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TECHNOLOGY READINESS AND ACCEPTANCE OF INDONESIAN FOOD SUPPLY CHAIN

[1]Idqan Fahmi, [2]R Dikky Indrawan, [3]Fithriyyah Shalihati, [4]Raden Isma Anggraini & [5]Anggia Rifani

[1, 2, 3, 4, 5]School of Business, IPB University, Bogor, Indonesia

**Corresponding Author: ifahmi@apps.ipb.ac.id*

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ABSTRACT

The use of technology in various public sectors has an impact on the ease of carrying out operational activities, including in the food industry sector. Technology can be useful in various activities in the food industry, from the production process, distribution, to reaching consumers. It is hoped that the existence of technology will not only help in making the process better but can also improve and better-quality results. This research was conducted to determine the readiness of the food industry in Indonesia to accept the existence of technology itself. This research was carried out by distributing questionnaires to 32 respondents who were actors in the food industry. The results obtained are that currently food industry players know the existence and benefits of this technology for their business. Furthermore, using Sem-PLS analysis, the results obtained showed that the most influential variable was related to perceived ease of use. Therefore, a strategy is needed to encourage food industry players to want to use and understand this technology, so that later it can be used easily and beneficially for their business.

Keywords: food industry, operational, perceived, technology.

INTRODUCTION

The food industry represents one of the most critically important sectors of the economy. Food is a basic necessity for human life and requires specialized handling, preparation, and logistics to be safe for human consumption. As the current population increases, of course the amount of food needed also increases, with the hope of producing better quality commodities. Various factors can cause concerns about the quality produced, such as climate, drought and productivity. Apart from these natural factors, there are also other factors such as the involvement of various parties in the process which do not rule out the possibility that they can also influence the quality of the food product (Abideen et al., 2021). Effective management of food needs related to safety, availability, supply, good quality can influence economic and social progress in the food sector (this journal). technology exists to be able to have a positive influence on factors that influence food quality, including those related to human error (Dadi et al., 2021). Currently, various technologies are available to solve various problems in the food supply chain. However, there is still little research conducted to find out what factors can influence technology adoption to achieve food supply chain 4.0 (Ali and Aboelmaged, 2021). This lack of research is also related to the existence of obstacles from government policies, technological practices or lack of awareness and education which ultimately hinders a sustainable strategy process (Sharma et al., 2019).

Motivated by the sensitivity of food supply chains and the advent of Industry 4.0, this study will explore the potentials of technology in the food industry. Therefore, the purpose of this study is to understand the readiness of food industry in Indonesia towards the technology food supply chain management. This study also investigating the challenges faced by food industry in implementing the technology in supply chain.

LITERATURE REVIEW

The rapid advancement of technology has significantly influenced various sectors, including the food supply chain, by enabling more efficient, traceable, and responsive systems (Dadi et al., 2021). In developing countries like Indonesia, food industry actors are beginning to recognize the benefits of integrating digital technologies such as augmented reality and smart sensors in production, distribution, and customer engagement. However, the adoption rate remains low due to limited readiness and perceived complexity. As technological integration becomes critical for achieving food supply chain 4.0, understanding the factors that influence acceptance, and implementation is essential for formulating effective strategies (Ali & Aboelmaged, 2021).

The Technology Readiness Index (TRI) and Technology Acceptance Model (TAM) are widely used frameworks for assessing how individuals and organizations perceive and adopt new technologies. TRI focuses on user traits like optimism and innovativeness as positive drivers, and insecurity and discomfort as barriers to adoption (Parasuraman, 2000). Meanwhile, TAM evaluates perceived usefulness and perceived ease of use as predictors of behavioral intention. The combination of TRI and TAM into the TRAM model provides a more holistic perspective on technology adoption, particularly in consumer-oriented industries like food production (Parida et al., 2021). This integration helps identify not only external usability factors but also internal psychological readiness, which is crucial in the Indonesian context where digital transformation is still emerging.

Studies have highlighted that the perceived ease of use is a strong predictor of technology adoption in the food sector, particularly among small and medium-sized enterprises (SMEs), which often struggle

with technological literacy and access to resources (Sharma et al., 2019). Moreover, internal motivation, such as employees' belief in the productivity benefits of technology, plays a critical role in driving usage (Lee, 2009). However, challenges such as fear of data insecurity, insufficient technical knowledge, and lack of government support can dampen enthusiasm. Thus, fostering a culture of innovation, providing accessible training, and addressing privacy concerns are necessary steps to improve adoption rates.

Despite these challenges, the intention to use technology remains high among Indonesian food industry players, suggesting a latent readiness that can be nurtured through strategic interventions. Initiatives such as stakeholder collaboration, regulatory support, and targeted digital literacy programs could bridge the current performance gaps in optimism, innovativeness, and ease of use. Understanding these readiness factors, through frameworks like TRAM, allows stakeholders to develop inclusive, effective policies that accelerate the digital transformation of the food supply chain while aligning with broader sustainability and industrial goals (Ghozali & Latan, 2015).

While current literature offers valuable frameworks such as TRI, TAM, and TRAM for understanding technology adoption, research specifically focused on the food industry in developing countries like Indonesia remains limited. Most existing studies emphasize general adoption patterns, leaving a gap in understanding the contextual and cultural nuances that influence readiness and usage within local food supply chains. Furthermore, little attention has been given to how micro-enterprises and rural food producers perceive and overcome barriers related to digital transformation. Future research should explore longitudinal studies to track behavioral changes over time, investigate the role of government interventions in facilitating adoption, and integrate socio-economic factors into existing models to better capture the complexity of technology readiness in emerging markets.

RESEACRH OBJECTIVE AND RESEARCH METHOD

Research Objectives

The aims of this study are to identify the readiness of food industry in Indonesia and to investigate the challenges faced by food industry in implementing the technology in supply chain.

Objective 1

To identify the readiness level of food industry in Indonesia – using Technology Readiness Index (TRI) and Technology Acceptance Model (TAM).

Objective 2

a. To estimate factors affecting the intention to use digital technology in the Indonesian Food Industry.
b. To determine challenges and priority strategies to improve the use of technology along the supply chain of Indonesia food industry – by comparing the size of impact with the current state of each variable. Highest priority will be emphasized on variable that has high impact but low performance level.

Research Method

This study is a mix between qualitative and quantitative study with three main phases: problem identification, data collection, and analysis & reporting. The respondents used in this study were 32 respondents who are practitioners in Indonesian food industry. Data collection was carried out by conducting and distributing 26 questions according to the number of indicators of variables used.

To answer the objective of this research, using Technology Readiness Index Model (TRI) (Parasuraman, 2000) and Technology Readiness and Acceptance Model (TRAM). The model and frameworks are seen in Figure 1 and Figure 2.

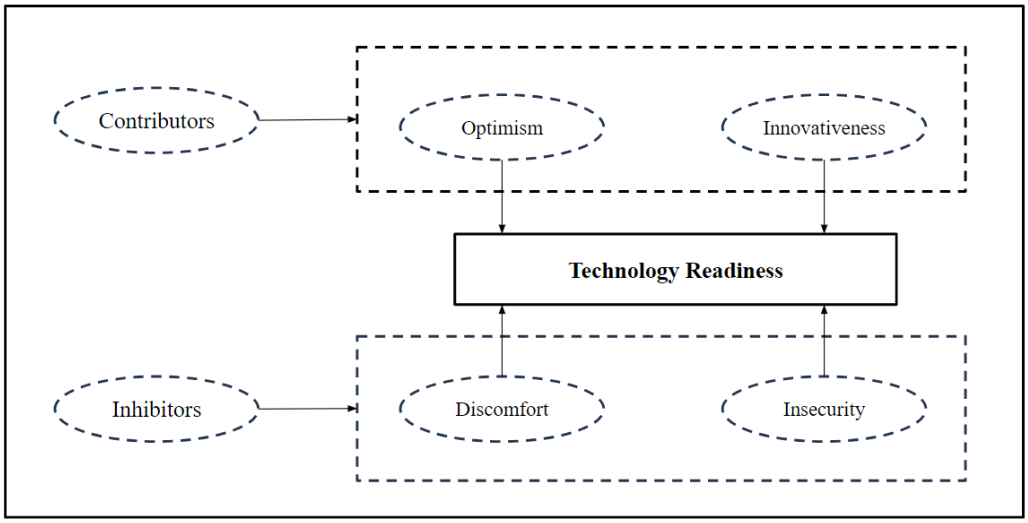

Figure 1
Technology Readiness Index Model (TRI)

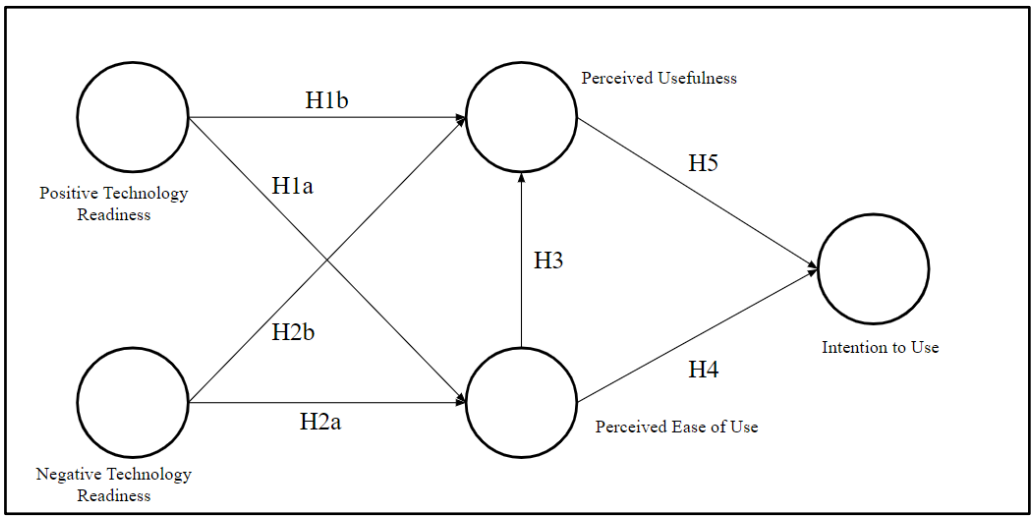

Figure 2
Technology Readiness and Acceptance Model (TRAM)

The hypotheses with TRAM are:

H1a: Positive Technology Readiness has a positive relationship with Perceived Ease of Use
H1b: Positive Technology Readiness has a positive relationship with Perceived Usefulness
H2a: Negative Technology Readiness has a positive relationship with Perceived Ease of Use
H2b: Negative Technology Readiness has a positive relationship with Perceived Usefulness
H3: Perceived Ease of use has a positive relationship with Perceived Usefulness
H4: Perceived Ease of Use has a positive relationship with Intention to Use
H5: Perceived Usefulness has a positive relationship with Intention to Use

Expected output of this research can be an initial standpoint for food industry in Indonesia to enhance their technological change by applying the technology digital in supply chain management.

Target Beneficiaries:

i. The finding will support both countries to further arrange strategy towards achieving the SDGs, highlight by the United Nation in 2015.
ii. Mainly with the goals number (9) industry, innovation, and infrastructure, and (11) sustainable cities and communities.

RESULT AND DISCUSSIONS

Objective 1: To identify the readiness level of food industry in Indonesia – using Technology Readiness Index (TRI)

Technology Readiness Index (TRI) could be used as a method for marketers to know consumer behaviour toward new technology, so that they can work effectively (Parasuraman, 2000). The integration of other approaches into TRI theory could also be found in the theory of planned behaviours (TPB) to understand the motivation of staff or customers in adopting new technology in their workplace (Lee, 2009).

In measuring current conditions, 5 variables with 26 indicators have been determined which have been adapted to the TRI and TRAM models, with calculation intervals 0.8 (scale 1-5):

- Very low: 1.0 - 1.8
- Low: > 1.8 - 2.6
- Moderate: > 2.6 - 3.4
- High: > 3.4 - 4.2
- Very high: > 4.2 - 5

Table 1
Value of indicator variables

	Variable	Mean Score	Level
A	Variable: Positive technology readiness - Optimism		
1	We think about using technology (example: AR technology)	3.59	High
2	We always choose to use the most up-to-date technology	2.94	Moderate
3	We find ourselves being more productive by using technology	3.72	High
4	We feel that using technology can help get work done without being limited by place and time	3.75	High
B	Variable: Positive technology readiness – Innovativeness		
5	We always strive to be at the forefront of implementing technology	2.59	Low
6	We can get the latest information about technological developments without the help of others	2.75	Moderate
7	We always follow the latest technological developments	3.13	Moderate
C	Variable: Negative technology readiness – Insecurity		
8	We do not feel safe providing information online	2.50	Low
9	We are not sure that the good/products are in accordance with the order	2.28	Low
10	We feel that the security system is not safe when conducting financial business transactions online	2.47	Low
11	We feel uncomfortable with paperless proof of transactions	1.94	Low
12	We are unsure whether the investment costs for the technology will be paid off	2.69	Moderate
D	Variable: negative technology readiness – discomfort		
13	We feel uncomfortable changing out transaction habits due to technology	2.00	Low
14	We are uncomfortable with the uncertainty and risk associated with using technology	2.78	Moderate
15	We are not comfortable with personal and company data circulating online	2.75	Moderate
E	Variable: perceived usefulness		
16	We feel that technology (example: AR technology) can improve the performance of the food supply chain as a whole	3.31	Moderate
17	We feel technology (example: AR technology) is able to increase consumer interest in buying products	3.41	High
18	We feel technology (example: AR technology) can increase consumer interest in buying products	3.56	High

19	We find the information provided through technology (example: AR technology) easier to understand	3.38	Moderate
F	Variable: perceived ease of use		
20	We find technology (example: AR technology) easy to use in everyday life	3.16	Moderate
21	We find technology (example: AR technology) easy to learn	3.34	Moderate
22	We find technology (example: AR technology) interactions easy to understand	3.28	Moderate
23	We found technology (example: AR technology) easy to operate	3.03	Moderate
24	We feel that technology (example: AR technology) does not require special equipment	3.06	Moderate
G	Variable: intention to use		
25	We predict that technology (example: AR technology) will be increasingly used in the food industry in the future	4.09	High
26	We will be leveraging technology (example: AR technology) a lot in the future	3.75	High

The current condition of each indicator on the existing variables is based on the results of questionnaires given to 32 respondents are:

- Optimism: Indicator 1,3, and 4 are already at high levels but indicator 2 is at moderate level
- Innovativeness: Indicator 5,6, and 7 are still not good because the are still in low and moderate levels
- Insecurity: Indicator 8 to 11 are still not good because the are still in low levels, likewise indicator 12 is at moderate level
- Discomfort: Indicator 14 and 15 are still not good because the are still in moderate levels, likewise indicator 13 is at low level
- Perceived Usefulness: Indicator 16 and 19 are still not good because the are still in moderate levels, but indicator 17 and 18 are good because the are in high levels
- Perceived Ease of Use: Indicator 20 to 24 are still not good because the are still in moderate levels
- Intention to Use: Indicator 25 and 26 are good because the are in high levels

Objective 2a: To estimate factors affecting the intention to use digital technology in the Indonesian Food Industry.

Some studies have combined technology readiness approach with popular theories such as theory of acceptance model (TAM) to elaborate the link between the acceptance and the readiness of technology adoption (TRAM). The integration of TAM and TRI becomes TRAM (Technology Readiness and Acceptance Model) have been used to augment TAM by considering the dimensions of technology readiness into the practical consumers adoption of innovation (Lin et al. 2006). To find out the factors affecting the intention to use, SEM PLS analysis was used using SmartPLS 4.

Validity Test

The validity test is carried out to see the value of each construct which must be greater than 0.60. The value of each construct that is more equal than 0.60 indicates that the indicators on each variable have an acceptable convergent validity value and certainly indicates that the indicator value is good (Ghozali and Latan 2015).

In Figure 3, it can be seen that four indicators, namely indicators B6, C8, D14, and F24 have a value below 0.60 so that the indicator is invalid and must be eliminated from the diagram model because it can affect the calculation results. after elimination and readjustment in the calculation of each indicator, only 19 valid indicators are obtained with additional elimination of indicators, namely C9, C11, and D15 which can be seen in Figure 4.

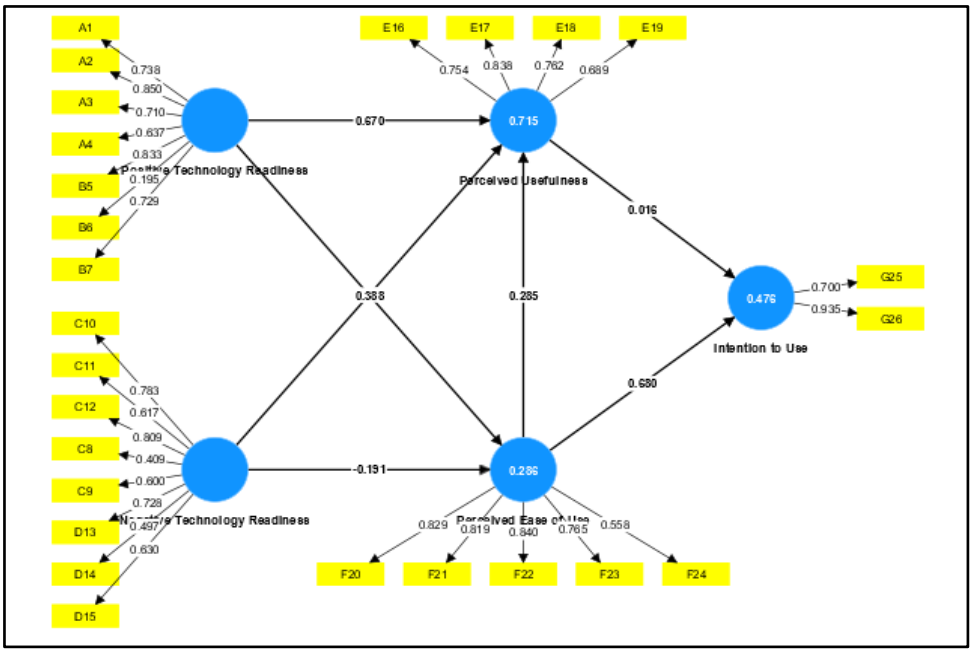

Figure 3
Preliminary Path Diagram

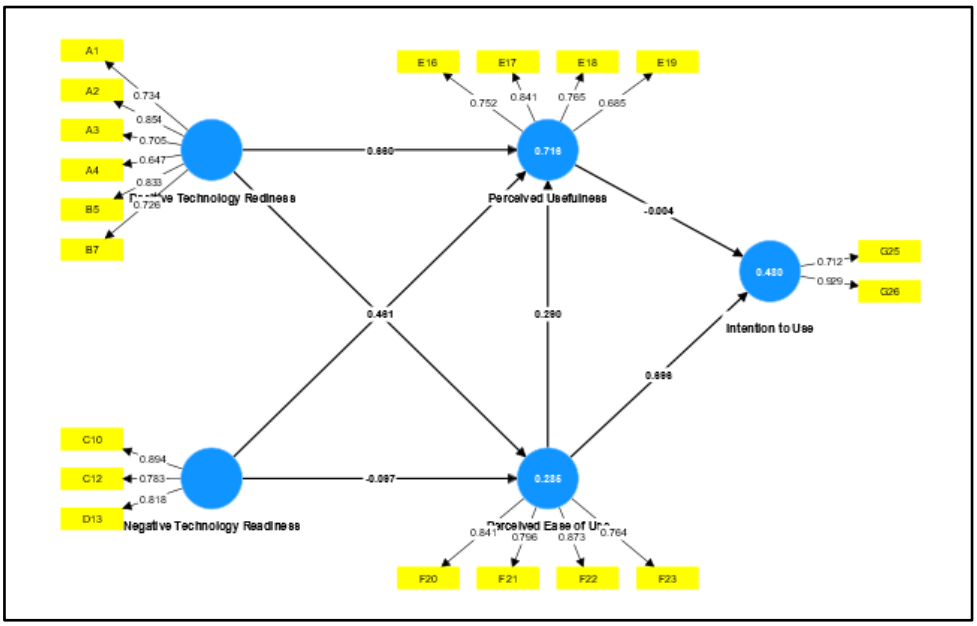

Figure 4
Final Path Diagram

Testing related to the validity value can also be done through the Average Variance Extracted (AVE) value apart from looking at the outer loading value. The AVE value is a value that shows whether each item used is unified or not, in the sense that this value has convergent validity or not with a value that is said to be good if the value is more than 0.5 (Aripradono, 2021). The AVE values can be seen in Table 2.

Table 2
Average Variance Extracted (AVE)

Variables	Average Variance Extracted (AVE) (> 0.5)
Positive technology readiness	0.685
Negative technology readiness	0,694
Perceived usefulness	0.672
Perceived ease of use	0.582
Intention to use	0.568

Based on the AVE value in Table 2, it can be seen that the AVE value of each variable is more than 0.5 so that it can be said that each indicator on each variable is unified or has convergent validity.

Reliability test

A latent variable can be said to be reliable if it has a composite reliability value of more than 0.7.

Table 3
Composite reliability

Variable	Composite reliability (> 0.7)
Positive technology readiness	0.729
Negative technology readiness	0,841
Perceived usefulness	0.854
Perceived ease of use	0.762
Intention to use	0.861

Table 3 shows that the composite value of all variables is more than 0.7 so it can be said that this research model has a good reliability value.

Inner model

R square is an analytical tool to determine how much proportion is given to the endogenous construct obtained from its predictor factors (Ghozali and Latan 2015). A study is considered successful if the r-square value is more than 0.20.

Table 4
R-square

Construct	R-square	R-square adjusted
Intention to use	0.480	0.445
Perceived ease of use	0.285	0.237
Perceived usefulness	0.716	0.686

Based on Table 4, the 2 variables used, namely Positive Technology Readiness and Negative Technology Readiness, managed to predict 48%. This shows that there are 52% explained by other variables outside the variables in this research model. As for the Perceived Ease of Use variable, it managed to predict 28.5%, which means that there are still around 71.5% explained by other variables outside this research model. Finally, the Perceived Usefulness variable managed to predict 71.6%, meaning that there are still around 28.4% that can be explained by other variables outside the variables in this research model, so that for further research, other variables can be added to further increase the predictive value of their influence.

The path coefficient value has the aim of seeing whether an endogenous construct has an influence or not, and seeing what direction the relationship has. The t-statistic or t-value is the value obtained from the bootstrapping results. Path coefficients must have a t-value greater than 1.96, with a t-table value that has a confidence level of 0.05 or 5%, which means significant.

Table 5
Path coefficients

Relationships	Path coefficients	T-statistics	P-values	Descriptions
Positive technology readiness → perceived usefulness	0.660	4.225	0.000	Significant
Positive technology readiness → perceived ease of use	0.461	2.361	0.018	Significant
Negative technology readiness → perceived ease of use	-0.097	0.455	0.649	Not significant
Negative technology readiness → perceived usefulness	0.006	0.035	0.972	Not significant
Perceived ease of use → perceived usefulness	0.290	2.475	0.013	Significant
Perceived ease of use → intention to use	0.696	5.247	< 0.001	Significant
Perceived usefulness → intention to use	-0.004	0.027	0.978	Not significant

In Table 5, it can be seen that there are 5 hypotheses in this study. Where hypotheses H2a, H2b, and H5 are rejected because the p-value is greater than 5%. Meanwhile, for other hypotheses, it is accepted because the value is smaller than 5%. Hypothesis with the high affecting the intention to use is perceived ease of use with path coefficient is 0.696, t-statistics is 5.247, and p-values is less than 0.001.

Objective 2b: To determine challenges and priority strategies to improve the use of technology along the supply chain of Indonesia food industry – by comparing the size of impact with the current state of each variable.

Determine challenges and priority strategies to improve the use of technology along the supply chain of Indonesian food industry – by comparing the size of impact with the current state of each variable. Highest priority will be emphasized on variable that has high impact but low condition.

In the previous section, related to the high affecting factor the intention to use, the highest perceived ease of use variable was obtained. Furthermore, based on these results, it is seen from each indicator that is in the perceived ease of use to determine the challenges and priorities of the strategy that must be carried out. The variable perceived ease of use is accepted in the H1b hypothesis which is related to positive technology readiness. So that indicators related to these two variables and indicators of intention to use will only be used to determine challenges and priorities of the strategy to be carried out. The indicators of the three variables with the results refer to objective 1 are:

Table 6
Value of indicator variables.

	Variable	Mean Score	Level
A	Variable: positive technology readiness - optimism		
1	We think about using technology (example: AR technology)	3.59	High
2	We always choose to use the most up-to-date technology	2.94	Moderate
3	We find ourselves being more productive by using technology	3.72	High
4	We feel that using technology can help get work done without being limited by place and time	3.75	High
B	Variable: positive technology readiness – innovativeness		
5	We always strive to be at the forefront of implementing technology	2.59	Low
7	We always follow the latest technological developments	3.13	Moderate
F	Variable: perceived ease of use		
20	We find technology (example: AR technology) easy to use in everyday life	3.16	Moderate
21	We find technology (example: AR technology) easy to learn	3.34	Moderate
22	We find technology (example: AR technology) interactions easy to understand	3.28	Moderate
23	We found technology (example: AR technology) easy to operate	3.03	Moderate
G	Variable: intention to use		
25	We predict that technology (example: AR technology) will be increasingly used in the food industry in the future	4.09	High
26	We will be leveraging technology (example: AR technology) a lot in the future	3.75	High
	Average	**3.36**	**Moderate**

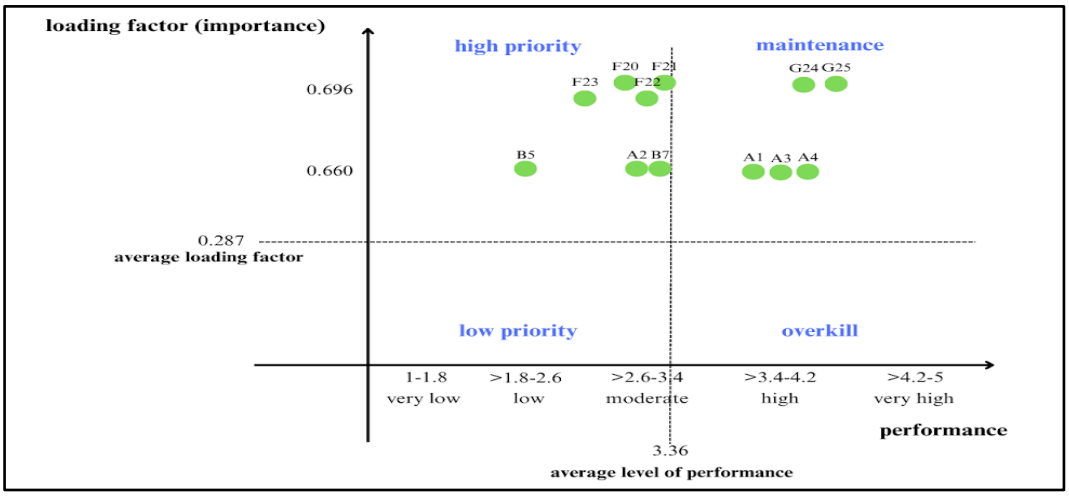

Figure 5
Importance performance analysis

The graph illustrates the condition of each indicator of the influential variables are positive technology readiness, perceived ease of use, and intention to use with the results:

- Indicators in the maintenance quadrant are indicators A1, A3, A4, G24, and G25 already have good performance with a high effecting the intention to use. So that good maintenance is needed so as not to reduce optimism and also interest in the use of technology in the food industry in Indonesia.
- Indicators that are in the high priority quadrant, namely indicators A2, B5, B7, F20, F21, F22, and F23, need greater attention and also strategies so that they can be improved in the future.
- Increase the willingness and confidence of food industry players to use the latest technology in their business. This is intended to make it easier to improve the quality of the products produced so that later they can compete in the market.
- B5 and B7 indicators are related to innovation, so there must be an encouragement for food industry players to innovate in their products, especially related to the use of technology so that it is always at the forefront and updated in its use. This will affect the market share of the products produced by the food industry actors.
- F20, F21, F22, and F23 indicators are concerned with understanding and ease of use of technology itself. Judging from the results that are still at a moderate level, it means that food industry players still feel that technology is not easy to use. In fact, on the other hand, this variable has the highest effecting on intention to use. So there needs to be a strategy to be able to provide encouragement to food industry players. To be able to understand and then use technology by conducting education that is more interesting, more intense, and easy to understand by food industry players.

CONCLUSION

Despite the potentials in increasing the competitiveness of the industry, the Indonesian food industry is at the very initial stage of using technology in general compared to other sectors or other countries. Therefore, there is a lot of gaps to catch for industry players, especially for those who are aiming to compete at the global level.

Technology readiness index also showed that at least 7 out of 17 indicators were either low or moderate or below the average. Food industry players did not always choose the best technology available, were not striving to be at the forefront of implementing technology and did not always follow the latest technology development. They also found technology in general was not easy to use, learn and operate.

Intention to use technology, however, is quite high in the Indonesian food industry. The biggest variable affecting the intention is the perceived ease of use. The perceived ease of use is affected by positive technology readiness either optimism or innovativeness. Therefore, the indicator variables in optimism and innovativeness, especially those considered low or moderate performance should be prioritized to be improved. Those variables were encouraging players to choose the best technology available, supporting them to strive at the forefront of implementing technology and facilitating them to update with the latest technology development.

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