, J., Chuah, F., Ting, H. & Memon, M.A. 2018. *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using Smartpls 3.0*. Kuala Lumpur: Pearson.
- Reinsberg, B. 2019. Blockchain technology and the governance of foreign aid. *Journal of Institutional Economics* 15(3): 413-429.
- Ringle, C.M. 2005. SmartPLS 2.0 (M3). Available at <http://www.smartpls.de>.
- Rusly, F.H., Taliba, Y.Y.A., Abd Mutaliba, H. & Hussina, M.R.A. 2020. Developing a digital adaptation model for Malaysian Manufacturing SMEs. In *Proceedings of the 4th UUM International Qualitative Research Conference (QRC 2020)* (Vol. 1: 3).
- Sharif, M.F.H. & Ghani, M.Z.A. 2019. Halal viral issues in Malaysia. *Halal Journal* 3: 61-71.
- Schieg, M. 2008. Strategies for avoiding asymmetric information in construction project management. *Journal of Business Economics and Management* (1): 47-51.
- Schmidt, J. & Keil, T. 2013. What makes a resource valuable? Identifying the drivers of firm-idiosyncratic resource value. *Academy of Management Review* 38(2): 206-228.
- Serenko, A. & Bontis, N. 2016. Understanding counterproductive knowledge behavior: Antecedents and consequences of intra-organizational knowledge hiding. *Journal of Knowledge Management* 20(6): 1199-1224.
- Shermin, V. 2017. Disrupting governance with blockchains and smart contracts. *Strategic Change* 26(5): 499-509.
- Singh, S.K. 2019. Territoriality, task performance, and workplace deviance: Empirical evidence on role of knowledge hiding. *Journal of Business Research* 97: 10-19.
- Tapscott, D. & Tapscott, A. 2016. *Blockchain Revolution: How the Technology Behind Bitcoin is Changing Money, Business, and the World*. New York: Penguin.
- Teo, T.S.H., Srivastava, S.C. & Jiang, Li. 2008. Trust and electronic government success: An empirical study. *Journal of Management Information Systems* 25(3): 99-132.
- Tonelli, F., Demartini, M., Loleo, A. & Testa, C. 2016. A novel methodology for manufacturing firms value modeling and mapping to improve operational performance in the industry 4.0 era. *Procedia CIRP* 57: 122-127.
- Van Der Vegt, G., Emans, B. & Van De Vliert, E. 2000. Team members' affective responses to patterns of intragroup interdependence and job complexity. *Journal of Management* 26(4): 633-655.
- Vanhaverbeke, W., Duysters, G. & Noorderhaven, N. 2002. External technology sourcing through alliances or acquisitions: An analysis of the application-specific integrated circuits industry. *Organization Science* 13(6): 714-733.
- Viriyasitavat, W., Da Xu, L., Bi, Z. & Sapsomboon, A. 2018. Blockchain-based business process management (BPM) framework for service composition in industry 4.0. *Journal of Intelligent Manufacturing*: 1-12.
- Williamson, O.E. 1975. *Markets and Hierarchies*. New York, 2630.
- Xu, L.D., Xu, E.L. & Li, L. 2018. Industry 4.0: state of the art and future trends. *International Journal of Production Research* 56(8): 2941-2962.
- Yin, S. & Kaynak, O. 2015. Big data for modern industry: challenges and trends [point of view]. *Proceedings of the IEEE* 103(2): 143-146.
- Yu, T., Lin, Z. & Tang, Q. 2018. Blockchain: The introduction and its application in financial accounting. *Journal of Corporate Accounting & Finance* 29(4): 37-47.
- Zaheer, A. & Soda, G. 2009. Network evolution: The origins of structural holes. *Administrative Science Quarterly* 54(1): 1-31.
- Ng Suat Thing
Faculty Economics and Management
Universiti Kebangsaan Malaysia
43600 UKM Bangi, Selangor, MALAYSIA.
E-Mail: suatthing@gmail.com
- Mohd Hasimi Yaacob (corresponding author)
Center for Governance Resilience & Accountability Studies (GRACE)
Faculty Economics and Management
Universiti Kebangsaan Malaysia
43600 UKM Bangi, Selangor, MALAYSIA.
E-Mail: mhasimi@ukm.edu.my
- Norazlan Alias
Center for Governance Resilience & Accountability Studies (GRACE)
Faculty Economics and Management
Universiti Kebangsaan Malaysia
43600 UKM Bangi, Selangor, MALAYSIA.
E-Mail: norazlan@ukm.edu.my

APPENDIX A

Table 4.1 Research Questions of Information Asymmetry

No	Statement	References	Sources
Private Information			
1	I explain that I would like to tell him/her but was not supposed to do it	Demirkasimoglu, 2016	International Journal of Higher education
2	I explain that the information is confidential and only available to people on a particular project		
3	I tell him/her that my boss not let anyone share this knowledge		
4	I say that I would not answer his/her question		
5	I withholds helpful knowledge to my subordinate	Singh, 2019	Journal of Business Research
6	I hides innovative idea to my subordinate		
7	I does not transform personal knowledge into organizational knowledge		
Different Information			
8	I agree to help him/her but never really intend to	Demirkasimoglu, 2016	International Journal of Higher education
9	I agree to help him/her but instead give him/her information different from what h/she wanted		
10	I tell him/her that I would help him/her out later but stall as much as possible		
11	I offer him/her some other information instead of what he/she really wants		
12	I often communicate part of the whole story to my fellow colleagues	Serenko & Bontis, 2016	Journal of Knowledge Management
13	I often twist the facts to suit my needs when communicating with my fellow colleagues		
14	I often leave out pertinent information or facts when communicating with my fellow colleagues		
Hidden Information			
15	Sharing my knowledge with colleagues should be rewarded	Lin, 2007	International Journal of Manpower Management
16	I am less likely to be considered for interesting and prestigious projects if I engage in knowledge sharing	Fullwood, Rowley & Delbridge, 2013	Journal of Knowledge Management
17	My knowledge sharing would strengthen the ties between existing members and myself in the organization		
18	My knowledge sharing would get me well-acquainted with new members in the organization		
19	My knowledge sharing would enable me to associate more with other members in the organizational		
20	My knowledge sharing would not result in colleagues sharing their knowledge with me		
19	My knowledge sharing would create strong bonds with members who have common interests in the organization		
20	My knowledge sharing activities would not improve my sense of self-worth		
Lack of Perfect Information			
21	I need more information and advice from my colleagues to perform my job well	Van der Vegt et al., 2000	Journal of Management
22	From my past experiences, I can deal with minor imperfect information to make good decision.		
23	I need to collaborate with my colleagues to performance my job well		
24	I regularly have to communicate with colleagues about work-related issues		
25	My past experience has increases my confidence in my ability to make decisions encouraging employees to share knowledge with colleagues	Lin & Lee, 2004	Management Decision
Informational Impactedness			
	When you facing the problem of lack of information, you will behave :		
26	Left the market / discontinued the business or proposal business	Bergh et al., 2019	Journal of Management
27	Form allies		
28	Go for training		
29	Use technology infrastructure		

Table 4.2 Research Questions of Adoption IR4

No.	Statement	References	Sources
Perceived Usefulness			
1	Adoption of Industry 4.0 in my job would enable me to accomplish tasks more quickly	Calisir, Gumussoy, Bayraktaroglu & Karaali, 2014; Park&Kim, 2014	Human Factors and Ergonomics in Manufacturing & Service Industries; Telematics and Indormatics
2	Adoption of Industry 4.0 would improve my job performance		
3	Adoption of Industry 4.0 in my job would increase my productivity		
4	Adoption of Industry 4.0 would enhance my effectiveness on the job		
5	Adoption of Industry 4.0 would make it easier to do my job	Ahn, Ryu & Han, 2007	Information & Management
6	I would find the that industry 4.0 useful in my job		
7	Adoption of Industry 4.0 help me to get better decision		
8	Adoption of Industry 4.0 saves me money		
9	Adoption of Industry 4.0 improve my task quality		
10	Adoption of Industry 4.0 advances my competitiveness		
Perceived Ease of Use			
12	Learning to operate Industry 4.0 system would be easy for me	Calisir, Gumussoy, Bayraktaroglu & Karaali, 2014	Human Factors and Ergonomics in Manufacturing & Service Industries
13	I would find it easy to get the Industry 4.0 system to do what I want it to do		
14	My interaction with the Industry 4.0 system would be clear and understandable		
15	I would find the Industry 4.0 system to be flexible to interact with		
16	It would be easy for me to become skilful at using the Industry 4.0 system		
17	I would find the Industry 4.0 system easy / effortless to use		
Perceived System Quality			
18	I think that adoption of Industry 4.0 will provide very reliable service	Calisir, Gumussoy, Bayraktaroglu & Karaali, 2014	Human Factors and Ergonomics in Manufacturing & Service Industries
19	I think that the speed of Industry 4.0 system will be fast		
20	I think that Industry 4.0 system is secure to use		
21	Has easy navigation to information	Ahn, Ryu & Han, 2007	Information & Management
22	Has fast response and transaction processing		
23	I think that Industry 4.0 system will keep personal information secure from exposure		
24	Adoption of Industry 4.0 make me can use when I want to use		
25	I think that industry 4.0 system has good functionality relevant to site type		
26	I think that Industry 4.0 keeps error-free transactions		
27	I think that Industry 4.0 system creates an audio-visual experience		
Perceived Content Quality			
28	Industry 4.0 system has sufficient contents where I expect to find information	Ahn, Ryu & Han, 2007	Information & Management
29	Industry 4.0 system provides complete information		
30	Industry 4.0 system provides site-specific information		
31	Industry 4.0 system provides accurate information		
32	Industry 4.0 system provides timely information		
33	Industry 4.0 system provides reliable information		
34	Industry 4.0 system communicates information in an appropriate format		
Perceived Cost			
35	Reduction of the operating costs of my organization by adopt Industry 4.0	P. Gupta et al., 2013	International Journal of information Management
36	Adopt Industry 4.0 instead of buying and deploying physical machines and software		
37	Elimination of hiring expensive IT expertise in-house		
38	Improvement of the scalability of IT infrastructure	Park et al., 2017	IEEE Internet of Things Journal
39	Adopt Industry 4.0 in organization is expensive overall		
40	Installing and operating Industry 4.0 in organization are a burden to me		
41	There is a financial barrier to maintaining and repairing industry 4.0 system		

APPENDIX B



FAKULTI EKONOMI DAN PENGURUSAN
(FACULTY OF ECONOMIC AND MANAGEMENT)
UNIVERSITI KEBANGSAAN MALAYSIA
BANGI, SELANGOR DARUL EHSAN

QUESTIONNAIRE SURVEY**Dear Sir / Madam**

My name is Ng Suat Thing, and I am a Master student in the Faculty of Economic and Management in the Universiti Kebangsaan Malaysia (UKM). This questionnaire is a part of study on the relationship between adoption of industry 4.0 towards information asymmetry and intention of manager and director in Halal industry in Malaysia. Information asymmetry defined as one party gain more or better information than another party in a relationship.

The researcher requests your kindness and generosity to answer all the questions in the questionnaire. Your answer is very important to the purpose of the research and the results will remain **absolutely confidential and anonymous**. I assure you that your answers will be treated strictly confidential and will be used for the purpose of the scientific research.

Thank you for your cooperation.
Respectfully yours,

The Researcher:
Ng Suat Thing P98817
Postgraduate Student

The Supervisor committees:
Dr. Mohd Hasimi Yaacob and Assoc Prof. Dr Norazlan Alias
Centre for Governance Resilience and Accountability (GRACE),
Faculty of Economics and Management, UKM

Section One: Demographic Profile

The following statements relate to the information concerning about yourself.

1. **Gender :**
 Male Female

2. **Age :**
 29 or below 30 – 45 46 – 60 61 and above

3. **Ethic :**
 Malay Chinese Indian
 Other(Please specify) : _____

4. **Marital Status:**
 Married Single Divorced Widowed

5. **Highest Academic Qualification**
 Doctoral Degree Master Degree Bachelor Degree Diploma
 Other (Please specify) : _____

6. **Current position**
 Manager Director Other (Please specify): _____

7. **Years with current position**
 Less than a year 1 – 3 years 4 – 7 years More than 7 years

8. **What is your sales turnover?**
 Manufacturing :
 less than RM300,000 RM300,000< RM15 mil RM15 mil < RM50 mil
 Services and other sectors:
 less than RM300,000 RM300,000< RM3 mil RM3 mil < RM20 mil

9. **How many people are employed at your company?**
 Manufacturing:
 less than 5 From 5 to < 75 From 75 to <200
 Services and other sectors:
 less than 5 From 5 to < 30 From 30 to <75

10. **Does your company have more than one location?**
 Yes No

11. **Does your company do business online?**
 Yes No

12. **Does your company serve :**
 Consumers Business Both

Section Two: Information Asymmetry Orientation

In this section the survey describes information asymmetry orientation of you in the department / organization. Please tick (✓) for each item that reflect your responses.

Please note that : Information asymmetry defined as one party gain more or better information than another party in a relationship.

	1 - Strongly disagree	2- Disagree	3- Neutral	4- Agree	5- Strongly Agree
No.	Statement				
A. Private Information					
1	I explain that I would like to tell him/her but was not supposed to do it				
2	I explain that the information is confidential and only available to people on a particular project				
3	I tell him/her that my boss not let anyone share this knowledge				
4	I say that I would not answer his/her question				
5	I withholds helpful knowledge to my subordinate				
6	I hides innovative idea to my subordinate				
7	I does not transform personal knowledge into organizational knowledge				
B. Different Information					
8	I agree to help him/her but never really intend to				
9	I agree to help him/her but instead give him/her information different from what h/she wanted				
10	I tell him/her that I would help him/her out later but stall as much as possible				
11	I offer him/her some other information instead of what he/she really wants				
12	I often communicate part of the whole story to my fellow colleagues				
13	I often twist the facts to suit my needs when communicating with my fellow colleagues				
14	I often leave out pertinent information or facts when communicating with my fellow colleagues				
C. Hidden Information					
15	Sharing my knowledge with colleagues should be rewarded				
16	I am less likely to be considered for interesting and prestigious projects if I engage in knowledge sharing				
17	My knowledge sharing would strengthen the ties between existing members and myself in the organization				
18	My knowledge sharing would get me well-acquainted with new members in the organization				
19	My knowledge sharing would enable me to associate more with other members in the organizational				
20	My knowledge sharing would not result in colleagues sharing their knowledge with me				
19	My knowledge sharing would create strong bonds with members who have common interests in the organization				
20	My knowledge sharing activities would not improve my sense of self-worth				
D. Lack of Perfect Information					
21	I need more information and advice from my colleagues to perform my job well				
22	From my past experiences, I can deal with minor imperfect information to make good decision.				
23	I need to collaborate with my colleagues to performance my job well				
24	I regularly have to communicate with colleagues about work-related issues				
25	My past experience has increases my confidence in my ability to make decisions encouraging employees to share knowledge with colleagues				
E. Informational Impactedness					
When you facing the problem of lack of information, you will behave :					
26	Left the market / discontinued the business or proposal business				
27	Form allies				
28	Go for training				
29	Use technology infrastructure				

Section Three: Adoption Industry 4.0

There remain 4 major technologies applied within industry 4.0 :

(i) **Internet of Things (IoT):** This technology enables physical objects to communicate with each other and further to share information and to coordinate decisions.

(ii) **Cyber-Physical Systems (CPS):** CPS represents a smart production line which communicates within machinery, operators, materials, and manufactures progress. Production information will be monitored and transferred to another network node wherein computation, analysis, and decision making will be performed and provided feedback.

(iii) **Cloud computing:** The designs of cloud computing enable anyone to upload and share information with others. A large volume of data can be upload and storage to a cloud computing center, which expedites the process of manufacturing, production, and decision-making activities.

(iv) **Blockchain:** Blockchain is immutable, transparent and redefines trust, as it enables transparent, secure, trustworthy and swift public or private solutions. The applications of blockchain is not limited to the financial services, and it can be used for any types of digitized transfer of information, which develop trusted and autonomous relationship among different components of smart factories, suppliers, and even customers.

Please read each statement carefully and tick (✓) for each item that represent your answer. Five scales ranging from "strongly disagree" to "strongly agree" use to reflect your level of agreement.

		1 - Strongly disagree	2- Disagree	3- Neutral	4- Agree	5- Strongly Agree		
No.	Statement	1	2	3	4	5		
A. Perceived Usefulness								
1	Adoption of Industry 4.0 in my job would enable me to accomplish tasks more quickly							
2	Adoption of Industry 4.0 would improve my job performance							
3	Adoption of Industry 4.0 in my job would increase my productivity							
4	Adoption of Industry 4.0 would enhance my effectiveness on the job							
5	Adoption of Industry 4.0 would make it easier to do my job							
6	I would find the that industry 4.0 useful in my job							
7	Adoption of Industry 4.0 help me to get better decision							
8	Adoption of Industry 4.0 saves me money							
9	Adoption of Industry 4.0 improve my task quality							
10	Adoption of Industry 4.0 advances my competitiveness							
11	Adoption of Industry 4.0 improves the quality of business operation							

B. Perceived Ease of Use						
12	Learning to operate Industry 4.0 system would be easy for me					
13	I would find it easy to get the Industry 4.0 system to do what I want it to do					
14	My interaction with the Industry 4.0 system would be clear and understandable					
15	I would find the Industry 4.0 system to be flexible to interact with					
16	It would be easy for me to become skilful at using the Industry 4.0 system					
17	I would find the Industry 4.0 system easy / effortless to use					
C. Perceived System Quality						
18	I think that adoption of Industry 4.0 will provide very reliable service					
19	I think that the speed of Industry 4.0 system will be fast					
20	I think that Industry 4.0 system is secure to use					
21	Has easy navigation to information					
22	Has fast response and transaction processing					
23	I think that Industry 4.0 system will keep personal information secure from exposure					
24	Adoption of Industry 4.0 make me can use when I want to use					
25	I think that industry 4.0 system has good functionality relevant to site type					
26	I think that Industry 4.0 keeps error-free transactions					
27	I think that Industry 4.0 system creates an audio-visual experience					
D. Perceived Content Quality						
28	Industry 4.0 system has sufficient contents where I expect to find information					
29	Industry 4.0 system provides complete information					
30	Industry 4.0 system provides site-specific information					
31	Industry 4.0 system provides accurate information					
32	Industry 4.0 system provides timely information					
33	Industry 4.0 system provides reliable information					
34	Industry 4.0 system communicates information in an appropriate format					
E. Perceived Cost						
35	Reduction of the operating costs of my organization by adopt Industry 4.0					
36	Adopt Industry 4.0 instead of buying and deploying physical machines and software					
37	Elimination of hiring expensive IT expertise in-house					
38	Improvement of the scalability of IT infrastructure					
39	Adopt Industry 4.0 in organization is expensive overall					

40	Installing and operating Industry 4.0 in organization are a burden to me					
41	There is a financial barrier to maintaining and repairing industry 4.0 system					

Section Three: Intention of the Focal Actor

Please read each statement carefully and tick (✓) for each item that represent your answer. Five scales ranging from “strongly disagree” to “strongly agree” use to reflect your level of agreement.

		1	2	3	4	5
		1	2	3	4	5
	Intention of the Respondents and Perspective on Competitor’s Organization					
1	I have intention to adopt Industry 4.0 because it will reduce the information gaps in my company					
2	I have intention to adopt Industry 4.0 because it will reduce the information gaps between my company and competitor					
2	My need for the Industry 4.0 will constantly increase in the future to align with the initiative and regulation by the government					
3	Collaboration between my company and the competitor in the Industry 4.0 will yield mutual benefit to both party					
4	I plan to not adopt Industry 4.0 because its disadvantages more than advantages					
5	I know that my competitor will also adopt Industry 4.0 in accordance with the initiative and regulation by the government					
6	I know that my competitor will also not adopt Industry 4.0 because its disadvantages more than advantages					

THANK YOU FOR YOUR TIME AND COOPERATION