7-4-2022

IT Governance Mechanisms that Influence Digital Transformation: A Delphi Study in Indonesian Banking and Insurance Industry

Rahmat Mulyana
Stockholm University, rahmat@dsv.su.se

Lazar Rusu
Stockholm University, lrusu@dsv.su.se

Erik Perjons
Stockholm University, perjons@dsv.su.se

IT Governance Mechanisms that Influence Digital Transformation: A Delphi Study in Indonesian Banking and Insurance Industry

Completed Research Paper

Rahmat Mulyana
Stockholm University
Borgarfjordsgatan 12, Kista, Sweden
rahmat@dsv.su.se

Lazar Rusu
Stockholm University
Borgarfjordsgatan 12, Kista, Sweden
lrusu@dsv.su.se

Erik Perjons
Stockholm University
Borgarfjordsgatan 12, Kista, Sweden
perjons@dsv.su.se

Abstract

IT governance (ITG) structures, processes, and relational mechanisms play an important role in supporting organisations' digital transformations (DT). However, traditional ITG mechanisms might no longer be valid. Unfortunately, few studies have investigated this phenomenon. Previously, a systematic literature review based on top rank journals and conference proceedings has identified 28 ITG mechanisms influencing DT. A Delphi study was conducted to validate these mechanisms to examine perceived experiences among Indonesian banking and insurance industry experts. The results provide the researchers and practitioners with a validated and extended list of 46 ITG mechanisms that influence DT, including 20 structures, 21 processes, and 5 relational mechanisms. Moreover, the results include a perceived ranking of the effectiveness and ease of implementation of the ITG mechanisms. Finally, the paper presents the top ten important ITG mechanisms, which could be used as a baseline toward a successful DT journey for banking and insurance organisations.

Keywords: Digital Transformation, IT Governance Mechanisms, Structures, Processes, Relational Mechanisms, Delphi Study, Banking, Insurance, Indonesia.

Introduction

Digital Transformation (DT) journey will deliver the competitive advantage to survive the disruption from the emergence of the digital technologies, the fast pace of competitors' digital innovation, and the changes in consumer behaviour, according to Warner and Wäger (2019). Despite that many incumbent organisations have responded with significant investments in DT, unfortunately, most of these efforts fail to meet or exceed expectations because they suffer from poor governance, as revealed by Obwegeser et al. (2020). Previous studies have identified that IT governance (ITG) provides alignment between business and information technology (De Haes and Van Grembergen 2008a) and also increases an organisation's performance (Vejseli and Rossmann 2017). However, according to DeLone et al. (2018), the traditional ITG mechanisms might no longer be valid in the digital era. To date, only a few studies have investigated the new ITG mechanisms and their influence on DT. For example, Rincon et al. (2020) have revealed the traditional ITG mechanisms that still influence the oil and gas companies' continuous innovation. Whereas Vejseli et al. (2022) have identified the hybrid influence of agile and traditional ITG mechanisms that influence the banking companies. Similarly, Jöhnk et al. (2022) also identified the multiple concurrent initiatives fostering hybrid ambidexterity that coheres and balances exploration (agile setups) and exploitation efforts to manage the complexity of DT.

There are often confusion about "digital" related terms due to ambiguous definitions. According to Frenzel et al. (2021, p. 8), "digitisation is the fully digital creation of information and data without a physical or analog counterpart", while "digitalisation is the use and application of digital technologies in contexts of individuals, organisations, or society at large, as well as the influences induced by this usage". Whereas "digital transformation is a fundamental change process, enabled by the innovative use of digital technologies accompanied by the strategic leverage of key resources and capabilities, aiming to radically improve an entity [e.g., an organization, a business network, an industry, or society] and redefine its value proposition for its stakeholders" Gong and Ribiere (2021, p. 12). While Spremic (2017, p. 215) differentiate digital technologies with IT by referring to "set of digital resources (technologies, tools, applications and algorithms) which enable efficient discovery, analysis, dissemination and usage of digital goods (e.g. mobile, social networks, cloud computing, big data, sensors and IoT, robotics, virtual and augmented reality, and all other emerging technologies)."

On the other hand, there is also another mix-up term between "IT governance" (ITG) and "IT management" (ITM), considering the few literatures that distinguish between the two. To differentiate with ITM, Peterson, 2003, as cited in Van Grembergen et al. (2004, p. 4) argues that "ITG concentrates on performing and transforming IT to meet the present and future demands of the business (internal focus) and the business' customers (external focus), whereas ITM focuses on the internal effective supply of IT services and products and the management of present IT operations". Later, De Haes et al. (2020, p. 3) define ITG as "an integral part of corporate governance, which the board is accountable, that involves the structures (i.e., Chief Information Officer, CIO), processes (i.e., IT strategic planning), and relational mechanisms (i.e., IT leadership) that enable both business and IT stakeholders to execute their responsibilities in support of business/ IT alignment and the creation and protection of IT business value".

A recent literature review of 46 articles from top-rank journals and conference proceedings from Mulyana et al. (2021) has identified 28 ITG mechanisms that influence DT. However, there is still a need to validate those ITG mechanisms in an industry context that is heavily disrupted by the financial technology, such as banking and insurance companies in Indonesia (Purba et al. 2019). To follow up this matter, we performed a multistage questionnaire-based consensus reaching technique from the expert panel, which is called as Delphi method (Schmidt 1997). Such research will extend the existing limitation of ITG mechanisms theory by not only validating the newly identified and traditional "strategic" and "management" level of ITG (De Haes and Van Grembergen 2008b, pp. 7-8) but also adding the "operational" level ITG mechanisms, sometimes called IT Management, that influence the successful DT.

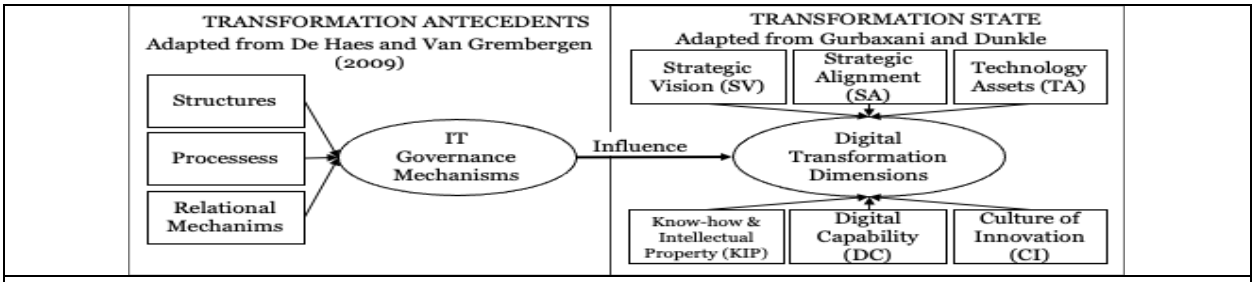


Figure 1. The research conceptual framework (adapted from De Haes and Van Grembergen (2009, p. 3) and Gurbaxani and Dunkle (2019, pp. 211-213))

The Delphi study presented in this paper has used the conceptual framework shown in Figure 1 that presents the ITG mechanisms as the transformation antecedents that influence the six dimensions of DT, in the transformation state. The three categories of ITG mechanisms of the conceptual framework in Figure 1 all of them are defined by Peterson (2004, pp. 14-15) as follows: ITG structures are defined as "structural (formal) devices and mechanisms for connecting and enabling horizontal, or liaison, contacts between business and IT management (decision-making) functions"; ITG processes are defined as "the formalisation of strategic IT decision-making, monitoring procedures, and performance; and the ITG relational mechanisms are defined as "the active participation of, and collaborative relationship between corporate executives, IT management, and business management".

The six DT dimensions of the conceptual framework shown in Figure 1 are, according to Gurbaxani and Dunkle (2019, pp. 212-213), described in the following way: Strategic Vision (SV) is "the existence of strategic digital future visualisation"; Strategic Alignment (SA) is "the commitment and collaboration to

support DT from strategic to operational level"; Technology Assets (TA) is "the ownership of digital technologies"; Know-how and Intellectual Property (KIP) is "the proficiency on how to use digital platforms as leverage"; Digital Capability (DC) is "the availability of digital talents"; whereas Culture of Innovation (CI) is "the presence of mechanisms that encourage invention and estimated risk-taking" (Gurbaxani and Dunkle (2019, pp. 212-213).

Background

Theoretical-wise, the disruption of digital technologies has pushed incumbent companies to endure a DT journey (Warner and Wäger 2019). Thus, to remain relevant, they need to innovate their business model and transform their business to explore new value-creation opportunities (Frenzel et al. 2021). Moreover, DeLone et al. (2018) argue about the effectiveness of traditional ITG in digital era. To answer that, (Jöhnk et al. 2022); Mulyana et al. (2021); (Vejseli et al. 2022) have found the influence of ambidexterity theory which gives rise to the agile/ adaptive ITG mechanisms that strengthen the exploration side, which is combined as hybrid approach with the exploitation side by the influence of traditional ITG mechanisms from De Haes and Van Grembergen (2008a); (Rincon et al. 2020). Not to mention that the ITG mechanisms could be revamped by the digitalisation as revealed by Kirchmer (2021). On the one hand, the concept of exploration and exploitation themselves have been coined by March (1991) in organisational learning toward competitive advantage in competition for primacy. These constructs offer the combination of risk-taking approach for experimentation, discovery and innovation, with the production, efficiency, and refinement. On the other hand, through a strategic management lens, it can be viewed that DT is a macro-level organisational outcomes built of routines and capabilities, similar to the six dimensions of DT from Gurbaxani and Dunkle (2019), which are the following: strategic vision, strategic alignment, technology assets, know-how and intellectual property, digital capability, and culture of innovation. These organisation's collective outcomes are impacted by the micro-level or microfoundation components such as individuals, structures, processes, and the interaction between them (Felin et al. 2012). They are analogous with the concept of ITG mechanisms that consists of structures, processses, and relational (Van Grembergen et al. 2004). Likewise, Elazhary et al. (2022) also found that the ITG mentioned above act as the microfoundation that influence the organizational agility through the mediation of innovation and IT capabilities for rendering DT as safe and smooth as possible, by extending the resource-based view of Wernerfelt (1984) with the dynamic capabilities view of Teece and Pisano (1994).

Practical-wise, this research has considered Indonesia because it has the most significant digital economy development predicted in the ASEAN countries (from 44 billion USD in 2020 toward the predicted value of 124 billion USD in 2025), and has a prospective market for banking and insurance digital services (Google et al. 2020). Indonesia Financial Service Authority (2021) has published the 2021-2025 Indonesia Financial Services Sector (FSS) Master Plan that focuses on three areas, namely: (1) Strengthening Resilience and Competitiveness, (2) Financial Services Ecosystem Development, and (3) Digital Transformation (DT) Acceleration. The DT acceleration is a specific focus area due to the customer's changing needs and expectations for fast, efficient, and secure financial services accessible anywhere and anytime. Furthermore, DT requires the Indonesian's banking industry to shift from a traditional bank to a modern one by adjusting their digital business strategies, rearranging distribution networks, and pushing the transactions via digital channels to enhance customer experience. However, they need to balance digital innovation with the proper governance to maintain prudent, safe and sound financial services, according to Indonesia Financial Service Authority (2021).

Therefore, this study has formulated a number of research questions (RQs) to find how ITG mechanisms influence DT in the Indonesian banking and insurance industry. The main research question (RQ1) of this study is: "What are the IT governance (ITG) mechanisms that influence digital transformation in the Indonesian banking and insurance industry?". It is followed by two research questions related to the main research question. The second research question (RQ2) is: "How effective and easy are these ITG mechanisms to be implemented?". The third research question (RQ3) is: "What are the top ten ITG mechanisms considered as a baseline?". To answer these RQs, we have conducted the Delphi study, which is a multistage questionnaire-based consensus reaching technique based on the experts (Schmidt 1997).

Research Methodology

This research has used Delphi as a research method as other studies have performed like, e.g. Rincon et al. (2020) in their research study on IT governance practices. The Delphi method is well suited for new

research areas and exploratory studies that rely on an expert panel of relevant practitioners and researchers where a number of rounds of questionnaires have been used to achieve consensus (Skinner et al. 2015).

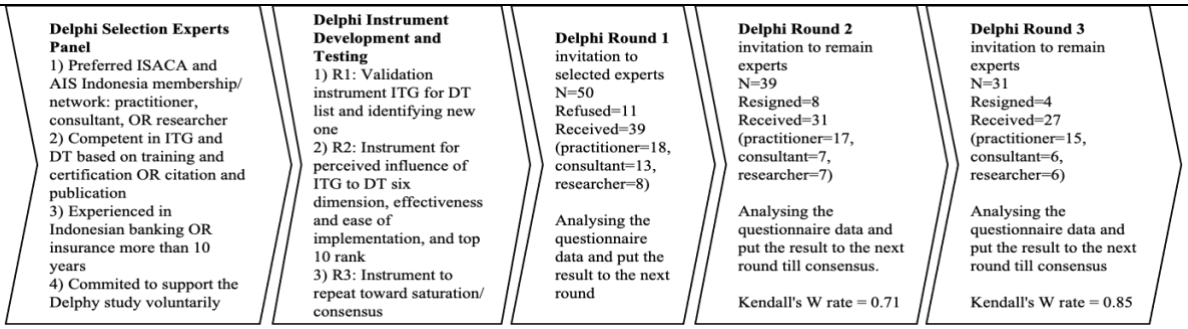


Figure 2. Delphi Research Processes

According to Okoli and Pawlowski (2004), the Delphi method can build the most reliable consensus of experts. For this purpose, a multistage questionnaire-based agreement has been used, and the Delphi research processes are shown in Figure 2.

N	Code	Edu.	Exp.	Ind. Type	Role	Position	Expertise
1	CO01	Master	13	Insurance	Consultant	CxO/BoD	COBIT, CISA, ISO 27001, ISO 9001
2	CO02	Bachelor	15	Insurance	Consultant	Sr.Mgr./DH	COBIT, ISO38500, ISO31000, ISO27001, ITIL
3	BA01	Bachelor	15	Banking	Practitioner	Sr.Mgr./DH	CISA, CDPSE, BSMR
4	CO03	Master	22	Banking	Consultant	CxO/BoD	CIA, CRISC, CRMA, CERM, GRCA, GRCP
5	CO04	Doctorate	17	Banking	Consultant	Sr.Mgr./DH	CISA, CISSP, PMP
6	CO05	Bachelor	25	Banking	Consultant	CxO/BoD	CISA, CIA, BSMR
7	IN01	Master	25	Insurance	Practitioner	Sr.Mgr./DH	TOGAF, ITIL
8	BA02	Master	17	Banking	Practitioner	Sr.Mgr./DH	CISA, BSMR
9	CO06	Doctorate	20	Insurance	Consultant	CxO/BoD	COBIT, ITIL, CISM, CRISC
10	BA03	Master	18	Banking	Practitioner	Sr.Mgr./DH	CISA, CGEIT, COBIT, ITIL, PRINCE, CDTP
11	BA04	Master	25	Banking	Practitioner	CxO/BoD	CISA, CISM, CDPSE, CSX
12	IN02	Bachelor	25	Insurance	Practitioner	Sr.Mgr./DH	CISA, CISM, ISO27001, COBIT, CEH
13	CO07	Master	13	Insurance	Consultant	CxO/BoD	CISA, TOGAF, ITIL, PRINCE, ISO 27001
14	CO08	Master	20	Insurance	Consultant	CxO/BoD	CIA, CRMA, CISA, CRISC
15	CO09	Bachelor	19	Insurance	Consultant	CxO/BoD	CISA, COBIT
16	IN03	Doctorate	20	Insurance	Practitioner	Sr.Mgr./DH	BSMR
17	BA05	Bachelor	15	Banking	Practitioner	Sr.Mgr./DH	CISM, BSMR
18	IN04	Bachelor	30	Insurance	Practitioner	CxO/BoD	CISA, CISM, CIA, QIA, CFE, CRMP, CERG
19	IN05	Master	20	Insurance	Practitioner	Sr.Mgr./DH	OCP, CRGP
20	BA06	Master	15	Banking	Practitioner	Mgr. /GH	CISA, CISM, CEP
21	CO10	Master	23	Banking	Consultant	Sr.Mgr./DH	CISA, CISM, CRISC, ITILF, TOGAF, COBIT
22	IN06	Master	20	Insurance	Practitioner	Mgr. /GH	CISA, CFE, COBIT, ITIL
23	BA07	Master	15	Banking	Practitioner	Mgr. /GH	CISA, BSMR
24	CO11	Master	20	Insurance	Consultant	CxO/BoD	CISA, CISM, CGEIT, CRISC, CRMA, COBIT
25	BA08	Master	16	Banking	Practitioner	Mgr. /GH	CISA, CISM, CGEIT, CRISC, CDPSE, COBIT
26	CO12	Master	17	Banking	Consultant	Sr.Mgr./DH	CISA, CRISC, TOGAF, ITIL, COBIT
27	IN07	Bachelor	10	Insurance	Practitioner	Mgr. /GH	CRISC, CISM, COBIT, ITIL
28	CO13	Bachelor	22	Banking	Consultant	CxO/BoD	CISA
29	IN08	Master	16	Insurance	Practitioner	CxO/BoD	CISA, CISM, CDPSE, GRCA, GRCP
30	BA09	Bachelor	10	Banking	Practitioner	Mgr. /GH	CISA, ISO27001
31	BA10	Master	11	Banking	Practitioner	Mgr. /GH	CISA
32	RE01	Doctorate	25	Insurance	Researcher	Professor	1000+ citations in ITG, DT, IS, TA
33	RE02	Doctorate	25	Insurance	Researcher	Sr. Researcher	500+ citations in ITG, DT, EA, EGov
34	RE03	Doctorate	15	Banking	Researcher	Researcher	250+ citations in ITG, DT, BPM, DI
35	RE04	Doctorate	23	Banking	Researcher	Sr. Researcher	500+ citations in ITG, DT, EA, IS
36	RE05	Doctorate	24	Banking	Researcher	Sr. Researcher	500+ citations in ITG, DT, ISMS, ISA
37	RE06	Doctorate	24	Insurance	Researcher	Professor	1000+ citations in ITG, DT, EA, IS
38	RE07	Doctorate	18	Insurance	Researcher	Sr. Researcher	1000+ citations in ITG, DT, GRC, IS
39	RE08	Doctorate	24	Banking	Researcher	Professor	1000+ citations in ITG, DT, RM, CS

Abbreviation: Edu=Education. Exp=Experience, Ind=Industry. COXY=consultant no. XY. BAXY=bank practitioner no. XY. INXY=insurance practitioner no. XY. REXY=researcher no. XY. CxO=chief X officer. BoD=board of directors. Sr=senior. Mgr=manager. DH=division head. GH=group head.

Expert certifications area: COBIT; ISO38500; GRCP=IT governance. CISA=IS auditor. ISO27001; CISM; CISSP; CEH; CSX, ISFS=information security. ISO9001=quality management. ISO31000; CRMA; BSMR; CERM; CRISC; CRMP; CERG; CRGP=risk management. ISO20000; ITIL=services management. QIA; CIA; GRCA=internal auditor. CDPSE=data privacy. PMP; PRINCE=project management. CFE=fraud examiner. TOGAF=enterprise architecture. "1000+" means more than 1000. IS=information systems. TA=technology adoption. Egov=E-government. BPM=business process management. DI=digital innovation. ISA=IS audit. GRC=governance, risk management, compliance. RM=risk management, CS=computer science.

Table 1. The 1st round Delphi expert panel

Regarding the ethical considerations, this research has followed the four fundamental principles of social research ethics based on Denscombe (2017). These are the protection of the interests of the participants by ensuring that participation is voluntary and based on informed consent, avoiding deception, operating with scientific integrity, and complying with the laws of the country.

In doing this research, we have followed the guidelines provided by Okoli and Pawlowski (2004). At the beginning of this study, a number of 50 experts with at least ten years of experience were invited to take part in this study. The participants are practitioners and consultants from the banking and insurance industry in Indonesia and also researchers from well-known universities in Indonesia. A number of 39 out of 50 invited experts have agreed to participate in this study as are shown in Table 1.

The 39 Delphi experts have profound experience in the banking and insurance industry and a broad experience in DT. They also have ITG-related professional certifications that further justify their expertise, for example, certifications in CGEIT, CRISC, CISA, CISM, CDPSE, COBIT, ITIL, TOGAF, ISO 20000, ISO 27001. At the same time, the participants from the universities in Indonesia are well-experienced researchers in ITG and DT related to financial services, as shown in Table 1.

In the first round of the Delphi study, a consent form was used to collect the participant's personal data. The collected data included: the full name (confidential, therefore encoded), education, experience, type of experience, job type, position, and expertise, as shown in Table 1. Then, all 39 participants were provided with a questionnaire with an initial list of 28 ITG mechanisms (6 structures, 17 processes, and 5 relational mechanisms) including a description of each mechanism. These were taken from a previous literature review (Mulyana et al. 2021), are shown in Table 3, and are those not marked with an asterisk (*) symbol. Moreover, the participants were asked to confirm this initial list of 28 ITG mechanisms. All the experts confirmed the initial list. At the same time, they were requested to write qualitative comments related to these ITG mechanisms as well as suggest other ITG mechanisms that influence DT according to their experiences. Based on these suggestions, the provided initial list was also extended with 18 new ITG mechanisms. If a new ITG mechanism was suggested, the participant was requested to explain the influence on DT in form of a comment. There are 24 general comments provided by the experts, which are discussed in the first sub-section of analysis and findings. The result of the first-round was 46 ITG mechanisms which consists of 20 structures, 21 processes, and 5 relational mechanisms, as shown in Table 3.

In the second round of the Delphi study, the first-round aggregated result was sent to the participants and they were asked to rate the ITG mechanisms influence on the six dimensions of DT from Gurbaxani and Dunkle (2019) by using "one" for agree or "null" for disagree. They were also asked to fill their perceived ITG mechanisms effectiveness (scale 0 to 5, the higher-the more effective), ease of implementation (scale 0 to 5, the higher-the easier to implement), and their perceived ranks. There were 31 of 39 experts who contributed in the second round because of the time constraint. After that, the second-round result was averaged, the deviation standards were checked, including the Kendall's W rate according to Schmidt (1997) for checking the consensus level, and it got the result 0.71.

Since the consensus level was not enough, *the third-round Delphi was executed*. The 31 experts were given the previous round average result, and they were asked to revalidate all of their last answers toward consensus. There were 27 experts who contributed in the third round and in this round four components were analysed. The Kendall's W for this round was 0.85, indicating a strong agreement level achieved in the third round (Schmidt 1997). Therefore, another round of the Delphi study was not needed. The analysis and results of the Delphi study three rounds is presented in the next section.

Analysis and Findings

In the Delphi first round, the 28 ITG mechanisms that influence the DT in the initial list from the previous literature review paper has been validated and also extended to 46 ITG mechanisms by 39 experts. Then, in the second round, there were 31 experts who returned the filled form and gave the ITG mechanisms perceived influence to the six DT dimensions, their perceived effectiveness and ease of implementation, and also their ranks. Finally, in the third round, there were 27 experts who were willing to revalidate all their answers toward consensus. The results have been analysed, and the findings are discussed in the following sub-sections.

The Influence of Agile/Adaptive and Traditional ITG Mechanisms to DT

The list of the ITG mechanisms that influence DT after the first round of the Delphi study is shown in Table 3. In this sub-section, we describe the ITG mechanisms and the description of the influence on DT given by the respondents in the first round of Delphi study. For example, IN06 has stated that "ITG mechanisms positively influence DT." Likewise, IN01 added an explanation that "ITG is required to make the DT processes accountable" and commented that "agile-based IT governance is suitable to perform a DT".

However, IN02 argued that "agile might not be applicable or difficult to be implemented in all IT projects". Moreover, IN06 has also added that "sometimes a project doesn't fit with agile methodology and need a traditional approach like the Waterfall". Not to mention that "traditional ITG mechanisms is still required due to regulatory reporting", according to CO04, strengthened by BA01, claiming that the traditional ITG mechanisms "is still required since well-documented projects is a requirement enforced by the regulations".

Correspondingly, CO12 emphasised that "the requirements from regulators are an essential aspect in the financial service industry like banking and insurance", in order "to have proper documentation and controls", and this was supported by IN08 and RE01. RE03 also revealed the Indonesia Financial Services Authority latest regulations, which are "POJK 38/2016 for banking and the newly introduced POJK 4/2021 for non-bank financial services; that mandate the risk management of IT for both sectors".

Subsequently, CO03 added as follows: "Both new regulations are actually using the same principle-based format, although in detail, a different set of IT governance mechanisms might be needed". The statement is in line with CO02 that has wrote that "generic large bank and insurance can use the same IT governance mechanisms to safeguard their assets".

Nevertheless, BA02 argued that "a large bank presumably have more significant product complexity than insurance since it offers complex working capital financing products". This argument is also related to both sectors' maturity in using digital technologies. As stated by CO09: "the governance maturity level from both industries is different that makes the banks need to provide more governance practices than the insurance".

Moreover, CO08 mentioned that "in fact, some banks and insurances are still referring to the traditional ITG approach (i.e., COBIT 4.1 or 5 from ISACA) as a reliable ITG framework". Similarly, CO09 brought another view that "from the auditor's perspectives, the traditional way is still preferable to help them set the baseline for assurance purposes".

Therefore, BA08 diplomatically argued that "both approaches, agile and traditional, are needed to keep as an option since they have strengths and weaknesses". This is in line with BA03 statement that "the hybrid approach should be increased and improved to embrace fast pacing environment and customer behaviour changing. Similarly, CO03 added that "the configuration needs to be hybrid to allow smooth digital transformation".

Furthermore, RE03 also argued that "the progression toward digital transformation does not fall into binary traditional or agile options, rather, something that runs along a spectrum, by blending them and reap the merits provided". On the other hand, CO12 believed that "for a project with specific goals and metrics, and tightly-coupled system development such as core system implementation, the use of waterfall is still a better option". Moreover, BA07 also stated that "for the core banking system, it is expected that the system should be reliable and stable 24/7 (all time). Thus, affecting how the changes and development of this system. It is suitable using Waterfall". IN08 also stated that "sometimes the company think it is too risky to adopt the agile approach for the core or sensitive systems". Whereas "for the customer-facing apps (mobile apps etc.) that heavily rely on attractive features with speed and time to market as an essential principle, then it is suitable using the agile method", according to BA07.

The influence of agile and traditional ITG mechanisms on business/IT alignment, and then to the performance of organisations, has also been investigated by Vejseli et al. (2020). In addition, to "agile" and "traditional", there are also "digital" ITG mechanisms as identified in the previous LR paper (Mulyana et al. 2021). The participants agreed that all ITG mechanisms, especially the ITG processes, can be optimised by using the emerging technology. It is relevant with Kirchmer (2021) statement that "ITG processes must go through a digital transformation itself by leveraging appropriate tools as an important foundation of successful digital transformation". An example is how big data analytics can help carry out an IT audit, as is mentioned by Manita et al. (2020).

The Validated IT Governance Mechanisms that Influence Digital Transformation

In the first round, the Delphi experts identified 18 new ITG mechanisms, as shown in an asterisk (*) in Table 3. In this sub-section, these newly added ITG mechanism identified by the experts are presented, and supported by the provided literatures. The experts have identified the S1-Chief Executive Officer (CEO) as justified by Weigel et al. (2020) that the CEO's leadership and digital competencies are decisive factors for sponsoring a successful DT. Then, the experts identified the S5-Chief Information Security Officer (CISO) and the S18-Information Security Function as new ITG mechanisms. Both are confirmed by Maynard et al. (2018) claiming that CISO is a 'strategist' that is supported by the function to secure the information assets from digital risks.

The first column of Table 2 shows the validated 46 ITG mechanisms with their influence to the six DT dimensions. Whereas the next columns concern those ITG mechanisms influence on DT's six dimensions (SV-CI), their effectiveness, ease of implementation and top ten ranks for the 2nd and 3rd rounds.

ITG	2nd Round									3rd Round								
	SV	SA	TA	KIP	DC	CI	Eff.	Ease OI.	Rank	SV	SA	TA	KIP	DC	CI	Eff.	Ease OI.	Rank
S1	0,96	0,89	0,82	0,74	0,71	0,89	4,46	4,25	6	0,96	0,92	0,84	0,81	0,82	0,93	4,49	4,25	6
S2	1,00	0,85	0,87	0,82	0,82	0,85	4,51	4,03	1	1,00	1,00	1,00	0,93	0,89	0,96	4,68	4,04	1
S3	0,92	0,95	0,82	0,90	0,95	0,95	4,51	3,69	3	0,93	0,96	0,89	0,96	0,93	0,89	4,57	3,57	3
S4	0,69	0,72	0,79	0,79	0,79	0,72	3,92	3,23	8	0,80	0,91	0,82	0,96	0,85	0,81	3,89	3,04	8
S5	0,79	0,71	0,86	0,79	0,79	0,71	3,46	3,75	16	0,81	0,88	0,87	0,81	0,81	0,82	3,56	3,75	17
S6	0,75	0,77	0,68	0,75	0,71	0,77	3,46	3,86	22	0,82	0,84	0,81	0,84	0,81	0,84	3,47	3,86	25
S7	0,68	0,75	0,69	0,77	0,81	0,75	3,25	3,43	37	0,83	0,81	0,80	0,86	0,87	0,83	3,32	3,43	38
S8	0,64	0,79	0,68	0,75	0,72	0,79	2,96	3,54	24	0,81	0,80	0,83	0,80	0,80	0,81	2,95	3,54	26
S9	0,90	0,82	0,76	0,87	0,67	0,82	4,03	3,46	2	0,89	0,96	0,81	0,89	0,90	0,86	4,19	3,48	2
S10	0,79	0,72	0,72	0,79	0,87	0,72	4,03	3,44	5	0,93	0,93	0,82	0,81	0,70	0,82	3,89	3,33	5
S11	0,79	0,71	0,68	0,72	0,71	0,71	3,36	3,39	29	0,86	0,83	0,80	0,81	0,82	0,82	3,36	3,39	30
S12	0,61	0,68	0,76	0,71	0,62	0,68	2,89	3,46	31	0,80	0,81	0,83	0,82	0,81	0,81	2,99	3,46	32
S13	0,71	0,82	0,74	0,68	0,86	0,82	3,57	3,71	10	0,82	0,93	0,80	0,80	0,87	0,83	3,67	4,25	10
S14	0,68	0,71	0,75	0,61	0,82	0,71	3,64	3,43	11	0,81	0,84	0,84	0,81	0,83	0,81	3,54	3,43	11
S15	0,44	0,92	0,85	0,87	1,00	0,92	4,05	3,56	9	0,17	0,81	0,86	0,93	1,00	0,96	4,04	3,50	9
S16	0,46	0,68	0,86	0,75	0,89	0,68	3,61	3,68	32	0,16	0,83	0,87	0,80	0,90	0,81	3,63	3,68	33
S17	0,54	0,79	0,86	0,82	0,79	0,79	3,26	3,25	33	0,19	0,83	0,86	0,81	0,80	0,85	3,28	3,25	34
S18	0,57	0,68	0,93	0,82	0,89	0,68	3,57	3,64	14	0,20	0,84	0,94	0,83	0,90	0,82	3,56	3,64	14
S19	0,68	0,64	0,78	0,78	0,81	0,64	3,61	3,50	20	0,80	0,83	0,81	0,83	0,82	0,80	3,63	3,50	22
S20	0,54	0,49	0,43	0,70	0,74	0,49	3,21	3,32	38	0,20	0,81	0,19	0,80	0,80	0,20	3,25	3,32	39
P1	0,92	0,85	0,82	0,69	0,82	0,85	4,46	3,72	4	0,96	0,96	0,86	0,82	0,96	0,89	4,64	3,75	4
P2	0,64	0,74	0,87	0,64	0,74	0,74	3,79	3,18	34	0,81	0,93	0,93	0,64	0,86	0,81	3,54	2,79	35
P3	0,49	0,79	0,72	0,79	0,87	0,79	4,00	2,95	30	0,20	0,89	0,84	0,86	0,93	0,93	3,79	2,64	31
P4	0,54	0,72	0,85	0,74	0,85	0,72	3,77	3,28	25	0,20	0,20	0,86	0,79	0,86	0,84	3,64	2,82	28
P5	0,44	0,72	0,90	0,82	0,77	0,72	3,74	3,46	12	0,39	0,86	0,93	0,86	0,89	0,82	3,89	3,25	12
P6	0,59	0,76	0,77	0,69	0,67	0,76	3,62	3,31	45	0,80	0,81	0,89	0,82	0,82	0,82	3,64	2,79	44
P7	0,41	0,79	0,72	0,69	0,72	0,79	3,59	3,36	19	0,16	0,20	0,81	0,82	0,86	0,89	3,57	3,07	23
P8	0,41	0,69	0,72	0,82	0,82	0,69	3,67	3,38	23	0,15	0,18	0,89	0,86	0,93	0,81	3,64	3,00	27
P9	0,44	0,46	0,74	0,77	0,82	0,46	3,69	3,23	39	0,17	0,20	0,81	0,89	0,89	0,20	3,64	2,96	40
P10	0,48	0,73	0,72	0,85	0,88	0,73	3,56	3,41	36	0,19	0,19	0,81	0,87	0,89	0,82	3,61	3,41	37
P11	0,44	0,77	0,74	0,72	0,70	0,77	3,30	3,04	40	0,17	0,18	0,83	0,81	0,82	0,84	3,39	3,04	41
P12	0,68	0,79	0,78	0,85	0,85	0,79	3,52	3,19	27	0,81	0,84	0,80	0,87	0,86	0,87	3,52	3,19	29
P13	0,66	0,82	0,79	0,85	0,95	0,82	3,95	3,54	17	0,80	0,81	0,81	0,86	0,95	0,83	3,97	3,54	19
P14	0,54	0,77	0,76	0,90	0,87	0,77	3,87	3,38	28	0,82	0,86	0,84	0,86	0,96	0,93	4,00	3,32	16
P15	0,64	0,95	0,77	0,82	0,95	0,95	4,13	3,38	21	0,81	0,82	0,81	0,93	0,96	0,89	3,86	2,96	24
P16	0,61	0,67	0,76	0,67	0,74	0,67	3,87	3,41	41	0,80	0,81	0,86	0,86	1,00	0,96	4,29	3,18	13
P17	0,74	0,95	0,44	0,67	0,79	0,95	4,36	3,28	26	0,86	0,93	0,20	0,89	0,93	0,81	3,93	3,14	21
P18	0,56	0,62	0,42	0,67	0,64	0,62	3,49	3,18	35	0,86	0,93	0,21	0,82	0,81	0,85	3,79	2,93	36
P19	0,72	0,74	0,64	0,69	0,72	0,74	3,85	3,26	18	0,82	0,93	0,81	0,86	0,81	0,83	3,57	2,79	20
P20	0,59	0,72	0,64	0,74	0,79	0,72	3,74	3,36	46	0,82	0,89	0,84	0,80	0,82	0,78	3,57	2,93	45
P21	0,48	0,59	0,43	0,73	0,73	0,59	3,00	3,15	42	0,20	0,89	0,14	0,80	0,86	0,74	3,36	3,07	42
R1	0,95	0,95	0,56	0,81	0,85	0,95	4,49	3,46	7	0,96	0,93	0,75	0,79	0,86	0,96	4,54	3,16	7
R2	0,79	0,54	0,62	0,74	0,74	0,54	3,44	3,26	13	0,82	0,96	0,84	0,80	0,86	0,81	4,11	2,89	15
R3	0,67	0,79	0,59	0,56	0,79	0,79	3,95	3,13	15	0,89	1,00	0,81	0,82	0,86	0,93	4,14	2,96	18
R4	0,44	0,74	0,36	0,74	0,90	0,74	3,46	3,67	43	0,20	0,81	0,19	0,93	0,93	0,82	3,39	3,68	43
R5	0,67	0,64	0,62	0,72	0,85	0,64	3,82	3,31	44	0,86	0,82	0,81	0,86	0,86	0,81	3,82	3,26	46

Notes: S=Structures, P=Processes, R=Relational, ITG=IT Governance, SV=Strategic Vision. SA=Strategic Alignment. TA=Technology Assets. KIP=Know-how and Intellectual Property. DC=Digital Capability, CI=Culture of Innovation. Eff=Effectiveness. oI=of Implementation.

Table 2. Delphi 2nd & 3rd round results – ITG influence on DT, their effectiveness and ease of implementation and the top ten ranks ITG mechanisms that influence DT

Consequently, the experts also brought up three ITG mechanisms: S6-Chief Risk Officer (CRO), the S11-Risk Committee, and the S19-Risk and Compliance Function to govern and manage the arisen IT and Digital (ITD) risks. Those mechanisms are justified by Karanja and Rosso (2017) and Ponsignon et al. (2019) who mentioned the importance of P18-A/T ITD Risk Management and P13-ITD Quality Management processes.

Likewise, the experts also identified the S6-Chief Risk Officer (CRO), S8-Chief Audit Executive (CAE), S11-Risk Committee, and S20-Internal Audit (IA) Function as the ITG mechanisms. Wright (2018) confirmed those mechanisms by emphasising that a DT journey will require a stronger relationship between CAE and CRO to strengthen the organisation's P18-A/T ITD Risk Management processes, which are managed by the S20-IA Function and oversighted by the S11-Risk Committee.

In Table 3 column 1, we can see the previous validated 28 S, P, R (Structures, Processes, Relational) from Mulyana et al. (2021), and the 18 newly identified (with asterisks). Whereas in column 2 and 3, the ITG influences to the six DT dimensions (SV-CI) with descriptions. Then, column 3 informs the references validation flow, whether from the literature review (LR) then validated by the experts (E), or in the contrary.

ITG Mechanism	Influence to DT Dimensions						The Description of the Influence on DT	Ref.
	SV	SA	TA	KIP	DC	CI		
S1-Chief Executive Officer (CEO)*	X	X	X	X	X	X	A highest board-level executive who EDM the overall DT	E, L
S2-Chief Information Officer (CIO)	X	X	X	X	X	X	A board-level executive who EDM the DT exploitation side.	LR, E
S3-Chief Digital Officer (CDO1)	X	X	X	X	X	X	A board-level executive who EDM the DT exploration side.	LR, E
S4-Chief Data Officer (CDO2)	X	X	X	X	X	X	A board-level executive who EDM the DT data management.	LR, E
S5-Chief Info. Security O. (CISO)*	X	X	X	X	X	X	A board-level executive who EDM the DT assets protection.	E, L
S6-Chief Risk Officer (CRO)*	X	X	X	-	X	X	A board-level executive who EDM the DT risks management.	E, L
S7-Chief HR Officer (CHRO)*	X	X	-	X	X	X	A board-level executive who EDM the DT talent management.	E, L
S8-Chief Audit Executive (CAE)*	X	X	-	X	-	-	A board-level executive who EDM the DT audit management.	E, L
S9-Transformation Committee	X	X	X	X	X	X	A board and senior management ad hoc body that govern the DT	LR, E
S10-ITD Steering Committee	X	X	X	X	X	X	A board and management-level ad hoc body that manage the DT	LR, E
S11-Risk Committee*	X	X	-	-	-	-	A board-level ad hoc body that oversees the DT risk management.	E, L
S12-Audit Committee*	X	X	-	-	-	-	A board-level ad hoc body that oversees the DT audit management	E, L
S13-Project M. Office (PMO)*	X	X	X	X	X	X	A unit that manages the DT programs and projects.	E, L
S14-ITD Strategy & Architecture F.*	X	X	X	X	X	X	A function/role that manages the DT strategy and architecture.	E, L
S15-ITD Solution Development F.	-	X	X	X	X	X	A function/role that manages the DT solution development.	LR, E
S16-ITD Operations & Service F.*	-	X	X	X	X	X	A function/role that manages the DT operations and services.	E, L
S17-Data M. & Analytics F.*	-	X	X	X	X	X	A function/role that manages the DT data and analytics.	E, L
S18-Information Security F.*	-	X	X	X	X	X	A function/role that manages the DT assets protection.	E, L
S19-Risk & Compliance F.*	X	X	X	X	X	X	A function/role that manages the DT risk and compliance.	E, L
S20-Internal Audit F.*	-	X	-	X	X	-	A function/role that manages the DT audit and assurance.	E, L
P1-(A/T) ITD Strategy M.	X	X	X	X	X	X	Activities to develop, guide and monitoring the DT strategy.	LR, E
P2-(A/T) Enterprise Architecture M.	X	X	X	X	X	X	Activities to align DT strategy to high-level modeling of business, data, application, technology, and security artifacts.	LR, E
P3-(A/T) Business Process. M.	-	X	X	X	X	X	Activities to align DT business arch. to integrated activities.	LR, E
P4-(A/T) Data M.	-	-	X	X	X	X	Activities to align DT data arch. to transact. and analytical DB	LR, E
P5-(A/T) Information Security M.	-	X	X	X	X	X	Activities to align DT security arch. to digital asset protection.	LR, E
P6-(A/T) ITD Portfolio M.	X	X	X	X	X	X	Activities to select, prioritise, distribute, across DT projects.	LR, E
P7-(A/T) ITD Project M.	-	-	X	X	X	X	Activities to initiate, plan, exec., monitor, control, close DT project.	LR, E
P8-(A/T) System Development M.	-	-	X	X	X	X	Activities to align the DT application arch. to system requirements, design, coding, testing, debugging, installation, and maintenance.	LR, E
P9-(A/T) ITD Vendor M.	-	-	X	X	X	-	Activities to procure the DT resources from vendors.	LR, E
P10-(A/T) ITD Ops. & Service M.*	-	-	X	X	X	X	Activities to operate the DT solutions and deliver the service level.	E, L
P11-(A/T) ITD Incident & Prob. M.*	-	-	X	X	X	X	Activities to recover DT interruptions and find the root cause.	E, L
P12-(A/T) Business Continuity M*	X	X	X	X	X	X	Activities to mitigate DT disaster risks.	E, L
P13-(A/T) ITD Quality M.*	X	X	X	X	X	X	Activities to achieve DT products requirement.	E, L
P14-(A/T) ITD Competency M.	X	X	X	X	X	X	Activities to provide DT abilities, attitudes, and traits.	LR, E
P15-(A/T) ITD Knowledge M.	X	X	X	X	X	X	Activities to administer tacit and explicit DT understanding.	LR, E
P16-(A/T) ITD Innovation M.	X	X	X	X	X	X	Activities to create new business values from DT.	LR, E
P17-(A/T) ITD Change M.	X	X	-	X	X	X	Activities to convert a current situation to a desired DT future state.	LR, E
P18-(A/T) ITD Risk M.	X	X	-	X	X	X	Activities to control DT risks to achieve the organisation's goals.	LR, E
P19-(A/T) ITD Business Value M.	X	X	X	X	X	X	Activities to achieve the proposed net-worth of DT projects.	LR, E
P20-(A/T) ITD Maturity & Perform. M	X	X	X	X	X	X	Activities to achieve the DT improvement state & strategic goals.	LR, E
P21-(A/T) ITD Audit & Assurance M.	-	X	-	X	X	X	Activities to assess the DT compliance/conformance & performance.	LR, E
R1-Transformational Leadership	X	X	X	X	X	X	A lead role that empowers DT team collaborations in transformation.	LR, E
R2-Digital Organisational Culture	X	X	X	X	X	X	Social behaviours to support DT in organisation.	LR, E
R3-Cross-functional Collaboration	X	X	X	X	X	X	Cooperations between related internal parties to achieve DT goals.	LR, E
R4-Cross-functional Training	-	X	-	X	X	X	Talent development approach to improve DT employee's teamwork.	LR, E
R5-External Collaboration	X	X	X	X	X	X	Cooperations between internal and external parties such as startups, businesses, outsourcing, research partners and customers for DT.	LR, E

Notes: The ITG with asterisk (*) = the 18 new mechanisms from the experts. The rest ITG = the previous 28 ITG mechanisms from the previous Literature Review (LR) of Mulyana et al. (2021), which has been validated by the Delphi experts (E). L=provided literature as justification. O=officer. F=function. M=management. Prob=problem. Ops=operations. Perform=performance (A/T) = Agile/ Adaptive or Traditional. EDM = Evaluate, Direct, Monitor. ITD = IT & Digital.

ITG Mechanism	Influence to DT Dimensions						The Description of the Influence on DT	Ref.
	SV	SA	TA	KIP	DC	CI		

Table 3. Delphi Results – The ITG Mechanisms that Influence DT

Moreover, the experts listed S7-Chief Human Resource Office (CHRO) as another ITG mechanism, which is justified by Larkin (2017) as the key success factor in attracting, retaining, and upskilling top digital talent. Furthermore, the experts also mentioned the S14-ITD Strategy and Architecture Function as confirmed by Horlach et al. (2019) claiming that its role is to support the leaders in strategic visioning and translating them into the enterprise architecture. All the newly identified ITG mechanisms that influence DT by the experts are shown in Table 3, marked by an asterisk (*) symbol.

The experts also identified the importance of S13-Project Management Office (PMO), which is supported by Ferreira et al. (2018), which have shown that the roles of PMO is to plan, implement, and monitor the DT projects. This apply not only the traditional PMO but also the agile/ adaptive PMO.

Moreover, the experts mentioned that the monitored transformation projects will be realised through digital solutions development and infrastructure implementation that eventually are delivered and operated as digital services. Furthermore, the experts also added the S16-ITD Operations and Services Function, P10-A/T ITD Operations and Services and P11-ITD Incident and Problem Management processes as new ITG mechanisms that influence DT. As justified by Wiedemann (2018), they can perform agile/ adaptive or traditional operations to provide the service delivery and swift recovery when the risks occur.

Moreover, the experts also provided the S17-Data Management and Analytics Function. Schilling et al. (2020) confirmed that to unlock the DT business value, many organisations are intensifying the enterprise-wide data management governed by the S14-Chief Data Officer (CDO2). Furthermore, the experts added P12-A/T Business and Continuity Management as argued by Margherita and Heikkilä (2021) stating that BCM provided critical contingencies for continuing business to mitigate the disaster risks of DT journey.

The Descriptions of ITG Mechanisms Influence on DT Six Dimensions

The 3rd round of the Delphi study recap is shown Table 4. This is compiled from the previous Table 2. In the first row, the experts agreed that 24 (52%) of ITG mechanisms fully influenced (100%) the all six dimensions of DT. The ITG mechanisms consist of 10 ITG structures (i.e., S1-CEO, S2-CIO, S3-CDO1, S4-CDO2, S5-CISO, S9-Transformation Committee, S10-ITD Steering Committee, S13-PMO, S14-ITD Strategy and Architecture and S19-Risk and Compliance Functions).

ITG Mechanisms that Influence DT						Total		Influence	
Structures	Σ	Processes	Σ	Relational	Σ	Σ	%	Σ	%
S1, S2, S3, S4, S5, S9, S10, S13, S14, S19	10	P1, P2, P12, P13, P14, P15, P16, P19, P20	10	R1, R2, R3, R5	4	24	52%	6	100%
S6, S7, S15, S16, S17, S18	6	P3, P5, P17, P18	4	-	-	10	22%	5	83%
-	-	P4, P7, P8, P10, P11, P21	6	R4	1	7	15%	4	67%
S8, S20	2	P9	1	-	-	3	7%	3	50%
S10, S11	2	-	-	-	-	2	4%	2	33%

Table 4. ITG mechanisms that influence DT dimensions

Table 4 is also shown the 10 ITG processes that, according to the experts, influence the DT's six dimensions in full, which are P1-(A/T) ITD Strategy Management, P2-(A/T) Enterprise Architecture Management, P12-(A/T) Businesss Continuity Management, P13-(A/T) ITD Quality Management, P14-(A/T) ITD Competency Management, P15-(A/T) ITD Knowledge Management, P16-(A/T) ITD Innovation Management, P19-(A/T) Business Value Management, and P20 (A/T) Maturity Management. Similarly, compiled from the Table 2, the experts also agreed that there are 4 ITG relational mechanisms that influence DT completely, such as R1-Transformational Leadership, R2-Digital Organisational Culture, R3-Cross-functional Collaborations, and R5-External Collaborations, as shown in Table 4.

The experts' consensus result in Table 2 then compiled as Table 4. The result can be explained based-on the provided literatures, which are used for the justification in the 1st round and also used the provided references from the previous LR in the following narratives. First, all the chief level structures mentioned in Table 4, led by the CEO (Weigel et al. 2020), are involved in DT strategic visioning in the Transformation Committee. Then, the digital vision and innovation will be formulated to strategy and translated toward architecture and portfolio of programs and projects in the ITD Steering Committee, led by the CDO1

(Horlacher et al. 2016). Sometimes the CDO1 role is integrated in CIO role that is covering both the exploration and exploitation sides (Kohli and Johnson 2011). Whereas technically, the processes will be supported by the S14-ITD Strategy and Architecture Function.

Subsequently, the portfolio of business, data, application, infrastructure, and security architecture will be cascaded to programs and projects (Horlach et al. 2019) and then will be implemented by the relevant team while being supervised and monitored systematically by the PMO (Ferreira et al. 2018). The implementation output will be an integrated digital technology asset accompanied by the know-how and its intellectual property to deliver the required digital services (Alter 2020).

Consequently, the related ITD risks (Karanja and Rosso 2017), processes and products quality (Ponsignon et al. 2019), also their compliance to relevant regulations and policies, will be monitored along the strategic, development, and operational cycles. The ITD services delivered will be safeguarded from any kind of interruptions (Caldeira and Brito e Abreu 2008), including the disaster risks, in order to make sure the business continuity (Margherita and Heikkilä 2021).

Afterwards, the digital maturity and DT's performance will be assessed regularly (Thordsen et al. 2020). Whereas the net-worth of business value by measuring the netflow of costs and benefits adjusted by risks, which is proposed in strategic-phase, will also be monitored and measured until the end of the asset lifecycle in the operational-phase (Maes et al. 2012).

All the activities above will be standardised according to all the ITG processes mentioned above. They will be performed by competent digital talents which will form the organisation's digital capability (Khin and Ho 2019). The DT journey will not only be fortified by the hard-governance such as the ITG structures and processes above, but also the soft-governance from ITG relational mechanisms (Smits and Van Hillegersberg 2017), as the 'informal' key success factors of DT journey.

Moreover, the transformational leadership in all governance levels, whether strategic, development, and operational (Weritz et al. 2020), will enlighten the cross-functional team's collaborations to realise the transformation smoothly (Shao and Huang 2018). Not only internal collaborations within the organisation, but also with the external entities such as start-ups, businesses, outsourcing, research partners and customers toward successful DT (Duerr et al. 2018).

However, as shown in Table 4 second row, there are a number of 10 (22%) ITG mechanisms that is perceived by the experts influencing five dimensions of DT (83%). The S6-CRO is perceived not influencing the know-how and intellectual property. Whereas the four structures and two processes as follows are perceived more technical and not influencing the strategic visioning dimension. The structures and processes are as follows: S15-ITD Solutions Development Function, S16-ITD Operations and Infrastructure Function, S17-Data Management and Analytics Function, S18-Information Security Function, P3-(A/T) Business Process Management and P5-(A/T) Information Security Management. Likewise, one structure and last two processes are also perceived not influencing the technology asset, which are the S7-CHRO, P17-(A/T) Change Management and P18-(A/T) ITD Risk Management processes.

Nevertheless, the S6-CRO has an important leadership role to guard the second layer in mitigating ITD risks based on P18-ITD Risk Management process of the "three lines of defence (TLOD)" best practice (Davies and Zhivitskaya 2018), since the ITD risks are inherently getting higher during DT journey (Karanja and Rosso 2017). While the S7-CHRO will take care of the digital talents as the actor behind the successful digitalisation (Larkin 2017), is supported by the P17-ITD Change Management process (P17) to transition the current condition toward the future transformed state. There are two kind of change management in DT, a technical change when implementing a new DT solution configuration, and an organisation-wide changes such as ethics, behaviour and culture of DT journey (Hartl 2019).

Whereas the functions mentioned above are responsible to develop the digital solutions (S15) based on the business models innovation, supported by the business process management practices (P3), to manage the data standardisation, databases, and its analysis in cooperation with the developer (S17), to operate the systems and delivering their services and related support (S16), to secure all related assets such as the data and information, application, technology, and the people behind them (S18 and P5).

On the other hand, there are six ITG processes and one relational mechanism that is perceived to influence 'only' four dimensions DT (67%) by the experts. These are the P4-(A/T) Data Management, P7-(A/T) ITD Project Management, P8-(A/T) System Development Management, P10-(A/T) ITD Operations and Service Management, P11-(A/T) ITD Incident and Problem Management, which are perceived as not influencing

the strategic visioning and alignment. In fact, they are involved more in strategy execution, particularly in development and implementation project, then the operation activities to deliver the digital services and support the related stakeholders. Whereas P21-(A/T) Audit and Assurance Management and R4-Cross Functional Training are perceived not influencing the strategic visioning and technology asset.

The processes mentioned above (P4, P7, P8, P10, P11) are actually the activities performed by the previous relevant functions (S17, S15, S16) that manage the development and operational level in DT (Gerster et al. 2018; Ghantous and Gill 2017; Pentek et al. 2017; Salovaara et al. 2019). Meanwhile, the audit and assurance management (P21) will provide the standardised practice in performance and conformance evaluation, monitoring and assessing DT activities (Mkoba and Marnewick 2020), as the third layer of defence implementation in mitigating the digital risks (Davies and Zhivitskaya 2018). Whereas cross-functional training will improve all related actors' knowledge and skills in DT (Horlacher et al. 2016).

Moreover, there are two structures, S8-CAE, S20-Internal Audit (IA) Function, and one process, P9-(A/T) ITD Vendor Management, that are perceived by the experts to 'only' influence 3 three DT dimensions (50%). The CAE (S8) as the 'strategic' third layer of defence in mitigating the ITD risks is perceived not influencing the technology assets, digital capability, and culture of innovation. It is supported by the S20-IA Function technically in executing the audit and assurance activities (Betti and Sarens 2021). In particular, the IA Function require specific knowledge and skills in digital auditing. Whereas the P9-ITD Vendor Management is perceived only influence the procurement of technology assets and the know-how and IP, that form the digital capability for DT (Rueckel et al. 2020).

Furthermore, the last two structure of S10-Risk and S11-Audit Committees are perceived by the experts 'only' influencing two DT dimensions (33%), which are the strategic visioning and alignment. It is relevant with their high-level 'strategic' ad hoc position in overseeing the overall risks management and audit processes according the TLOD best practice (Davies and Zhivitskaya 2018), and not specific for ITD only (Malik et al. 2020).

The ITG Mechanisms Perceived Effectiveness and Ease of Implementation

In this section, the perceived ranking of the effectiveness and ease of implementation of the ITG mechanisms are presented based on the Delphi study. According to Figure 3, the most effective ITG mechanism for successful DT is the S2-CIO as the board-level structure who evaluates, directs, monitors the DT exploitation side.

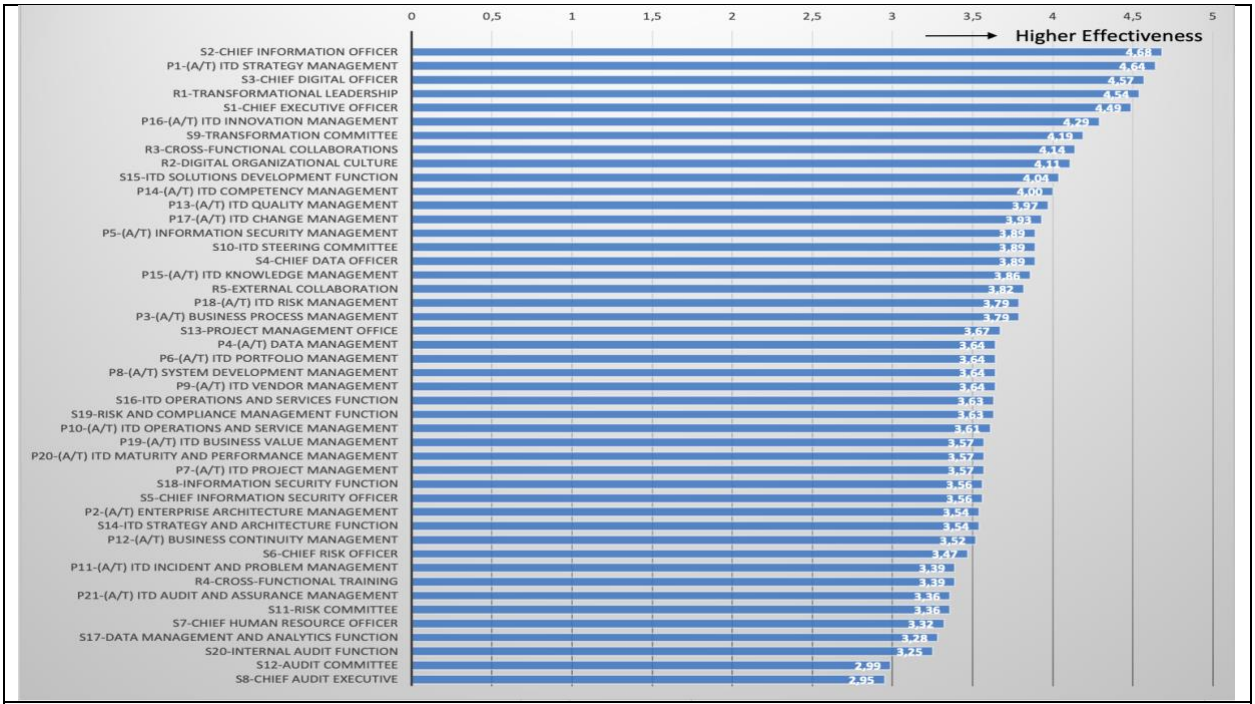


Figure 3. The perceived effectiveness of ITG mechanisms that influence DT

This is a reasonable result because CIO is a popular structure in banking and insurance companies according to the experts, sometimes the companies integrate the role in one director, i.e, the Director of Operations and IT. Whereas for the second position as the most effective ITG mechanism on DT, the experts have agreed with the importance of P1-(A/T) ITD Strategy Management as the foundation for DT although the term can be different in the field. Concerning the S3-Chief Digital Officer (CDO1) as the third most effective. It has been found that most of the companies are integrating both the CIO and CDO within a CIO role, sometimes called the Chief of IT and Digital. CDO1 is perceived as less well-known term compared to the CIO. The rest of perceived most effective ITG mechanisms that influence DT is shown in Figure 3.

Likewise, the results of the perceived ease of implementation of ITG mechanisms on DT is shown in Figure 4. The results in this case indicate that the experts have agreed that the S1-CEO is the easiest ITG mechanism for a successful DT because the CEO role has the most power and influence to lead and sponsor the DT journey in the organisation.

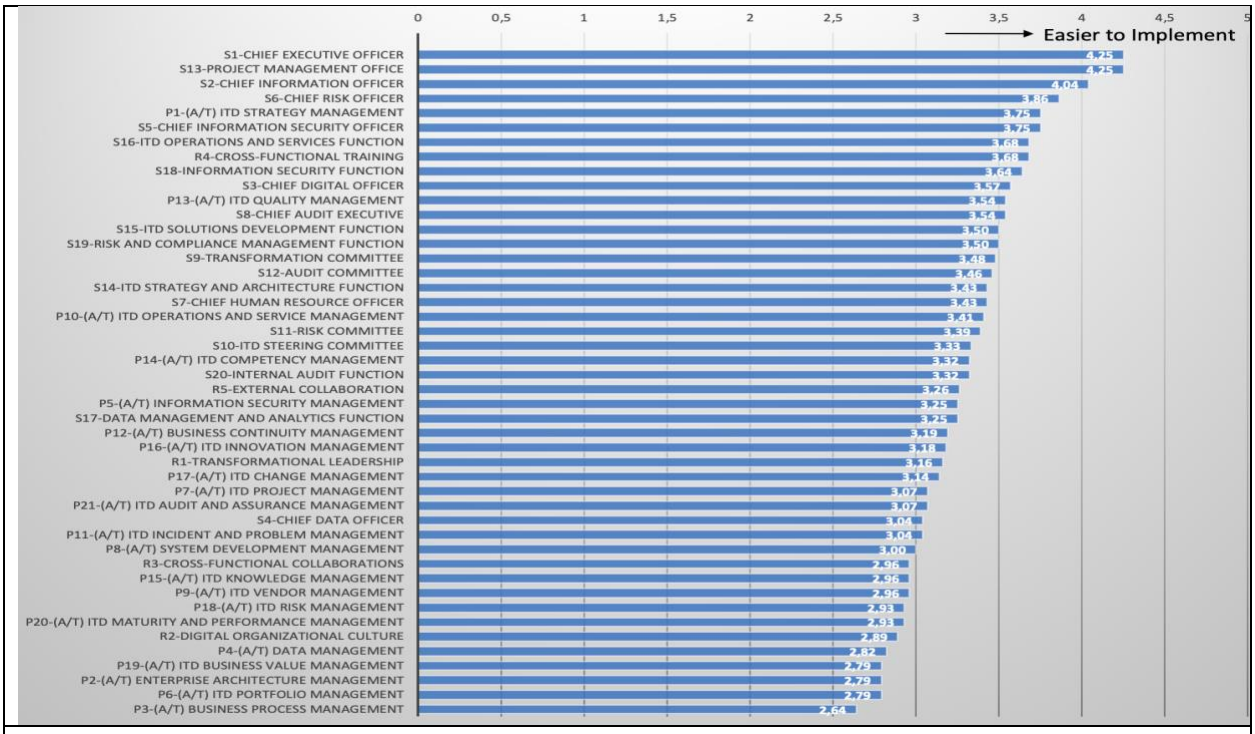


Figure 4. The perceived ease of implementation of ITG mechanisms that influence DT

The experts also mentioned that S13-PMO as the second most easy ITG mechanism to be implemented. The PMO role is to coordinate, standardize, and monitor all the related projects and optimise the required resources in a DT journey. Moreover, the S2-CIO is the third most easy ITG mechanism to implement, as it is a good practice to orchestrate the DT compared to implementing the S3-CDO1 (digital). While the rest of the perceived most easy ITG mechanism that influence DT to implement are shown in Figure 4.

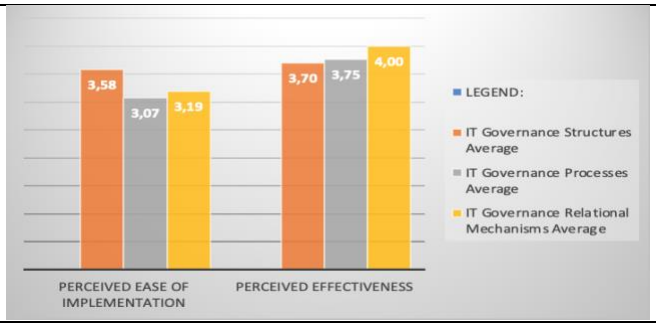
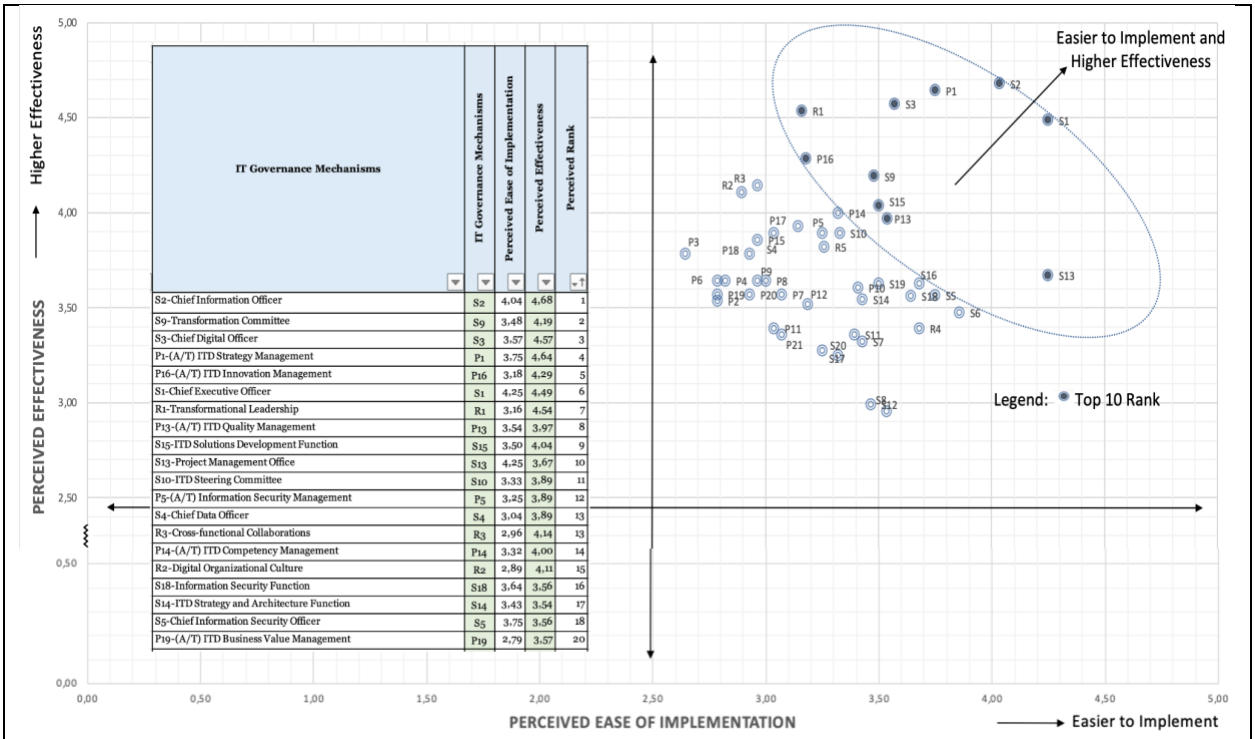


Figure 5. Average of perceived effectiveness and ease of implementation of ITG mechanisms that influence DT

Furthermore, the Delphi study also shows (see Figure 5) that ITG structures are perceived as the easiest to implement. On the other hand, ITG relational mechanisms (soft governance) are perceived as the most effective compared to structures and processes (hard governance). As argued by Smits and Van Hillegersberg (2017, p. 48), people should not "only act or think in terms of structure and process only", but also need to put "more attention" to soft governance (i.e., culture) that "can be seen as a factor highly influencing the implementation of ITG".

The Perceived Top Ten ITG Mechanisms Considered as a Baseline for DT

In this section, the top ten most important ITG mechanisms that influence DT as a baseline for implementing ITG for successful DT are presented. It is based on experts' knowledge and experiences. They have selected the top ten most important ITG mechanisms that influence DT as a baseline for implementing ITG for successful DT since these are easier to implement and have higher effectiveness, see Figure 6.



IT Governance Mechanisms	IT Governance Mechanisms	Perceived Ease of Implementation	Perceived Effectiveness	Perceived Rank
S2-Chief Information Officer	S2	4.04	4.68	1
S9-Transformation Committee	S9	3.48	4.19	2
S3-Chief Digital Officer	S3	3.57	4.57	3
P1-(A/T) ITD Strategy Management	P1	3.75	4.64	4
P16-(A/T) ITD Innovation Management	P16	3.18	4.29	5
S1-Chief Executive Officer	S1	4.25	4.49	6
R1-Transformational Leadership	R1	3.16	4.54	7
P13-(A/T) ITD Quality Management	P13	3.54	3.97	8
S15-ITD Solutions Development Function	S15	3.50	4.04	9
S13-Project Management Office	S13	4.25	3.67	10
S10-ITD Steering Committee	S10	3.33	3.89	11
P5-(A/T) Information Security Management	P5	3.25	3.89	12
S4-Chief Data Officer	S4	3.04	3.89	13
R3-Cross-functional Collaborations	R3	2.96	4.14	13
P14-(A/T) ITD Competency Management	P14	3.32	4.00	14
R2-Digital Organizational Culture	R2	2.89	4.11	15
S18-Information Security Function	S18	3.64	3.56	16
S14-ITD Strategy and Architecture Function	S14	3.43	3.54	17
S5-Chief Information Security Officer	S5	3.75	3.56	18
P19-(A/T) ITD Business Value Management	P19	2.79	3.57	20

Figure 6. The rank of perceived top ten ITG mechanisms that influence DT

The recommended baseline to implement the ITG for a successful DT, the top ten most important, are consecutively as follows: S2-Chief Information Officer (CIO), S9-Transformation Committee, S3-Chief Digital Officer (CDO1), P1-(A/T) ITD Strategy management, P16-(A/T) ITD Innovation management, S1-Chief Executive Officer (CEO), R1-Transformational leadership, P13-(A/T) ITD Quality management, S15-ITD Solutions Development Function, S13-Project Management Office (PMO).

Conclusion

A limitation of this Delphi study is that the examination of ITG mechanisms that influence DT was conducted in Indonesia's banking and insurance industry context, and the findings might be unique to Indonesia's context, in particular to the governance, culture, and economic conditions of Indonesia's banking and insurance industry.

Despite the limitation, we believe that our study contribution is two folds. On the one hand, this Delphi study has successfully validated 28 ITG mechanisms and identified 18 new ITG mechanisms that influence DT. In total, there are 46 mechanisms that consist of both agile/ adaptive and traditional mechanisms, as hybrid ITG approach. The study has extended the existing theory of ITG mechanisms, by validating some of the traditional and newly identified mechanisms in strategic and management level, also adding the operational level of ITG mechanisms (IT Management) that influence DT. On the other hand, our study also

has practical implications by providing recommendations to practitioners, like those in the banking and insurance industry, with the perceived ITG mechanisms effectiveness and ease of implementation on DT, including the top ten ITG mechanisms to be used as a baseline in their organisations towards a successful digital transformation journey. These ITG mechanisms could be useful for other organisations, especially in banking and insurance industry, that are concerned to succeed in their digital transformation journey.

It has been found that agile/ adaptive approaches can assist these organisations in carrying out their digital transformation by providing the digital solutions they need rapidly through digital innovation although facing higher risks and uncertainty. However, it was also found that not all IT and digital initiatives are suitable to be realised with an agile/ adaptive approach. Such an approach is more suitable for quick solutions, rely more on attractive features, faster time to market, and the requirements are not detailed yet. Whereas for the critical business processes and tightly-coupled systems, the experts do not recommend using the agile/ adaptive approach. On the other hand, the incumbent banking and insurance industry in Indonesia is bound by relatively rigid regulations that require formal job documentation, compared to an agile approach that tend to have a more informal documentation.

Therefore, an interesting research agenda could be to look through multiple case studies in Indonesia's banking and insurance industry to analyse the influence of the identified ITG mechanisms on DT as well on the organisations' performances.

Acknowledgments

This research is supported by Stockholm University and the Management and IT (MIT) Research School, a collaboration of 13 Swedish universities. We thank our colleagues from ISACA and AIS, all the Indonesian Delphi experts panel (practitioners, consultants, and researchers), PACIS committee, peer reviewers, and all the DSV teammates who provided insight, expertise, and support that greatly assisted the research.

References

Alter, S. 2020. "How Well Do Service Concepts Apply to Digital Services and Service Digitalization?," *Proceedings of the Hawaii International Conference on System Sciences (HICSS)*, Maui, USA, pp. 1185-1194.

Betti, N., and Sarens, G. 2021. "Understanding the internal audit function in a digitalised business environment," *Journal of Accounting & Organizational Change* (17:2), pp. 197-216.

Caldeira, J., and Brito e Abreu, F. 2008. "Influential factors on incident management: Lessons learned from a large sample of products in operation," *International Conference on Product Focused Software Process Improvement*: Springer, pp. 330-344.

Davies, H., and Zhivitskaya, M. 2018. "Three Lines of Defence: A Robust Organising Framework, or Just Lines in the Sand?," *Global Policy* (9), pp. 34-42.

De Haes, S., and Van Grembergen, W. 2008a. "Analysing the relationship between IT governance and business/IT alignment maturity," *Proceedings of the Annual Hawaii International Conference on System Sciences (HICSS)*, Waikoloa, USA, pp. 1-10.

De Haes, S., and Van Grembergen, W. 2008b. "An Exploratory Study into the Design of an IT Governance Minimum Baseline through Delphi Research," *Communications of the Association for Information Systems* (22:March 2015), pp. 1-30.

De Haes, S., and Van Grembergen, W. 2009. "An Exploratory study into IT Governance implementations and its impact on Business/IT Alignment," *Information Systems Management* (26:2), pp. 123-137.

De Haes, S., Van Grembergen, W., Anant, J., and Huygh, T. 2020. *Enterprise governance of Information Technology: Achieving alignment and value in digital organizations*, (3 ed.). Cham: Springer.

DeLone, W., Migliorati, D., and Vaia, G. 2018. *CIOs and the Digital Transformation: A New Leadership Role*, (1 ed.). Cham: Springer.

Denscombe, M. 2017. *The good research guide: For small-scale social research projects*, (6 ed.). Open University Press.

Duerr, S., Holotiuk, F., Beimborn, D., Wagner, H.-T., and Weitzel, T. 2018. "What is digital organizational culture? Insights from exploratory case studies," *Proceedings of the Hawaii International Conference on System Sciences (HICSS)*, Waikoloa, USA, pp. 5126-5135.

Elazhary, M., Popovič, A., Henrique De Souza Bermejo, P., and Oliveira, T. 2022. "How Information Technology Governance Influences Organizational Agility: The Role of Market Turbulence," *Information Systems Management*), pp. 1-21.

Felin, T., Foss, N. J., Heimeriks, K. H., and Madsen, T. L. 2012. "Microfoundations of routines and capabilities: Individuals, processes, and structure," *Journal of Management Studies* (49:8), pp. 1351-1374.

Ferreira, L. G. A., Viegas, P. B., and Trento, D. 2018. "An Agile Approach Applied in Enterprise Project Management Office." Springer International Publishing, pp. 95-102.

Frenzel, A., Muench, J. C., Bruckner, M. T., and Veit, D. 2021. "Digitization or digitalization?–Toward an understanding of definitions, use and application in IS research"," *Proceeding: 27th Americas Conference on Information Systems, Montreal, AMCIS*.
Gerster, D., Dremel, C., and Kelker, P. 2018. ""Agile meets non-Agile": Implications of adopting agile practices at enterprises," *Proceedings of the Americas Conference on Information Systems (AMCIS)*, New Orleans, USA, pp. 1-10.
Ghantous, G. B., and Gill, A. Q. 2017. "DevOps: Concepts, practices, tools, benefits and challenges," *Proceedings of the Pacific Asia Conference on Information Systems (PACIS)*, Langkawi, Malaysia, pp. 1-13.
Gong, C., and Ribiere, V. 2021. "Developing a unified definition of digital transformation," *Technovation* (102), p. 102217.
Google, Temasek, and Company, B. 2020. "e-Conomy SEA 2020: At Full Velocity - Resilient and Racing Ahead." Retrieved 15 December 2021, from https://www.bain.com/globalassets/noindex/2020/e_conomy_sea_2020_report.pdf
Gurbaxani, V., and Dunkle, D. 2019. "Gearing up for successful digital transformation," *MIS Quarterly Executive* (18:3), pp. 209-220.
Hartl, E. 2019. "A characterization of culture change in the context of digital transformation," *Proceedings of the Americas Conference on Information Systems (AMCIS)*, Cancún, Mexico, pp. 1-10.
Horlach, B., Schirmer, I., and Drews, P. 2019. "Agile portfolio management: Design goals and principles," *Proceedings of the European Conference on Information Systems (ECIS)*, Kista, Sweden, pp. 1-17.
Horlacher, A., Klarner, P., and Hess, T. 2016. "Crossing boundaries: Organization design parameters surrounding CDOs and their digital transformation activities," *Proceedings of the Americas Conference on Information Systems (AMCIS)*, San Diego, USA, pp. 1-10.
Indonesia Financial Service Authority. 2021. "The Indonesian Financial Services Sector Master Plan 2021-2025." Retrieved 15 December 2021, from https://www.ojk.go.id/id/berita-dan-kegiatan/info-terkini/Documents/Pages/Master-Plan-Sektor-Jasa-Keuangan-Indonesia-2021-2025/The%20Indonesian%20Financial%20Services%20Sector%20Master%20Plan%202021-2025.pdf
Jöhnk, J., Ollig, P., Rövekamp, P., and Oesterle, S. 2022. "Managing the complexity of digital transformation—How multiple concurrent initiatives foster hybrid ambidexterity," *Electronic Markets*), pp. 1-23.
Karanja, E., and Rosso, M. A. 2017. "The Chief Risk Officer: a study of roles and responsibilities," *Risk Management* (19:2), pp. 103-130.
Khin, S., and Ho, T. C. F. 2019. "Digital technology, digital capability and organizational performance: A mediating role of digital innovation," *International Journal of Innovation Science* (11:2), pp. 177-195.
Kirchmer, M. 2021. "Digital Transformation of Business Process Governance," in *Business Modeling and Software Design (BMSD 2021) of Lecture Notes in Business Information Processing,* B. Shishkov (ed.). Cham: Springer, pp. 243-261.
Kohli, R., and Johnson, S. 2011. "Digital Transformation in Latecomer Industries - CIO and CEO Leadership Lessons from Encana Oil & Gas (USA) Inc," *MIS Quarterly Executive* (10:4), pp. 141-156.
Larkin, J. 2017. "HR digital disruption: the biggest wave of transformation in decades," *Strategic HR review* (26:2), pp. 55-59.
Maes, K., De Haes, S., and Van Grembergen, W. 2012. "IT Value Management as a Vehicle to Unleash the Business Value from IT Enabled Investments," *International Journal of IT/Business Alignment and Governance* (3:1), pp. 47-62.
Malik, M. F., Zaman, M., and Buckby, S. 2020. "Enterprise risk management and firm performance: Role of the risk committee," *Journal of Contemporary Accounting & Economics* (16:1), p. 100178.
Manita, R., Elommal, N., Baudier, P., and Hikkerova, L. 2020. "The digital transformation of external audit and its impact on corporate governance," *Technological Forecasting and Social Change* (150), p. 119751.
March, J. G. 1991. "Exploration and exploitation in organizational learning," *Organization science* (2:1), pp. 71-87.
Margherita, A., and Heikkilä, M. 2021. "Business continuity in the COVID-19 emergency: A framework of actions undertaken by world-leading companies," *Business Horizons* (64:5), pp. 683-695.
Maynard, S., Onibere, M., and Ahmad, A. 2018. "Defining the strategic role of the chief information security officer," *Pacific Asia Journal of the Association for Information Systems* (10:3), p. 3.
Mkoba, E., and Marnewick, C. 2020. "Conceptual framework for auditing agile projects," *IEEE Access* (8), pp. 126460-126476.
Mulyana, R., Rusu, L., and Perjons, E. 2021. "IT Governance Mechanisms Influence on Digital Transformation: A Systematic Literature Review," *Proceedings of the Americas Conference on Information Systems*, Virtual, pp. 1-10.
Obwegeser, N., Yokoi, T., Wade, M., and Voskes, T. 2020. "7 key principles to govern digital initiatives," *MIT Sloan Management Review* (61:3), pp. 1-9.
Okoli, C., and Pawlowski, S. D. 2004. "The Delphi method as a research tool: An example, design considerations and applications," *Information and Management* (42:1), pp. 15-29.
Pentek, T., Legner, C., and Otto, B. 2017. "Towards a reference model for data management in the digital economy," *Proceedings of the International Conference on Design Science Research in Information Systems and Technology*, Karlsruhe, Germany, pp. 73-82.

Peterson, R. R. 2004. "Integration strategies and tactics for information technology governance," in *Strategies for Information Technology Governance,* W. Van Grembergen (ed.). Hershey PA: Idea Group Publishing, pp. 37-80.

Ponsignon, F., Kleinhans, S., and Bressolles, G. 2019. "The contribution of quality management to an organisation's digital transformation: a qualitative study," *Total Quality Management & Business Excellence* (30:sup1), pp. S17-S34.

Purba, J., Hery, H., and Lestari, V. 2019. "Financial technology readiness: Strategic innovation management in the service industry 4.0," *Proceedings of the Asian Conference on Humanities, Industry, and Technology for Society (ACHITS)*, Surabaya, Indonesia, pp. 1-14.

Rincon, A. R., Jewer, J., Ke, G. Y., Jewer, J., and Ke, G. Y. 2020. "IT governance and continuous digital innovation: Insights from a delphi study," in: *Proceedings of the American Conference on Information Systems (AMCIS)*. Virtual: pp. 1-10.

Rueckel, D., Krumay, B., Schwarzgruber, S., and Rueckel, D. 2020. "Outsourcing in the age of digital transformation," *Proceedings of the Americas Conference of Information Systems (AMCIS)*, Virtual, pp. 1-10.

Salovaara, A., Lyytinen, K., and Penttinen, E. 2019. "High reliability in digital organizing: Mindlessness, the frame problem, and digital operations," *MIS Quarterly: Management Information Systems* (43:2), pp. 555-578.

Schilling, R., Aier, S., Winter, R., and Haki, K. 2020. "Design dimensions for enterprise-wide data management: A chief data officer's journey," *Proceedings of the Hawaii International Conference on System Sciences (HICSS)*, Wailea, USA, pp. 5829-5838.

Schmidt, R. C. 1997. "Managing Delphi surveys using nonparametric statistical techniques," *Decision Sciences* (28), pp. 763-774.

Shao, Z., and Huang, Q. 2018. "Transformational Leadership and IS Extended Use-The Mediating Role of Job Autonomy and Moderating Role of IT Innovativeness," *Proceedings of the Pacific Asia Conference on Information Systems (PACIS)*, Yokohama, Japan, pp. 1-13.

Skinner, R., Nelson, R. R., Chin, W. W., and Land, L. 2015. "The Delphi method research strategy in studies of information systems," *Communications of the Association for Information Systems* (37:July), pp. 31-63.

Smits, D., and Van Hillegersberg, J. 2017. "The development of a hard and soft IT governance assessment instrument," *Procedia Computer Science* (121), pp. 47-54.

Spremic, M. 2017. "Governing digital technology – how mature IT governance can help in digital transformation?," *International Journal of Economics and Management Systems* (2), pp. 214-223.

Teece, D., and Pisano, G. 1994. "The Dynamic Capabilities of Firms: an Introduction," *Industrial and Corporate Change* (3:3), pp. 537-556.

Thordsen, T., Bick, M., Thordsen, T., and Bick, M. 2020. "Towards a holistic digital maturity model," *Proceedings of the International Conference on Information Systems (ICIS)*, Hyderabad, India, pp. 1-10.

Van Grembergen, W., De Haes, S., and Guldentops, E. 2004. "Structures, Processes and Relational Mechanisms for IT Governance," in *Strategies for Information Technology Governance,* W. Van Grembergen (ed.). Hershey, PA: Idea Group Publishing, pp. 1-36.

Vejseli, S., Rossman, A., and Garidis, K. 2022. "The Concept of Agility in IT Governance and its Impact on Firm Performance," *Proceedings of the European Conference on Information Systems (ECIS)* Timisoara, pp. 1-16.

Vejseli, S., and Rossmann, A. 2017. "The impact of IT governance on firm performance: a literature review," *Proceedings of the Pacific Asia Conference on Information Systems (PACIS)*, Langkawi, Malaysia, pp. 217-223.

Vejseli, S., Rossmann, A., and Connolly, T. 2020. "Agility matters! Agile mechanisms in IT governance and their impact on firm performance," *Proceedings of the Hawaii International Conference on System Sciences (HICSS)*, Virtual, pp. 5633-5642.

Warner, K. S. R., and Wäger, M. 2019. "Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal," *Long Range Planning* (52:3), pp. 326-349.

Weigel, A., Heger, O., Hoffmann, J., Röding, K., Weigel, A., Heger, O., Hoffmann, J., and Kristina, R. 2020. "CEOs of SMEs: How IT-Governance Compensates the Lack of Digital Competencies," *Proceedings of the European Conference on Information Systems (ECIS)*, Virtual, pp. 6-15.

Weritz, P., Braojos, J., and Matute, J. 2020. "Exploring the Antecedents of Digital Transformation: Dynamic Capabilities and Digital Culture Aspects to Achieve Digital Maturity," *The Americas Conference on Information Systems (AMCIS)*, Virtual, pp. 1-12.

Wernerfelt, B. 1984. "A resource-based view of the firm," *Strategic management journal* (5:2), pp. 171-180.

Wiedemann, A. 2018. "IT Governance Mechanisms for DevOps Teams - How Incumbent Companies Achieve Competitive Advantages," *Proceedings of the Hawaii International Conference on Systems Sciences (HICSS)*, Waikoloa, USA, pp. 4931-4940.

Wright, C. 2018. "The CAE-CRO relationship: Chief audit executives and chief risk officers can collaborate in many ways to ensure the organization manages risks effectively," *Internal Auditor* (75:1), pp. 31-36.