


The Prevalence of Information Technology in Indonesia's Accredited Hospitals

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ABSTRACT

During the COVID-19 pandemic in Indonesia, examination and relaying of important health information were done with the support of information technology. Therefore, this study measures information technology (IT) within hospitals through IT adoption and IT integration. The study uses data of 752 accredited in Indonesia. The study uses a descriptive analysis and ANOVA to identify the score of different locations, classes, and accreditations of hospitals to determine whether there are any associations or significant differences between the top- and lower-class hospitals. The results indicate that hospital classes A, B, C, and D in Indonesia apply information processing related to the storage, retrieval, sharing, and use of health services information for communication and significant decision-making. However, there are no significant distinction in the prevalence of IT usage among these hospitals. This study contributes to the understanding of the current rate of adoption and integration of information technology resources.

KEYWORDS

COVID-19, Healthcare, Hospital, Hospital Management, Indonesia, Information Technology, IT Adoption, IT Integration

INTRODUCTION

The last decade has seen a significant increase in hospital information-related technologies research (Handayani, 2018). The development of digital-based health services in Indonesia has also grown. The use of digital and information health technology facilitates health services for the public, bringing improvements in service quality, reducing costs, and simplifying and speeding up patient diagnosis. In a country such as Indonesia, with a unique archipelago, technology is needed to promote healthy lifestyles and prevent diseases through remote testing and more widespread health services.

While digital health care models are often too expensive to implement, they are more affordable in developing countries and have the potential to provide healthcare systems with better accessibility, safety, and quality (PwC, 2020). The use of digital and information technology was also further apparent during the Covid-19 pandemic. Once Covid-19 was detected in Indonesia, and large-scale social restrictions were implemented, patients' visits to hospitals decreased by up to 70 percent

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(Dinisari, 2020). The examination and relaying of important health information are now expected to be done through information technology (IT).

However, are these hospitals ready to take on the implementation and adoption of ITs? This study examines the current prevalence of the adoption and integration of IT in existing hospitals in Indonesia. It also helps understand hospitals' current level of readiness in adopting up-to-date digital and IT healthcare services in the post-Covid-19 world. Do the different levels of hospital classes and hospitals' accreditation achievements indicate the level of IT usage or any distinctions in IT adoption?

BACKGROUND

Due to Covid-19, a large theme for IT-enabled services in hospitals has emerged, including the dissemination of Covid-19-related information, digitalized processes to reduce infection risks, the sharing of information amongst health professionals, telemedicine, and IT-specific initiatives taken by hospitals (Yan et al., 2020). Advanced digital technology has been increasingly used by health facilities to enhance effectiveness, efficiency, and service quality. The computation system of BPJS Kesehatan enables first-tier health facilities to refer patients to advanced levels online. Some hospitals have implemented electronic decision support systems that are integrated into electronic medical records to assist physicians in making more precise therapy decisions according to clinical guidelines using electronic prescriptions.

In 2022, the digital health income in Indonesia is expected to increase to \$973 million (Erlangga, 2019). As the digital tools of the health ecosystem in Indonesia grow, businesses are applying new and existing technologies to improve healthcare. Indonesia still has the opportunity to grow within digital health and room for further investment to advance the way health services are delivered (Connect, 2020). Investments in technological equipment in the healthcare environment come in the form of administrative technology, clinical technology, and patient medical information systems (Gu et al., 2018). Furthermore, the use of patient health data or records also needs to be managed to bring convenience when patients change health services (Dinisari, 2020). Vertically integrated health systems are where services are structurally integrated from the level of influence—namely, practice places, doctor organizations, and hospital networks through joint ownership or joint management (Machta et al., 2019).

Information Technology in Healthcare

In healthcare, new technology enables managers to better monitor and manage the allocation of support services for clinical staff, thereby increasing the number of patients. Investments in IT can enable an organization to access information and collaborate both internally and externally with other healthcare organizations. Health information technology expenses are positively associated with hospitals' return on assets, positive financial performance, and productivity (Wang et al., 2018).

IT human resources are built through formal IT-based training, including technical, analytical, managerial, and interpersonal skills, to consistently solve business problems and address business opportunities through information technology. This is in line with the understanding of resource-based theory so that unique IT human resources are created and have a strong positive correlation with company performance (Ashrafi, 2015). IT resources become IT technology and managerial IT resources (Melville et al., 2004; Melville, 2008). Technology provides the potential for more efficient organizational structures, with technology facilitating resource management and day-to-day management as well as the expansion of collaborative structures in organizational networks (Sauer, 2004).

IT resources or healthcare IT (HIT) continues to grow in acceptance in daily clinical activities, yet most doctors seem willing but unable to be involved in the development of HIT (Vogt et al., 2018). The application of technology can also boost the efficiency and productivity of the hospital, and hospital workers can find it easier to develop new ideas to improve the quality of existing services and

inefficient work routines, increase task efficiency, and reduce cost allocation (Chen & Tsou, 2016). An IT strategy in line with business objectives guides decisions on how information systems will be developed, acquired, and implemented through in-house efforts, outsourcing, or a combination of the two (Mendelson, 2000). IT business alignment helps create and develop a shared understanding between IT and business to improve performance.

Within the hospital, IT resources are aimed at improving the quality of health services, effectiveness, productivity, and efficiency to improve processes, reduce medical errors and improve healthcare accuracy and procedural accuracy, expand real-time communication of health information among healthcare professionals, and expand access to health (Vogt et al., 2018). The skills and knowledge of IT staff have a positive relationship with a competitive advantage; however, managerial skills can provide a sustainable competitive advantage (Dehning & Stratopoulos, 2003). The literature shows that well-trained IT human resources, particularly in terms of IT managerial skills, contribute to business value and maintain a competitive advantage. IT knowledge resources, which include policies, procedures, business processes, and information about competitors, are considered an asset and a major contributor to IT business value (Bhatt & Grover, 2005).

Hospital Quality Indicators – The Lack of IT Indicators

Quality indicators in Indonesia are often associated with hospital accreditation. Hospital accreditation originating from high-income countries is increasingly used as a quality indicator to improve healthcare services (Mansour et al., 2020). Accredited hospitals of a larger size have been found to have higher utility and efficiency (Wardhani et al., 2019). Hospital characteristics such as hospital size and ownership are significantly associated with accreditation status. However, the implementation and influence of accreditation are still to be explored. Although a hospital's accreditation is widely adopted as a visible measure of an organization's quality and safety, compliance with management standards is necessary as well. However, there is still inconsistent evidence regarding the influence of hospital accreditation on hospital performance, with limited studies being conducted in developing countries.

Regarding the prevalence of IT in Indonesia's hospitals, there is still very little consensus on its indicators and measures. Indonesia's Law Number 11 of 2008 defines IT only as a technique for collecting, preparing, storing, processing, publishing, analyzing, and/or disseminating information. How much hospitals adopt and implement IT and how innovative they can do so are not often captured or measured (Prasanti & Wardhani, 2020; Smits et al., 2014; Wardhani et al., 2019).

This study profiled the relevant hospitals according to the class and accreditation of each hospital as the unit of analysis. Data used here are from the Indonesian Commission on Accreditation of Hospitals (ICAHO). For the sake of capturing data and analyzing hospital units in Indonesia, the study looked at Indonesia's hospital class classification (i.e., A, B, C, D) and the level of hospital accreditation (i.e., Paripurna, Utama, Madya, Dasar).

The entire classification of hospitals in Indonesia is regulated by the Minister of Health of the Republic of Indonesia (Regulation Number 56 of 2014), with article 11 of this regulation focusing on the classification and licensing of hospitals. This study classified hospitals based on the type of service provided, categorizing them as general hospitals or hospitals; it further classified them into Class A, Class B, Class C, Class D, or *Pratama* Class D. All classes could be found in either general or specialist hospitals types. The B class signifies non-classified hospitals.

In terms of management and management standards, hospitals in Indonesia are accredited by two independent institutions by the Minister of Health Decree No. 428 / MENKES / SK / XII / 2012—the Indonesian Commission on Accreditation of Hospital (ICAHO) and the Joint Commission International (JCI). According to the national accreditation body, hospitals are divided into *Dasar* or Primary class, the basic accreditation level, *Utama* (Main class), *Madya* (Intermediate class), and *Paripurna* or Plenary class the highest accreditation (Komisi Akreditasi Rumah Sakit, 2017). This accreditation is based on the general functions of the hospital organization, which are grouped

according to functions related to providing services to patients, the management of each unit, departments, and services in the hospital.

In this study, two indicators of IT use within hospitals were used: IT adoption and IT integration. IT adoption was defined as the organization's ability to create capabilities that are positively derived from the relationship between IT assets and hospital resources in the context of healthcare. Meanwhile, IT integration refers to activities undertaken by management to support, guide, and assist with the integration of IT assets into organizational resources. The study also used descriptive analysis to determine the score of each hospital class and level. Using an ANOVA, it determined whether any association or significant difference existed between the top and lower classes of hospitals.

The measurement of these indicators was taken from secondary data assessment elements in the ICAHO. The indicators of the national program's assessment elements of ICAHO are measured through accreditation results data on a scale ranging from 1 to 3 with a score of 0 (fail to pass), 5 (partially fulfilled), or 10 (completely fulfilled; see Table 1).

Table 1. IT measurements

IT Adoption	
1	Caregiver professionals (PPA) and heads of fields/divisions, as well as heads of service units, participate in selecting, integrating, and using information management technology.
	Professional care providers were involved in building the hospital information system.
	Heads of fields/divisions and heads of service units were involved in the building of the hospital information system.
2	The hospital data and information management system is prepared to determine data and information that is routinely (regularly) collected according to the professional needs of care providers (PPA), heads of fields/divisions, heads of service units, and other agencies/parties outside the hospital.
	The hospital provides a collection of data on the aims and objectives that must be available to meet users' needs—namely, PPA, heads of fields/divisions, and heads of service units.
	The hospital provides data needed by other agencies/parties outside the hospital by statutory regulations.
3	Data and information are delivered promptly in a format that meets users' expectations and with the desired frequency.
	Data and information are delivered according to users' needs.
	Users receive data and information in the format that is needed.
	Users receive data and information promptly.
	Data processing staff have access rights to data and information as required by their responsibilities.
IT Integration	
1	The implementation of the hospital management information system (MIS) must refer to the laws and regulations.
	There is a work unit that manages the management information system.
	The hospital has a hospital management information system-based outpatient registration process.
	The hospital has a hospital management information system-based inpatient registration process so that the public can find out which places/facilities are still available.
	Human resources in the hospital management information system work unit are competent and have been trained.
	There are regulations regarding data and information management.
	Clinical and managerial data and information are categorized as needed to support decision-making.

Table 1 continued on next page

Table 1 continued

IT Adoption	
2	The hospital plans and designs information management processes to meet internal and external information needs.
	The information needs planning process occurs by the aims and objectives.
	The information needs planning process refers to the laws and regulations.
	Planning is adjusted to the size and complexity of the hospital.
3	The analyzed data are converted into information to support patient care, hospital management, and quality management programs, as well as education and research.
	There is evidence that the analyzed data are converted into information to support patient care.
	There is evidence that the analyzed data are converted into information to support hospital management.
	There is evidence that the analyzed data are converted into information supporting a quality management program.
	There is evidence that the analyzed data are transformed into information to support education and research.

The scores of these indicators were then computed and analyzed for significant differences between classes, accreditation, and location in hospitals. In addition, a regression tree analysis was also adopted to determine which factors are most significant in determining IT resources used.

MEASURING INFORMATION TECHNOLOGY IN INDONESIAN HOSPITALS

Based on the ICAHO, 752 sample hospitals' complete data were used for this study. The hospital included in this study are hospitals of classes A to D, where 27 A class hospitals, the highest class hospitals, 143 B class hospitals, 396 C class hospitals, 176 D class hospitals, and ten non-class hospitals (Be). Hospitals based on their accreditation to ICAHO were also included based on their 2019/2020 accreditation rankings. The data includes a majority of 329 hospitals from the *Paripurna* accreditation, 155 hospitals having the *Utama* accreditation, 176 hospitals with *Madya* accreditation, and 92 hospitals with *Dasar* accreditation. The location of the hospitals is widespread throughout Indonesia; 602 hospitals are concentrated in the West of Indonesia, 116 hospitals are located in Central Indonesia, and 18 hospitals are located in the East of Indonesia. Hospitals included in this study are mostly located in Java (61%), Sumatera (19%), Sulawesi (8%), Kalimantan (5%), and Bali (3%).

The two measures used for IT resources, hospital IT adoption and IT integration, were measured in various ways. IT adoption was measured in terms of how heads of fields/divisions and heads of service units participate in selecting, integrating, and using information management technology. The organization's data and information management system that prepares the pool of data and information routinely collected according to the professional needs was also considered. Finally, the study examined the timely delivery of data and information in a format that meets users' expectations and at the desired frequency.

IT integration was measured in terms of management's activities to support, guide, and assist with the integration of IT assets into organizational resources. The implementation of a hospital management information system must refer to laws and regulations. The organization plans and designs information management processes to meet internal and external information needs. Finally,

the data analyzed were converted into information to support patient care, hospital management and quality management programs, and education and research.

Based on the data obtained, the tendency of each variable in each hospital class category can be obtained. Inspired by the MSCI social index value from the AAA – CCC assessment (ESG Research, 2020), this study will form 5 value categories to assess the tendency of each variable. The five categories of this scale are 1) Very low, 2) Low, 3) Moderate, 4) High, and 5) Very High. From the composite scores of these measures, the authors draw the tendency for hospital and IT resource prevalence into five categories. Interval calculations for five categories were carried out according to the Sturges formula, namely $k = 1 + 3,3\log_{10}n$, and $k = \text{category}$. The range is calculated by the maximum value of the data minus the minimum value. Therefore, in this calculation, it is known that $k = 5$, and $n = 752$. For control, the formula $ik \geq \text{range} + 1$ was used. Then the scale form by the description in the table below (Table 2).

Table 2. Information technology range category

Score	Category	Range
Very low	The hospital does not apply any information processing related to the storage, retrieval, sharing, and use of health services information, data, and knowledge for communication and decision-making.	-2.00–0.99
Low	The hospital does not implement information processing related to the storage, retrieval, sharing, and use of health services information, data, and knowledge for communication and decision-making.	1.00–4.99
Moderate	Hospital occasionally employs information processing that relates to the storage, retrieval, sharing, and use of healthcare information, data, and knowledge for communication and decision-making.	3.00–6.99
High	Hospital applies information processing related to the storage, retrieval, sharing, and use of healthcare information, data, and knowledge relatively well for communication and decision-making.	7.00–9.99
Very high	Hospital applies information processing very well to the storage, retrieval, sharing, and use of health services information, data, and knowledge for communication and decision-making.	10.00–12.49

Several points can be concluded from the results of the trend value of IT resources in hospital sample classes A, B, C, D, and Be (Table 3). In Indonesia, hospital classes A ($\mu = 6.69$), B ($\mu = 6.92$), C ($\mu = 6.68$), D ($\mu = 6.37$), and Be ($\mu = 6.81$) tend to have moderate IT resources. These hospitals sometimes apply information processing related to the storage, retrieval, sharing, and use of health services information, data, and knowledge for communication and significant decision-making ($\alpha < 0.05$). Therefore, there is no difference in IT resources in hospitals in Indonesia when differentiated by hospital class with an α of 1.104, which is non-significant at $\alpha > 0.05$. Thus, class A, B, C, D, and Be hospitals are all shown to have significant IT resources at $\alpha < 0.05$.

Table 3. IT resources based on hospital class

	A	B	C	D	Be
Std. Error	0.50465	0.20529	0.11144	0.19577	0.74855
Mean	6.6923	6.9214	6.6819	6.3736	6.8182
95% Confidence Lower Bound	5.6530	6.5155	6.4628	5.9873	5.1503
95% Confidence Upper Bound	7.7317	7.3273	6.9010	6.7599	8.4861
5% Trimmed Mean	6.7821	7.1032	6.8331	6.5073	6.9646
Median	7.5000	8.0000	7.0000	7.0000	7.0000
Variance	6.622	5.900	4.881	6.976	6.164
μ	moderate	moderate	moderate	moderate	moderate

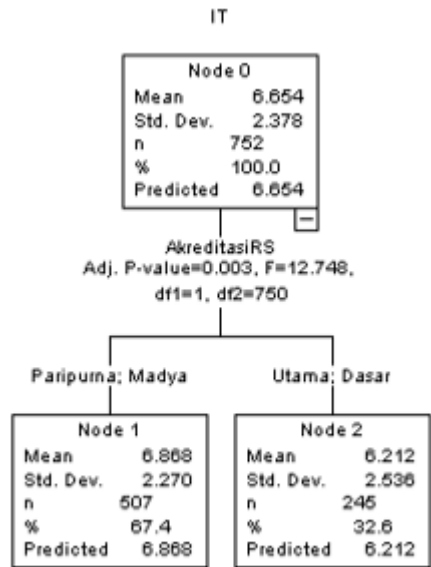
Table 4. IT resources based on hospital accreditation

	Paripurna/ Plenary	Madya/ Intermediate	Utama/ Main	Dasar/ Basic
Std. Error	0.12144	0.17919	0.18897	0.29881
Mean	6.9515	6.7119	6.3694	5.9318
95% Confidence Lower Bound	6.7126	6.3582	5.9962	5.3379
95% Confidence Upper Bound	7.1904	7.0655	6.7427	6.5257
5% Trimmed Mean	7.0976	6.8286	6.5287	6.0404
Median	7.0000	7.0000	7.0000	7.0000
Variance	4.867	5.684	5.606	7.857
μ	moderate	moderate	moderate	moderate

The results of the trend value of IT resources at accredited plenary, intermediate, main, and basic hospitals are shown in Table 4. In Indonesia, accredited *Paripurna* ($\mu = 6.95$), *Utama* ($\mu = 6.36$), *Madya* ($\mu = 6.71$), and *Dasar* ($\mu = 5.93$) hospitals tend to have a *moderate* level of IT resources. In addition, to some degree, these hospitals have applied information processing related to storage, retrieval, sharing, and use of health services information, data, and knowledge for communication and decision-making (significant at $\alpha < 0.05$). Similar to the results related to classes of hospitals, no differences in IT resources were found in hospitals in Indonesia if differentiated based on hospital accreditation with an F of 5.299. Thus, plenary, main, intermediate, and basic accredited hospitals do not differ in moderate IT resources (significant at $\alpha < 0.05$).

Based on the results of the trend value of IT resources at hospitals in the provinces of Bali, Java, Sumatra, Sulawesi, Kalimantan, Maluku, Nusa Tenggara, and Papua, those in Java ($\mu = 6.75$), Bali ($\mu = 6.83$), and Sumatra ($\mu = 6.0$) tend to occasionally employ information processing at a moderate degree (significant at $\alpha < 0.05$). Meanwhile, hospitals in Sulawesi were found to have a significantly higher implementation of IT resources ($\mu = 7.00$, $\alpha < 0.05$). Hospitals in Kalimantan ($\mu = 6.74$) tended to be relatively good (significant at $\alpha < 0.05$). Hospitals in Maluku ($\mu = 6.42$) and Nusa Tenggara ($\mu = 5.73$) also showed a moderate tendency to occasionally employ information processing (significant at $\alpha < 0.05$). Finally, hospitals in Papua tended to be relatively good at implementing information processing related to the storage, retrieval, sharing, and use of healthcare information, data, and knowledge ($\mu = 7.40$, $\alpha < 0.05$).

Figure 1. Information technology regression tree



The mapping of the results of the IT resources value shows that IT value tends to be moderate, with hospitals responding well to the needs of public health services that prioritize an important role in dealing with national and environmental health problems. A further analysis using the regression tree shows significance (P-value = 0.003; Fig. 1), indicating that hospitals with the higher accreditation of *Paripurna* or *Madya* are 67.4% likely to have implemented the use of IT, whereas those with *Utama* or *Dasar* are 32.6% likely to achieve the use of IT in their hospitals. This again demonstrates that accreditation is to some degree significant as a quality indicator and significantly measures and predicts the uses of IT resources in hospitals.

CONCLUSION

The future of healthcare shows a trajectory toward e-health and telemedicine, which requires adaptive and responsive hospitals across the nation to be active in continuous innovation development and the adoption of technology to serve the community better. The hospital's ability to recognize IT resource development opportunities represents its technological competence and strategy in the use of technology (Okongwu et al., 2013) in both IT adoption and integration. The study concluded that, in general, moderate levels of IT resources are used across hospitals in Indonesia. However, there seems to be no significant difference in IT resources used between hospital classes or among different hospital accreditations and locations.

This study has several limitations. First, the data used in this study were focused on secondary data from ICAHO as an existing reference point for measuring the use of IT in hospitals. Therefore, this study is limited to already accredited hospitals. In addition, some incomplete hospital data could not be included in this study. These come with the limitation of using secondary data analysis deemed short-term based on the documented evidence leading up to the accreditation of the hospital. Future research could include a continuous evaluation of hospitals collected through a primary source to accompany the available secondary data.

Second, items to measure the future of IT were not included in this study or measured across time. Therefore, the study does not provide a comparison of before and after IT application prior to accreditation. Further research may also want to investigate IT use in different departments, including the absorptive capacity of health personnel and patients in adopting and adapting new IT in day-to-day operations. A look into the hospital's ownership and type of hospital might also find a larger contrast in how they utilize IT.

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REFERENCES

- Ashrafi, R., & Mueller, J. (2015). Delineating IT resources and capabilities to obtain competitive advantage and improve firm performance. *Information Systems Management*, 32(1), 15–38. doi:10.1080/10580530.2015.983016
- Bhatt, G. D., & Grover, V. (2005). Types of information technology capabilities and their role in competitive advantage: An empirical study. *Journal of Management Information Systems*, 22(2), 253–277. doi:10.1080/07421222.2005.11045844
- Chen, J. S., & Tsou, H. T. (2016). *Information technology adoption for service innovation practices and competitive advantage: the case of financial firms*, 12(3). <http://www.informationr.net/ir/12-3/paper314.html>
- Dehning, B., & Stratopoulos, T. (2003). Determinants of a sustainable competitive advantage due to an IT-enabled strategy. *The Journal of Strategic Information Systems*, 12(1), 7–28. doi:10.1016/S0963-8687(02)00035-5
- Dinisari, M. C. (2020). *Peluang dan Tantangan Teknologi Digital Bidang Kesehatan di Era Pandemi COVID-19 - Lifestyle Bisnis.com*. <https://lifestyle.bisnis.com/read/20201031/106/1311904/peluang-dan-tantangan-teknologi-digital-bidang-kesehatan-di-era-pandemi-covid-19>
- Erlangga, D., Ali, S., & Bloor, K. (2019). The impact of public health insurance on healthcare utilization in Indonesia: Evidence from panel data. *International Journal of Public Health*, 64(4), 603–613. doi:10.1007/s00038-019-01215-2 PMID:30737522
- Gu, D., Yang, X., Li, X., Jain, H., & Liang, C. (2018). Understanding the role of mobile internet-based health services on patient satisfaction and word-of-mouth. *International Journal of Environmental Research and Public Health*, 15(9), 1972. doi:10.3390/ijerph15091972 PMID:30201921
- Handayani, P. W., Hidayanto, A. N., & Budi, I. (2018). User acceptance factors of hospital information systems and related technologies: Systematic review. *Informatics for Health & Social Care*, 43(4), 401–426. doi:10.1080/17538157.2017.1353999 PMID:28829650
- Komisi Akreditasi Rumah Sakit. (2017). Standar Nasional Akreditasi Rumah Sakit.
- Machta, R. M., Maurer, K. A., Jones, D. J., Furukawa, M. F., & Rich, E. C. (2019). A systematic review of vertical integration and quality of care, efficiency, and patient-centered outcomes. *Health Care Management Review*, 44(2), 159–173. doi:10.1097/HMR.000000000000197 PMID:29613860
- Mansour, W., Boyd, A., & Walshe, K. (2020). The development of hospital accreditation in low- and middle-income countries: A literature review. *Health Policy and Planning*, 35(6), 684–700. doi:10.1093/heapol/czaa011 PMID:32268354
- Melville, K., Kraemer, , & Gurbaxani, . (2004). Review: Information technology and organizational performance: An integrative model of IT business value. *Management Information Systems Quarterly*, 28(2), 283. doi:10.2307/25148636
- Melville, N., & Ramirez, R. (2008). Information technology innovation diffusion: An information requirements paradigm. *Information Systems Journal*, 18(3), 247–273. doi:10.1111/j.1365-2575.2007.00260.x
- Mendelson, H. (2000). Organizational architecture and success in the information technology industry. *Management Science*, 46(4), 513–529. doi:10.1287/mnsc.46.4.513.12060
- Okongwu, U., Morimoto, R., & Luras, M. (2013). The maturity of supply chain sustainability disclosure from a continuous improvement perspective. *International Journal of Productivity and Performance Management*, 62(8), 827–855. doi:10.1108/IJPPM-02-2013-0032
- Prasanti, I., & Wardhani, V. (2020). Exploring quality management system maturity of the accredited hospitals. *Enfermeria Clinica*, 30, 123–126. doi:10.1016/j.enfcli.2020.06.028
- PwC. (2020). *The Digital Healthcare Leap*. <https://www.pwc.com/id/en/media-centre/press-release/2016/indonesian/menurut-pwc--model-baru-perawatan-kesehatan-digital-dapat-memban.html>
- ESG Research. (2020). *MSCI ESG rating methodology*. Author.

Sauer, C. (2004). Strategic alignment revisited: Connecting organizational architecture and IT infrastructure. *Proceedings of the Hawaii International Conference on System Sciences*, 37, 3629–3638. <https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&scp=12344327274&origin=inward>

Smits, H., Supachutikul, A., & Mate, K. S. (2014). Hospital accreditation: Lessons from low- and middle-income countries. *Globalization and Health*, 10(1), 65. doi:10.1186/s12992-014-0065-9 PMID:25185526

Vogt, F., Seidl, F., Santarpino, G., van Griensven, M., Emmert, M., Edenharter, G., & Pförringer, D. (2018). Healthcare IT utilization and penetration among physicians: Novel IT Solutions in healthcare - use and acceptance in hospitals. *European Surgical Research. Europäische Chirurgische Forschung. Recherches Chirurgicales Europeennes*, 59(1–2), 100–113. doi:10.1159/000490241 PMID:30048992

Wang, T., Wang, Y., & McLeod, A. (2018). Do health information technology investments impact hospital financial performance and productivity? *International Journal of Accounting Information Systems*, 28, 1–13. doi:10.1016/j.accinf.2017.12.002

Wardhani, V., Van Dijk, J. P., & Utarini, A. (2019). Hospitals accreditation status in Indonesia: Associated with hospital characteristics, market competition intensity, and hospital performance? *BMC Health Services Research*, 19(1), 372. Advance online publication. doi:10.1186/s12913-019-4187-x PMID:31185984

Yan, A., Zou, Y., & Mirchandani, D. A. (2020). How hospitals in mainland China responded to the outbreak of COVID-19 using information technology-enabled services: An analysis of hospital news webpages. *Journal of the American Medical Informatics Association*, 27(7), 991–999. 10.1093/jamia/ocaa064

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