The Influence of IT Infrastructure Capability, IT Business Spanning Capability, and IT Proactive Stance on Organizational Performance, mediated by Organizational Agility

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Abstract

The impact of Information Technology (IT) has been argued to have significant effect towards Business Performance. However, several literatures argued that such impact also depends on the company's agility to implement such Technology. This research aims to investigate the impact of IT Infrastructure Capability, IT Business Spanning Capability, and IT Proactive Stance towards Organizational Performance by considering the effect of Organizational Agility as Mediating Factor. Online questionnaires were developed and distributed to respondents from several coal mining companies in Indonesia. The analysis of PLS–SEM was performed to test the hypotheses due to significant deviations from normality assumptions being found in the data. Results indicated that IT Infrastructure Capability and Organizational Agility do influence Organizational Performance significantly. IT Infrastructure Capability was also found to have significant influence towards Organizational Agility, while IT Proactive Stance also provided similar results. The analysis of indirect effect showed that Organizational Agility only mediates the relationship between IT Proactive Stance towards Organizational Performance. The other two factors of IT Infrastructure Capability and IT Business Spanning Capability was found to be insignificant. It is arguable that the characteristic of the coal mining industry, which is the focus of this research might be contributed heavily on the findings.

Keywords
IT Infrastructure Capability, IT Business Spanning Capability, IT Proactive Stance, Organizational Agility, Organizational Performance.

1. Introduction
Experts estimate that the impact of the Covid-19 pandemic will not end in a matter of few years, consequently any hindrances derived from the pandemic will have to be dealt accordingly. What was bellowed a few years ago concerning D-VUCA-D (Disruption, Volatility, Uncertainty, Complexity, Ambiguity, Diversity) is undeniably felt today due to the Covid-19 pandemic. For this reason, everyone must strive to face whatever impediments amidst of a very significant decline in demand for manufactured, commodities and energy products, through the adaptation of new normal conditions. Various uncertainties in all interrelated aspects cannot be avoided, especially regarding to the coal mining industry. Thus, the best effort is to perpetually be prepared in facing any uncertainty, so that optimal company performance is achieved.

Company performance emphasizes the need for businesses to adapt quickly to new market conditions and react to the risk of sudden failure (Sambamurthy et al. 2003; Ravichandran 2018). Therefore, researchers have begun to explore the effects of resources and IT capabilities from its process agility and the implications towards firm performance (Tallon and Pinsonneault 2011; Chen et al. 2013). It has been suggested that IT-based responses to market changes require IT resources to be continuously and promptly updated (Weill et al. 2002; Vessey and Ward 2013). This, in

turn, spark discussion involving the types of capabilities required in managing an ever-expanding IT portfolio, where organizations are obliged to construct more specific IT capabilities (Leiblein et al. 2002; Rai and Tank 2010). Studies have shown various IT-related capabilities, including information management capabilities, IT infrastructure capabilities and planning capabilities, decisively produce performance benefits for companies (Rai and Tang 2010; Lu and Ramamurthy 2011). Numerous studies have also shown that organizational agility is a vital mechanism by which IT capability affects company's performance (Chen et al. 2013; Ravichandran 2018).

One capability that has been accepted as the core of an organization's ability to compete in a highly uncertain, competitive, or volatile environment is organizational agility. Organizational agility is highly essential for firms in a challenging environment, because it allows them to sense and respond to unexpected environmental changes (Teece et al. 2016). However, organizational agility is not innate in a firm, it must be learned and maintained. Recent research suggests that proper application of IT capabilities in an organization can contribute to the development of sophisticated levels of organizational agility (Chakravarty et al. 2013; Felipe et al. 2016; Felipe et al. 2019).

Interestingly, prior studies such as those conducted by DeGroote and Marx (2014) and Queiroz et al. (2017), expressed different conclusions of agility as a mediator on the relationship between IT and company performance. DeGroote and Marx (2014) stated that agility is not simply a mediator, but can also act as an independent variable, where IT has significant direct relationship to company performance. Meanwhile, Queiroz et al. (2017) identified that agility acts as a full mediator between IT and company performance, where IT does not have a direct relationship to company performance.

Several studies related to IT capability have also revealed inconsistent results. DeGroote and Marx (2014) for example, revealed that IT capability has a significant direct relationship to firm performance. On the other hand, Chen et al. (2013) identified that the relationship between IT capability and firm performance did not have a direct effect. The results from other studies that are less consistent are considerably interesting for in-depth research, particularly regarding the relationship between organizational agility and company performance, and how IT capability able to influence organizational capability, specifically in the context of the coal mining industry.

1.1 Objectives

Objectives of this research is to investigate the impact of IT Infrastructure Capability, IT Business Spanning Capability, and IT Proactive Stance towards Organizational Performance by considering the effect of Organizational Agility as Mediating Factor.

2. Literature Review

Organizational Performance

Organizational performance emphasizes the need for businesses to adapt quickly to new market conditions and react to the risk of sudden failure (Queiroz et al. 2017; Ravichandran 2018). Organizational performance measures companies' achievement and is generally divided into 2 aspects; financial and non-financial (Arokodare et al. 2019). In measuring organizational performance some researchers use financial features, while others opt for non-financial aspects. The existence of this differences will be one of the discussions in this study.

Numerous studies have practiced different parts of measurement related to company performance. Conceptually, Matchaba-Hove and Goliath (2007) defined organizational performance as an aspect of non-financial accomplishment, measuring innovativeness, pro-activeness, risk-taking, competitive, aggressiveness, and autonomy. Jahanshahi et al. (2012) stated that company performance is the result of operational performance (market share, new product introduction, product / service quality, marketing effectiveness, customer satisfaction), financial performance (profitability, growth, leverage-liquidity-cash). flow, efficiency) and market-based performance (return to shareholders, market value added, annual return), which are also financial and non-financial aspects.

Quieroz et al. (2017) supported Powell and Dent-Micallef (1997) found 5 items that can be seen as organizational performance, they are return on investment, market share, revenues, sales growth, and profitability compared to competitors. This again includes financial and non-financial aspects. Chung et al. (2019) and Lee and Choi (2003) use measurement of company performance through universal outputs such as market share, profitability, growth rate, innovativeness, successfulness, and the size of business compared to the main competitors. Lee and Choi (2003) measurement is also an assessment that includes financial and non-financial aspects.

Several previous literatures performed by Chen et al. (2013), DeGroote and Marx (2014), Quieroz et al. (2017), and Chung et al. (2019) involved several variables such as IT, agility, and performance. Many of those studies found inconsistencies regarding the relationship between IT towards performance. However, most of that research supported the argument that agility influence performance significantly.

Information Technology (IT) Capability

Sambamurthy and Zmud (1994), and Mao et al. (2014) defined IT Capability as an organization's ability to acquire, deploy, combine, and reconfigure IT resources to support and improve business strategies and work processes. Firms have long considered the development of Information Technology capability as a key approach to creating strategic value in gaining a sustainable competitive advantage (Bharadwaj 2000; Wade and Hulland 2004; Mao et al. 2014). Various studies about information systems have presented IT capability as an organizational capability that is fundamental for the realization of greater business value (Rai and Tang 2010; Fink 2011; Chen et al. 2013; Panda and Rath 2018). Felipe et al. (2019) conceptualized organizational agility as a higher order of organizational capabilities enabled by information system capability at organizational level to achieve sustainable performance through continuous sensing and the process of responding to environmental challenges. These studies show results that are somewhat different from other studies, particularly studies conducted by Chen et al. (2013). Chen et al. (2013) essentially suggested that the relationship between IT capability and organizational performance does not have a direct effect. While research by Queiroz et al. (2017) promoted organizational agility as a mediating factor that connects IT capability and organization performance. Panda and Rath (2018) in their recent research introduced a multidimensional framework of IT capability which is divided into three dimensions including IT capability as IT infrastructure capability, IT business spanning capability, and IT proactive stance.

IT Capability Multidimensional Framework

Weil et al. (2002), Lu and Ramamurthy (2011), and Mao et al. (2014) defined IT infrastructure capability as the ability to manage technical facilities (systems and network hardware), applications (platforms, databases, operating systems, and core software), and IT management services. Meanwhile, IT business spanning capability is described as the organization's ability to integrate IT, business processes, and strategies so that the organization has a clear vision regarding IT (Bharadwaj et al. 1999; Lu and Ramamurthy 2011; Wade and Hulland 2004; Mao et al. 2014). IT proactive stance is explained as the ability to proactively explore the latest IT innovations or exploit available IT resources in creating and using business opportunities as a competitive advantage. (Weill et al. (2002), Fichman (2004), Lu and Ramamurthy (2011), and Mao et al. (2014)).

Hence, founded by the above discussion, this study proposes to investigate in more detail the relationship between the three forms of IT capability and organizational performance by recommending research hypotheses as follows:

H1: IT infrastructure capability has a positive effect on organizational performance
H2: IT business spanning capability has a positive effect on organizational performance
H3: IT proactive stance has a positive effect on organizational performance

Organizational Agility

Presently, agility has captured the attention from academics and practitioners alike. According to a recent survey conducted by the Economist Intelligence Unit (Glenn 2009), 88% of executives identify agility as the key to global success. Agility gives companies the ability to improve business and swiftly processes business and effectively manage unpredictable external and internal changes (Van Oosterhout et al. 2006; Mao et al. 2014).

Felipe at al. (2019) conducted a study and concluded a positive indirect effect of information system (IS) capability on performance through organizational agility, while the direct relationship between IS capability and performance showed insignificant results. Several other studies conducted by Lu and Ramamurthy (2011), Mao et al. (2014), and Panda and Rath (2018) showed similar result, that there was a positive influence between IT capability on organizational agility. However, this study did not examine in detail the influence of each dimension of IT capability. For this reason, this study will explore further the following hypotheses:

H4: IT infrastructure capability has a positive effect on organizational agility
H5: IT business spanning capability has a positive effect on organizational agility
H6: IT proactive stance has a positive effect on organizational agility

As organizations adapt to a highly competitive environment, organizational agility, as the ability to sense environmental changes and respond quickly and appropriately (Overby et al. 2005), becomes increasingly imperative for the survival of the company (Sambamurthy et al. 2003). According to Maskhani and Khodadadi (2016), based on the theory agreed by Worley and Lawler (2010), there is a significant relationship between organizational agility and organizational performance. Chen et al. (2013) also supported the significant influence of process agility towards organizational performance.

DeGroote and Marx (2014) studied the impact of IT on agility and firm performance also confirmed that agility is a mechanism by which IT affects financial and operating performance. This finding has important implications for companies considering investing in IT. To optimize this investment, companies should focus on using IT to increase understanding and respond to the agility, as both have shown to directly improve company performance. Based on the arguments above, this study will investigate the following hypothesis:

H7: There is a positive influence on organizational agility with organizational performance

Conceptual model and hypotheses

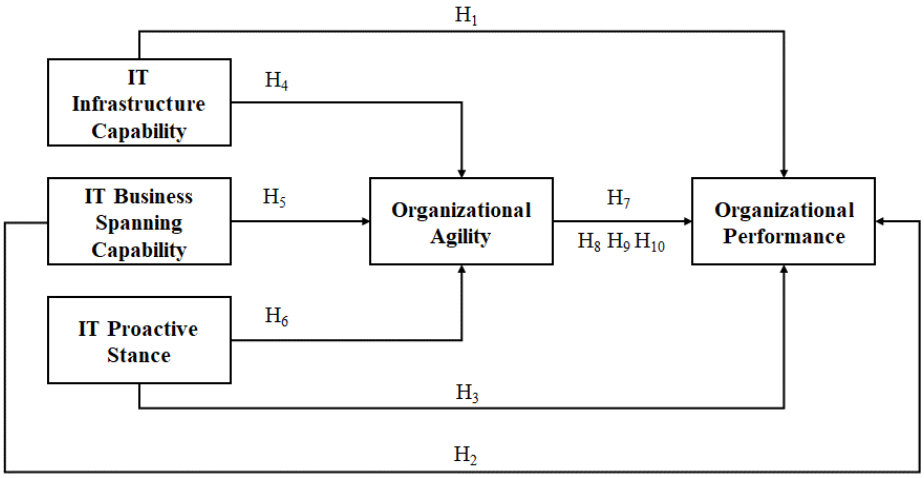

Figure 1. Research Model

The research model and hypotheses are shown in Figure 1. The core idea underlying this research model is that various IT-related capabilities, including information management capabilities, IT infrastructure capabilities and planning capabilities, generate performance benefits for the company (Rai and Tang 2010; Lu and Ramamurthy 2011).

Moreover, organizational agility is an imperative mechanism to complement IT capability in influencing company performance (Chen et al. 2013; Ravichandran 2018). Queiroz et al. (2017) have also established that organizational agility is a mediator between the positive effects of IT capability on organizational performance. In line with the previous hypotheses, this study will investigate in greater detail the role of organizational agility as a mediator of the relationship between each component of IT capability and organizational performance with the following propositions:

H8: Organizational agility mediates the relationship between IT infrastructure capability and organizational performance
H9: Organizational agility mediates the relationship between IT business spanning capability and organizational performance
H10: Organizational agility mediates the relationship between IT proactive stance and organizational performance

3. Methods

This study uses a quantitative approach with a cross sectional survey design, and a non-probability-sampling technique, called purposive sampling (taking samples from members of the population by determining certain criteria of the population) with the objective to test hypotheses. The subjects in this study are permanent employees of coal mining companies in Indonesia, who understand company performance and business developments in the coal mining industry. The research questionnaire has a screening question, included in the beginning, related to respondent's

understanding of the competitor's development. It is intended that only respondents who understand the development of competitors and the company's performance are the suitable data to be used in this study.

For this study 5 research variables are involved, they are organizational performance with references from Powell and Dent-Micallef (1997), Kim et al. (2011), Queiroz et al. (2017), and Chung et al. (2019), organizational agility with reference to Goldman et al. (1995), Tsourveloudis et al. (1999), Lu and Ramamurthy (2011), and Mao et al. (2014), IT capability consisting of IT infrastructure capability, IT business spanning capability and IT proactive stance with references from Weil et al. (2002), Lu and Ramamurthy (2011), and Mao et al. (2014).

4. Data Collection

The research scale was distributed online through google form to 342 respondents working for coal mining companies in Indonesia. From the distribution of the questionnaire, 202 questionnaires were completed and sent back to the researchers, however 20 questionnaires cannot be used because respondents did not understand the development of competitors in the screening question, and consequently only 182 respondent's data were qualified for further analysis. From the data of 182 respondent, the researchers conducted an outlier test and deemed 7 respondents to be outliers, consequently leaving 175 respondent data suitable for further processing.
Demographic distribution of 175 respondents in terms of gender are mostly men, 171 person (94%). In terms of positions respondents and working period with the company is show in Figure 2.

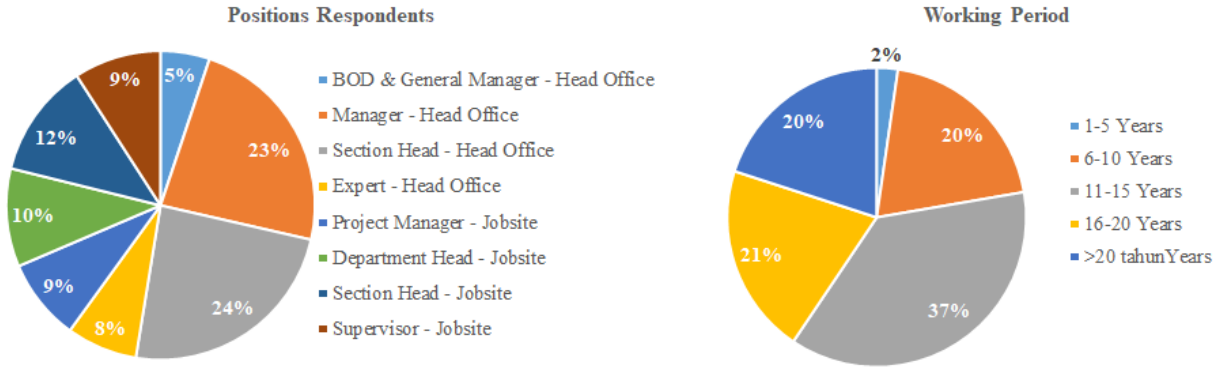

Figure 2. Characteristics of Respondents

5. Results and Discussion

5.1 Results

To evaluate the measurement model, the partial least squares method was employed because it maximizes the variance explained in the dependent variable and only requires a small sample size to obtain considerable statistical power (Chin 1998). Testing of the structural model in this study was carried out with the Structural Equation Modeling - Partial Least Square (SEM-PLS) version 3.0. SEM-PLS is suitable for a complex model analysis and can also be used for data that are not normally distributed (Fornell and Bookstein 1982; Hair et al. 2011; Ringle et al. 2015; Ringle and Sarstedt 2016). The use of bootstrapping technique in hypothesis testing is carried out when the data processed is less than 200 data, this is to assist the test statistical significance between variables.

Validity and reliability tests were carried out for all the data in this research. Factor loading and AVE (Average Variance Extracted) numbers are the parameters being observed when conducting the validity test. Also, the parameter observed while conducting the reliability test is the composite reliability value. In addition to these parameters, an assessment is also done to test discriminant validity, where the AVE value for each construct must be greater than the correlation between constructs. The limit of the factor loading value to meet the validity test criteria is 0.7, a value of 0.5 for the AVE and value of 0.7 for composite reliability (Henseler et al. 2016).

Table 1. AVE (Average Variance Extracted) dan Composite Reliability Result

Variable	AVE (Average Variance Extracted)	Composite Reliability
IT Infrastructure Capability	0.707	0.923
IT Business Spanning Capability	0.760	0.905

IT Proactive Stance	0.744	0.897
Organizational Agility	0.585	0.875
Organizational Performance	0.603	0.883

In Table 1, the AVE calculation also shows that all variables are valid with score > 0.5. The reliability test shows the composite reliability of all variables > 0.6, which means that all variables are reliable. The next process is the calculation of discriminant validity to ensure the validity of the variables and internal consistency in the variables, where the results show that the IT business spanning capability variable, IT infrastructure capability variable, IT proactive stance variable, organizational agility variable and organizational performance variable are valid with respective values of 0.872; 0.841; 0.862; 0.765; 0.776.

Table 2. Hypothesis Results (Direct Effects)

Hypothesis	Path	Path Coefficient	t-statistics	p-value	Conclusion
H1	IT Infrastructure Capability → Organizational Performance	0.238	2.239	0.025	Accepted
H2	IT Business Spanning Capability → Organizational Performance	0.091	0.690	0.490	Rejected
H3	IT Proactive Stance → Organizational Performance	0.015	0.150	0.881	Rejected
H4	IT Infrastructure Capability → Organizational Agility	0.182	2.091	0.037	Accepted
H5	IT Business Spanning Capability → Organizational Agility	0.183	1.829	0.068	Rejected
H6	IT Proactive Stance → Organizational Agility	0.289	3.058	0.002	Accepted
H7	Organizational Agility → Organizational Performance	0.289	3.594	0.000	Accepted

Based on the hypothesis test conducted, the results of direct effects were achieved in Table 2, showing IT infrastructure capability with a significant positive effect on organizational performance (p-value 0.025). The table also illustrates that IT infrastructure capability and IT proactive stance have a considerable positive effect on organizational agility (p-values 0.037 and 0.002). Meanwhile, organizational agility has a sizeable effect on organizational performance (p-value 0.000). The outcomes of the hypothesis test also recognize sufficient evidence that there is an influence between IT business spanning capability on organizational agility as well as between IT proactive stance and IT business spanning capability on organizational performance (p-value < 0.05).

Table 3. Hypothesis Results (Indirect Effects)

Hypothesis	Specific Indirect Effects	t-statistic	p-value	*Conclusion*
H8	IT Proactive Stance → Organizational Agility → Organizational Performance	2.282	0.023	Accepted
H9	IT Infrastructure Capability → Organizational Agility → Organizational Performance	1.727	0.084	Rejected
H10	IT Business Spanning Capability → Organizational Agility → Organizational Performance	1.535	0.125	Rejected

In Table 3, the results of indirect effects ascertain that organizational agility noticeably acts as a mediator along with IT Proactive Stance, hence it has significant effect on organizational performance (p-value 0.023). Meanwhile, the

mediating influence of organizational agility did not exhibit a noteworthy effect, together with the IT infrastructure capability and IT business spanning capability in influencing organizational performance (p-value > 0.05).

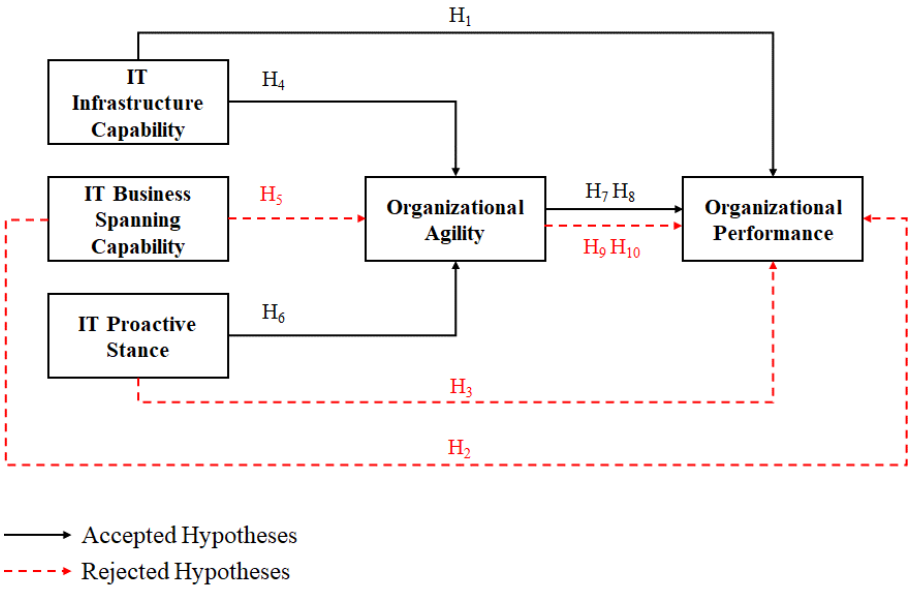

Figure 3. Accepted Research Model

Referring to the conclusions based on Tables 3 and 4, there are 5 accepted hypotheses and 5 rejected hypotheses as illustrated in Figure 3.

Table 4. R-Square Result

Variable	*R Square*	*R Square Adjusted*
Organizational Agility	0.336	0.325
Organizational Performance	0.284	0.267

In table 4, the results of adjusted R-Square for organizational agility is 0.325 and organizational performance is 0.267. This indicates that the contribution of IT infrastructure capability and IT proactive stance to organizational agility is 32.5%, and if translated further, there are still 67.5% of other latent factors or constructs that can affect organizational agility. While the contribution of the influence of organizational agility to organizational performance is 26.7%, so there are still 73.3% of other latent factors or constructs that can influence organizational performance.

5.3 Discussion

It is a necessity for all parties to strive in facing each and every obstacle in the midst of a tremendous significant decline in demand for manufactured, commodities and energy products, by adjusting to New Normal conditions due to Covid-19 Pandemic. In response, academics have begun to explore the effects of resource and IT capabilities on agility processes and their resulting implications on organizational performance (Tallon and Pinsonneault 2011; Chen et al. 2013). This study further examined the role of agility on the relationship of IT to organizational performance, in particularly in the context of the mining industry in Indonesia. Equally, this study also observed in greater detail the relationship of IT elements to organizational performance. Based on the data from the hypothesis test, it is discovered that IT infrastructure capability and IT proactive stance have a significant positive effect on organizational agility. This is in line with the findings of Panda and Rath (2018), where they have suggested that in the face of a complex environment, companies equipped with high IT capability have ability to collect, process, and disseminate information related to the market and customers more efficiently to obtain agility, both in better business processes and responsiveness to the market. Likewise, Queiroz et al. (2017) have identified that there is a significant effect of IT application orchestration capability on organizational agility. However, the results of this study demonstrated that there is no significant influence of IT businesses spanning capability on organizational agility. This would mean, with a more detailed study of each dimension of IT capability, it can be understood that not all dimensions have a positive effect on organizational agility. This finding contradicts Lu and Ramamurthy (2011) and Mao et al. (2014), where

they deliberated IT infrastructure capability, IT business spanning capability, and IT proactive stance as a unified IT capability multidimensional framework that has a positive effect on organizational agility.

The influence for each component of IT Capability, namely IT Infrastructure Capability, IT Business Spanning Capability, and IT Proactive Stance, towards Organizational Agility, has shown that each component provides different influence towards the variable. The findings of these studies varies because it is influenced by differences in the research setting, covering both in the industrial sector and also the location of the company's existence. This study has shown that the component of IT Infrastructure Capability and IT Proactive Stance have the ability to improve organizational agility in various organizations. This is one of the strengths of start-up companies which are currently growing at a fantastic rate. Efforts to strengthen IT capability occur in numerous industries, including the coal mining industry with digital transformation, is believed to increase organizational agility in order for companies to have more added competitive advantages, as well as become more adaptive and better anticipate in responding to current and future developments.

The relationship between IT capability and organizational performance is determined by internal and external factors that are very dependent on the characteristics of the place where the company competes (Melville and Kraemer 2004; Stoel and Muhanna 2009). This study equally explored in depth at the influence of each dimension of IT capability on organizational performance in the coal mining industry. Where it is known that IT infrastructure capability has a direct positive influence on organizational performance. This is in line with the research of DeGroote and Marx (2014), proposing that IT has a considerable direct relationship to organizational performance. Moreover, IT proactive stance also has a positive influence on organizational performance mediated by organizational agility, this result is aligned with previous research conducted by Queiroz et al. (2017) and Felipe at al. (2019). Those studies also indicated that organizational agility has a substantial role in the relationship between IT / IS capability and organizational performance. On the other hand, IT business spanning capability does not have a direct or indirect effect on organizational performance. This is what separates this study from previous studies, such as those conducted by Lu and Ramamurthy (2011), Mao et al. (2014), and Panda and Rath (2018), where they have all examined each and every dimension of IT capability into a single unit but did not explore in further detail the effect on each dimension.

In terms of organizational agility and organizational performance, this study results maintained that organizational agility has a significant influence on organizational performance. Indeed, this is consistent with theories on organizational agility, as it helps companies to identify the need for change from internal and external factors, implement the necessary changes, and achieve ultimate performance (Worley and Lawler 2010). Jalal et al. (2017) conducted an analytical test of several telecom companies in Pakistan, to find out whether there is a relationship between organizational agility and organizational performance and the results reinforced the argument that there is a strong relationship in which organizational agility positively affects organizational performance. Further research by Felipe et al. (2019) also have shown that organizational agility did influence organizational performance significantly. Companies that have high agility are currently able to survive and thrive in a D-VUCA-D (Disruption, Volatility, Uncertainty, Complexity, Ambiguity, Diversity) circumstances, hence many organizations are at present trying to improve organizational agility because their believes are in line with the results of these studies, that agility has a positive effect on performance.

A deeper examination of the organizations being studied have shown that there is no blueprint for the IT capability development process currently being developed in a comprehensive and integrated manner. This may be one of the causes of the lack of influence of IT business spanning capability on organizational agility. If the IT blueprint is integrated and made comprehensively, the overall dimensions of the company's IT capability will likely show an entirely positive influence on organizational agility. The direct positive influence of IT infrastructure capability on organizational agility and organizational performance is also confirmed by the company's increasingly massive budget allocation to improve IT capability, which commonly start with IT infrastructure capability. In addition, a high IT proactive stance will have a positive influence on organizational agility which in turn affect organizational performance. This is driven by the rapid development of IT and offers solutions needed by companies both in an effort to improve company agility and performance.

6. Conclusion

From the results of this study, it is concluded that IT proactive stance does have a positive effect on organizational performance mediated by organizational performance. IT infrastructure capability and IT proactive stance in the coal mining industry have a positive influence on organizational agility in dealing with business developments during D-

VUCA-D situations, particularly the current Covid-19 pandemic. However, for IT business spanning capability, this variable does not have a positive effect on organizational agility as well as organizational performance. Nonetheless, IT infrastructure capability does have a positive effect on organizational performance besides having a positive effect on organizational agility. This study delivered further investigation of the research that has been carried out by DeGroote and Marx (2014) and Queiroz et al. (2017), who have acknowledged that agility acts as a full mediator variable between IT and organizational performance. This study also provided a new perspective on organizational agility considering the context of research encompasses coal mining industry.

For future studies, there are several areas are to be researched in greater depth. First, the scope of this research in the coal mining industry can be expanded, not only to companies engaged in coal but also other types of industries (oil and gas, gold, manufacturing, pharmaceuticals and so on). This way, more samples could be obtained, so that the quality of statistical tests will be greater, consistent, and comprehensive. Second, further study on the contribution of IT capability to organizational agility and to organizational performance, because in the coming decades the phenomenon of digitalization will be dominant and greatly affect the sustainability of a company, not merely company performance.

References

Arokodare, M. A., Asikhia, O. U. and Makinde, G. O., Strategic agility and firm performance: The moderating role of organisational culture, *Business Management Dynamics*, vol. 9, no. 3, pp. 1-12, 2019.

Bharadwaj, A., A resource-based perspective on information technology capability and firm performance: An empirical investigation, *MIS Quarterly*, vol. 24, no. 1, pp. 169–196, 2000.

Chakravarty, A., Grewal, R. and Sambamurthy, V., Information technology competencies, organizational agility, and firm performance: Enabling and facilitating roles, *Information Systems Research*, vol. 24, no. 4, pp. 976-997, 2013.

Chen, Y.,Wang, Y., Nevo, S., Jin, J.,Wang, L. and Chow, W. S., IT capability and organizational performance: The roles of business process agility and environmental factors, *European Journal of Information Systems*, vol. 23, no. 3, pp. 326-342, 2013.

Chen, Y., Wang, Y., Nevo, S., Benitez, J. and Kou, G., Improving strategic flexibility with information technologies: Insights for firm performance in an emerging economy, *Journal of Information Technology*, vol. 32, no. 1, pp. 10–25, 2017.

Chung, T., Liang, T., Peng, C., Chen, D. and Sharma, P., Knowledge creation and organizational performance: Moderating and mediating processes from an organizational agility perspective. *AIS Transactions on Human-Computer Interaction*, vol. 11, no. 2, pp. 79-106, 2019.

DeGroote, S. E. and Marx, T. G., The mediating effect of agility: IT's impact on firm performance among US manufacturing firms, *Ind Eng Manage*, vol. 3, no. 123, 2169-0316, 2014.

Felipe, C. M., Leidner, D. E., Roldán, J. L. and Leal-Rodríguez, A. L., Impact of IS capabilities on firm performance: The roles of organizational agility and industry technology intensity, *Decision Sciences*, 51, pp. 575-619, 2020.

Felipe, C. M., Roldán, J. L. and Leal-Rodríguez, A. L., An explanatory and predictive model for organizational agility, *Journal of Business Research*, vol. 69, no. 10, pp. 4624-4631, 2016.

Fichman, R.G., Real options and IT platform adoption: Implications for theory and practice, *Information Systems Research*, vol. 15, no. 2, pp. 132-154, 2004.

Fornell, C. and Bookstein, F.L., Two structural equation models: LISREL and PLS applied to consumer exit-voice theory, *J. Mark. Res.*, vol. 19, no. 4, pp. 440–452, 1982.

Goldman, S.L., Nagel, R. N. and Preiss, K., *Agile competitors and virtual organizations: Strategies for enriching the customer*, Van Nostrand Reinhold, New York, 1995.

Hair, J.F., Black, W.C., Babin, B.J. and Anderson, R.E., *Multivariate data analysis*, Seventh edition, Pearson Education Limited, 2014.

Henseler, J., Ringle, C. M. and Sarstedt, M., Testing measurement invariance of composites using partial least squares, *International Marketing Review*, vol. 33, no. 3, pp. 405-431, 2016.

Jahanshahi, A. A., Rezaei, M., Nawaser, K., Ranjbar, V. and Pitamber, B. K., Analyzing the effects of electronic commerce on organizational performance: Evidence from small and medium enterprises, *African Journal of Business Management*, vol. 6, no. 22, pp. 6486-6496, 2012.

Jalal, S., Jehangir, M. and Ullah, Z., Organizational agility determinants and performance: A case of Pakistani telecommunication sector, *Global Regional Review*, vol. 2, no. 1, pp. 211-227, 2017.

Kim, G., Shin, B., Kim, K. K. and Lee, H. G., IT capabilities, process oriented dynamic capabilities, and firm financial performance, *Journal of Association for Information Systems*, vol. 12, no. 7, pp. 487–517, 2011.

Leiblein, M.J., Reuer, J.J. and Dalsace, F., Do make or buy decisions matter? The influence of organizational governance on technological performance, *Strategic Management Journal*, vol. 23, no. 9, pp. 817–833, 2002.
Lee, H. and Choi, B., Knowledge management enablers, processes, and organizational performance: An integrative view and empirical examination, *Journal of Management Information Systems*, vol. 20, no. 1, pp. 179-228, 2003.
Lu, Y. and Ramamurthy, K., Understanding the link between information technology capability and organizational agility: An empirical examination, *MIS Quarterly*, vol. 35, no. 4, pp. 931-954, 2011.
Mao, H., Liu, S. and Zhang, J., How the effects of IT and knowledge capability on organizational agility are contingent on environmental uncertainty and information intensity, *Information Development*, vol. 31, no. 4, pp. 358-382, 2014.
Matchaba-Hove, T. M. and Goliath, J. E., The entrepreneurial orientation and business performance relationship: A study of young-adult-owned small businesses. *Proceedings of the 28th Annual Conference of the Southern African Institute of Management Scientists*, Pretoria, South Africa, September 6, 2007.
Melville, N. and Kraemer, K., Information technology and Organizational performance: An integrative model of IT business value, *MIS Quarterly*, vol. 28, no. 2, pp. 283–322, 2004.
Overby, E., Bharadwaj, A. and Sambamurthy, V., Enterprise agility and the enabling role of information technology, *European Journal of Information Systems*, vol. 15, no. 2, pp. 120-131, 2006.
Panda, S. and Rath, S. K., Information technology capability, knowledge management capability, and organizational agility: The role of environmental factors, *Journal of Management & Organization*, vol. 27, no. 1, pp. 148-174, 2021.
Powell, T.C. and Dent-Micallef, A., Information technology as competitive advantage: The role of human, business, and technology resources, *Strategic Management Journal*, vol. 18, no. 5, pp. 375-405, 1997.
Queiroz, M., Tallon, P. P., Sharma, R. and Coltman, T., The role of IT application orchestration capability in improving agility and performance, *Journal of Strategic Information Systems*, vol. 27, no. 1, pp. 4-21, 2017.
Rai, A. and Tang, X., Leveraging IT capabilities and competitive process capabilities for the management of inter organizational relationship portfolios, *Information Systems Research*, vol. 21, no. 3, pp. 516-542, 2010.
Ravichandran, T., Exploring the relationships between IT competence, innovation capacity, and organizational agility, *The Journal of Strategic Information Systems*, vol. 27, no. 1, pp. 22-42, 2018.
Ravichandran, T. and Lertwongsatien, C. (2005). Effect of information systems resources and capabilities on firm performance: A resource-based perspective. Journal of Management Information Systems, 21(4), 237–276.
Ringle, C. M. and Sarstedt, M., Gain more insight from your PLS-SEM results: The importance-performance map analysis, *Industrial Management & Data Systems*, vol. 116, no. 9, pp.1865–1886, 2016.
Ringle, C. M., Wende, S. and Becker, J., *SmartPLS 3*, Smart-PLS, B¨onningstedt, 2015.
Sambamurthy, V. and Zmud, R. W., *IT management competency assessment: A tool for creating business value through IT*, Financial Executives Research Foundation, Morristown, NJ, 1994.
Sambamurthy, V., Bharadwaj, A. and Grover, V., Shaping agility through digital options: reconceptualizing the role of information technology in contemporary firms, *MIS Quarterly*, vol. 27, no. 2, pp.237-263, 2003.
Stoel, M. D. and Muhanna, W. A., IT capabilities and firm performance: A contingency analysis of the role of industry and IT capability type, *Information and Management*, vol. 46, no. 3, pp. 181–189, 2009.
Tallon, P. P. and Pinsonneault, A., Competing perspectives on the link between strategic information technology alignment and organizational agility: Insight from a mediation model, *MIS Quarterly*, vol. 35, no. 2, pp. 463–486, 2011.
Teece, D., Peteraf, M. and Leih, S., Dynamic capabilities and organizational agility: Risk, uncertainty, and strategy in the innovation economy, *California Management Review*, vol. 58, no. 4, pp. 13-35, 2016.
Van Oosterhout, M., Waarts, E. and Van Hillegersberg, J., Change factors requiring agility and implications for IT, *European Journal of Information Systems*, vol. 15, no. 2, pp. 132-145, 2006.
Vessey, I. and Ward, K., The dynamics of sustainable IS alignment: The case for IS adaptivity, *Journal of the Association of Information Systems*, vol. 14, no. 6, pp. 283–311, 2013.
Wade, M. and Hulland, J., Review: The resource-based view and information systems research: Review, extension, and suggestions for future research, *MIS Quarterly*, vol. 28, no.1, pp. 107-142, 2004.
Weill, P., Subramani, M. and Broadbent, M., Building IT infrastructure for strategic agility, *Sloan Management Review*, vol. 44, no. 1, pp. 57-65, 2002.
Worley, C. G., & Lawler, E. E., Agility and organization design: A diagnostic framework. *Organizational Dynamics*, vol. 39, no. 2, pp. 194-204, 2010.

Appendix

Survey items and constructs

This study uses a Likert scale with answer choices including, 1: Strongly disagree; 2: Disagree; 3. Neutral; 4. Agree, 5: Strongly agree. The details of the items in each survey in this research that have been through validity and reliability tests:

Organizational Performance

Adapted from Powell and Dent-Micallef (1997); Kim et al. (2011); Queiroz et al. (2017); Chung et al. (2019). In the last 3 years, compare your company with competitors, whether:

- Demonstrated higher profitability than competitors
- Demonstrated higher sales/production growth than competitors
- Demonstrated higher revenue growth than competitors
- Demonstrated product or service quality superior to competitors
- Demonstrated overall better performance than competitors

Organizational Agility

Adapted from Goldman et al. (1995); Tsourveloudis et al. (1999); Lu and Ramamurthy (2011); Mao et al. (2014). Based on the following statements to what extent reflect the current situation in your company?

- Able to make quick responses to meet requests
- Able to quickly adjust production or service levels to support fluctuations based on market demand
- Able to quickly make the right decisions in the face of changing demands
- Able to quickly implement measures based on decisions taken in the face of changing demands
- Constantly seeking to reinvent or reengineer to better meet market needs

IT Infrastructure Capability

Adapted from Weil et al. (2002), Lu and Ramamurthy (2011), and Mao et al. (2014). Based on the following statements to what extent eflect the current situation in your company?

- Data management services are reasonably good
- The communication network is largely fulfilled in terms of connectivity, reliability, and availability
- The quality of IT service applications (eg, ERP, ASP) is able to meet needs
- IT management services is able to coordinate the physical infrastructure effectively and efficiently
- IT management services can manage relationships with business units effectively and efficiently

IT Business Spanning Capability

Adapted from Bharadwaj et al. (1999), Lu and Ramamurthy (2011), and Mao et al. (2014). Based on the following statements to what extent reflect the current situation in your company?

- Have a clear understanding of how IT contributes to competitive advantage
- Integrate business strategic planning with IT planning
- The company has an effective and flexible IT planning process

IT Proactive Stance

Adapted from Weill et al. (2002), Lu and Ramamurthy (2011), and Mao et al. (2014). Based on the following statements to what extent reflect the current situation in your company?

- Constantly up to date with the latest IT innovations
- Encourage new ways of using IT
- Continuously looking for new methods to increase the effectiveness of using IT.

Biographies

Nur Cholis Dwi Saputro, ST, MPM, is professional practioner of mining and energy industry in Indonesia. He is currently the Head of Strategic Initiatives section of PT Pamapersada Nusantara member of PT Astra International, Tbk., once of the Biggest Mining Contractor Company in Indonesia. He received his ST (Bachelor of Engineering) majoring in Mechanical Engineering from Institute Technology of Sepuluh November (ITS), Surabaya – Indonesia. He received certified Master Project Manager (MPM) from American Academy of Project Management (AAPM) Indonesian Chapter. He also received certified Quality Lead Auditor of ISO 9001 form Neville Clarke, Jakarta – Indonesia. He is currently completing master's degree in Magister Management (MM) at BINUS Business School, Bina Nusantara University, Jakarta – Indonesia. His thesis focus on The Effect of Information Technology Capability and Knowledge Management Process Capability on Organizational Agility and Organizational Performance (Research on One of The Mining Contractor Companies in Indonesia). He is internal consultant of PT Pamapersada Nusantara and Group in developing strategic dan innovation initiatives to boost company growth and sustainability. He has more experiences in leading strategic initiative project to boost company performance such Business Performance Improvement Project, and Value Chain Innovation Project among companies' group of PT Astra Internation, Tbk. He is currently drive Research and Development (R&D) project initiatives in mining operation with adoption of updated Information Technology which impacted to company performance. He and his team won

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Tengku Mohd. Khairal Abd, B.B.A., M.B.A., Ph.D. is currently the Head of Program of MM Blended Learning at BINUS Business School, Jakarta – Indonesia. He has around 20 years of combined professional academic & industry experience in Malaysia & Indonesia. He received his Ph.D from Universiti Utara Malaysia in 2011. His thesis which focused on Corporate Restructuring Strategy, making him one of few scholars who has expertise in restructuring troubled companies. During more than 20 years of his stay in Malaysia, he also involved in several projects on Corporate Strategy Formulation involving both private and government agencies. His main research area is still on Corporate Strategy/ Strategic Management. He is also fluent in gaming and gamification effect in teaching. He secured 2 Fundamental Research Grant Scheme from Malaysian Government in 2011, which is one of the most competitive Research Grant Scheme in Malaysia, and also making him one of the few non-local who managed to secure the grant. One of them was how gaming and gamification enhance students' understanding in the subject of Strategic Management. He is also quite fluent in designing and teaching online learning modules. He has almost 10 years of experience in e-learning and online teaching. He has certification in E-learning and Online Teaching from University of Wisconsin-Stout, and he just received Certification in Instructional Design from the same university at the end of 2021. With almost 20 years of experience as academician, his portfolio of subjects covered wide area of business management, such as Strategic Management, Operational Management, Human Resource Management and Research Methodology. Although he has wide range of teaching portfolio, his passion is still on Corporate Restructuring, Business Strategy, Strategic Management and Research Methodology both in face-to-face as well as in online mode.

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Heidi Lianawaty Lisan, ST is bachelor's degree majoring Industrial Engineering from Atma Jaya University, Jakarta – Indonesia with cum laude predicate (2001 – 2005). She is currently taking master's degree in Magister Management (MM) at BINUS Business School, Bina Nusantara University, Jakarta – Indonesia. She is Head of Corporate Strategy and PDCA section (managerial level) in PT Pamapersada Nusantara, a multi-billion company, one of the largest mining contractors in Indonesia and member of ASTRA. She has 15 years experiences in Strategic Management, Project Management, Business Management, Innovation and Quality Management System on multi-industries such as manufacturing, mining & energy. Her Essay: Design of Machine Maintenance Information System on Roller Mill as a Critical Machine at PT. Indofood Sukses Makmur, Tbk – Bogasari Flour Mills. Her thesis: The Effect of Information Technology Capability and Knowledge Management Process Capability on Organizational Agility and Organizational Performance (Research on One of The Mining Contractor Companies in Indonesia). Some innovations and sharing which she has done were well appreciated, such as: 1st Winner Behavior Improvement "Strategic Collaboration Project" (as Leader) in PAMA-2018, category Program of Excellence "Positive Environment", The Most Dedicated Facilitator, awarded in PAMA INTERNOVA-2018, Gold Award Innovation medals in International Convention on Quality Control Circles 2018 in Singapore, "Pioneer Source Person" in Astra Management System Implementation Guidance Book 2020, The Best AMMP (Astra Middle Management Program) participant-2020, Sharing about Strategic Management and Innovations in ASTRA Group, such as PT Astra Otoparts, Astra Property, FIF, etc.