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The impact of construction stakeholder's readiness and acceptance of technology on the success of Indonesian digital government transformation in construction sector

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Despite its potential to significantly improve the efficiency, effectiveness, transparency, and accountability of construction sector services, the implementation of digital government transformation in many countries has often failed to achieve desired results due to low user adoption. This study introduces a factor model to predict technology readiness and acceptance behavior in the implementation of digital government transformation within construction business licensing and procurement services by integrating the Technology Readiness and Technology Acceptance Models. Survey data collected from construction companies, experts, project managers, and procurement committees in Indonesia were used to test the model through Structural Equation Modelling (SMART-PLS). The findings reveal that positive technological readiness has a significant impact on perceived usefulness and users' intention to use the system. Additionally, it was discovered that a one-point increase in the intention to use led to a 0.625 increase in achievement value. This research contributes to addressing the slow adoption of digital government transformation by exploring intention-to-use behavior in the construction sector.

1. Introduction

Digital government transformation has emerged as a significant possibility for improving public services in various countries. Along with the demand for more efficient, effective, transparent, and accountable public services, governments in several countries have pledged to accelerate digital transformation in order to make innovative leaps of magnitude. However, the implementation of digital government transformation projects has generally been unsuccessful, and failure rates remain relatively high (Rosacker & Olson, 2008). Thirty five percent of developing countries experience absolute failure, indicating that digital transformation cannot be implemented at all, 50 percent partially succeed/partial failure, which shows an inability to meet the key objectives or benefits of digital government transformation, and 15 percent are successful (Kuldosheva, 2021; Manurung, 2017; Twizeyimana & Andersson, 2019).

The Indonesian government has kept the pledge, believing that digital transformation is necessary to meet the challenges of the 4.0 era. The current focus of Indonesia's digital government transformation initiative is on a few key businesses, most notably the construction sector, which is essential to the nation's economy. Since the enactment of Law No. 2 of 2017 on construction services, the construction sector has begun its digital transformation by establishing an Integrated Construction Services Information System (ICSIS). The establishment of ICSIS aims to improve the quality of business licensing and public procurement services. The presence of ICSIS also provides opportunities for government agencies to strengthen their collaboration, allowing them to operate more effectively and efficiently. Behind these shifts, however, is the fact that ICSIS is still underutilized. Despite operating for approximately six years, adotion rates have consistently been low (Lembaga

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Pengembangan Jasa Konstruksi, 2023). Consequently, as a digital transformation project in the construction services sector, ICSIS has struggled to make a significant impact on two critical functions: public procurement and business licensing.

The reluctance to embrace digital government transformation initiatives is not confined to specific sectors or countries. Despite the demonstrated potential of technology in the construction sector to enhance work performance, research indicates a resistance to its adoption among workers, both in field roles and managerial positions (Wang et al., 2020). Collaboration among all stakeholders in the construction sector for the purpose of sharing information, resources, and responsibilities to improve efficiency and competitiveness is lacking. The transformation process is particularly challenging in the context of collaborative and integrated information systems, requiring a shift in paradigm and mindset not only at the government level but also among all connected stakeholders (United Nation, 2022; United Nations, 2014). The acceptance of new technologies by targeted user has a significant impact on the success of digital government transformation (Al-Muftah et al., 2018). A thorough understanding of data and information openess ini digitalisation inisiative is critical for construction business success (Nezami, Bruijne, et al., 2022). To promote sector-wide adoption of a technology, it's important to examine end-user behaviour, application, and impact before making significant investments. It is essential to research the factors that are critical to successful information technology integration (Nnaji et al., 2023).

This study specifically delves into the integrated information system within the context of digital government transformation initiatives in the construction sector. This sector is characterized by intricate interaction patterns, widespread stakeholder involvement, and a heavy reliance on inter-organizational system interoperability. The research builds upon the theoretical foundations of technology readiness and acceptance, contributing to existing literature by simultaneously exploring both technology adoption and value creation aspects. The study has two primary objectives. Firstly, it aims to identify the factors of technological readiness and acceptance that influence construction stakeholders' intention to use. Secondly, it seeks to determine how this intention to use impacts value creation, which serves as the ultimate goal of digital government transformation system initiatives. To achieve these goals, a comprehensive understanding of technology adoption and value creation from the user's perspective is crucial. Such an understanding establishes a solid foundation for addressing the constraints associated with the implementation of digital government transformation initiatives as a whole.

2. Literature review

2.1 Digital Government Transformation

Due to its diverse and captivating nature, digital transformation has garnered widespread attention from various scientific disciplines. Fundamentally, digital transformation signifies change on two levels: firstly, at the organization's core, affecting its processes and routines; and secondly, in its broader environment, encompassing business models, products and services, and interactions between users and the organization itself (Mergel et al., 2019). Governments at all levels are actively undergoing digital transformation to deliver more efficient, transparent, and cost-effective public services. Presently, digital government transformation is indispensable for meeting the expectations of modern citizens. In the private sector, digital transformation predominantly focuses on creating new business models or transitioning production modes from analog to digital (Fischer et al., 2021).

Digital technologies are instigating significant organizational changes, necessitating proper government organization to achieve improved operational performance (Ashaye & Irani, 2019). The digital transformation process mandates collaboration between institutions and engagement with external stakeholders during its implementation. Successful digital transformation in government requires frequent collaboration with external stakeholders, particularly the private sector. This collaboration is commonly termed a partnership, wherein synergy, resource exchange, and the distribution of authority and responsibility all contribute to more efficient and effective service delivery (Cordella & Paletti, 2019; Wilson & Mergel, 2022). The enhancement of interoperability stands out as a crucial, if not the most critical, prerequisite for any trust-based collaboration in digital transformation. To ensure the overall benefit of data exchange, there must be balanced and fair regulations in place, facilitating integration among various collaborating stakeholders. The prerequisites for data sharing in a multi-stakeholder environment extend beyond technical implementation; they also rely on fair and transparent regulations implemented in a trustworthy manner through authorized institutions for integration purposes (Curry et al., 2022). Achieving digital transformation requires a collaborative regulatory framework that considers the diverse interests of construction stakeholders and balances any competing objectives (Bühler et al., 2023).

Transformative change with digital technologies necessitates external drivers that influence overall organizational processes. These drivers encompass legal regulations, the economic situation, citizen demands, and the country's technological maturity. Influencing these external factors proves challenging for actors confined within a single organizational boundary, as they constrain the scope of technology implementation within the organization (Haug et al., 2023). Consequently, successful collaboration in implementing digital change requires meticulous planning, clearly defined responsibilities, and assured support from leaders wielding authority (Zhang et al., 2017).

2.2 Digital Technology in Construction Sector

Integrated digital platforms and data sharing for a secure, trusted, and sovereign construction sector are poised to play a substantial role in the future. Such platforms will facilitate collaboration, the generation of new value, and the digital transformation and organization of the construction value chain (Bühler et al., 2023). Over the years, the construction sector has made efforts to collaborate data networks among all stakeholders.

The entire lifecycle of construction projects involves various phases, spanning planning, design, bid/procurement, construction, operation/maintenance, to final demolition and recycling (Huang et al., 2021). Business licensing is a prerequisite that must be fulfilled before commencing any stage of construction. Construction companies require a business permit to participate in tenders and undertake construction projects. In many industries across the Asia Pacific region, traditional in-person and paper-based methods for applying for a business license still dominate the governance landscape (APEC & Digital Economy Steering Committee, 2022). Numerous studies suggest that this system leads to inefficiencies and often results in delays for planned projects and investments while awaiting necessary approvals. Such delays contribute to increased investment costs, job losses, sluggish economic growth, and negatively impact economic competitiveness. Moreover, the fragmentation of fee collection at various stages by different agencies, along with offline payments for permits and licensing services, coupled with disjointed government databases, tends to create opportunities for corruption. Automating all stages of the business licensing process can help overcome data inconsistencies from disparate sources and reduce lengthy validation times during the evaluation process.

Digital government transformation is also prevalent in public procurement. It could also benefit from the use of digital technology. This includes investigating and utilizing tender evaluation decision support systems. As a result of computing technology, it is possible to determine what to do and how to outline infrastructure procurement strategies. Furthermore, several methods have been developed to forecast deviations in duration and cost during construction bidding (Ibem & Laryea, 2014).

2.3 Adoption of Digital Technology in Construction Sector

Adoption refers to how targeted users utilize the integrated information system as part of a digital transformation initiative. Although the success of digital transformation is often assessed solely from the perspective of government institutions, it is crucial to consider the viewpoint of users as service recipients. Both perspectives are integral to the success of digital government transformation projects (Burmeister et al., 2019; Gil-Garcia & Flores-Zúñiga, 2020).

As information technology enhances productivity, a key advantage of understanding the determinants of user's intention is the opportunity it presents to improve construction sector productivity through interventions to enhance construction stakeholder's technology adoption (Lai & Lee, 2020; Rajendra et al., 2015). Previous studies identified various factors contributing to low adoption rates, which could be examined from the perspective of organizations (Lim et al., 2012; Susha et al., 2023) or individuals as users (Venkatesh et al., 2016). These factors vary across sectors and are influenced by the specific circumstances of each country (Veeramootoo et al., 2018). Socioeconomic structure, as well as geographical and demographic factors, for instance, can influence the success of digital transformation in some regions (Al-Muftah et al., 2018; Kuldosheva, 2021; Wilson & Mergel, 2022). Studies also highlighted the impact of risk, security, privacy, distrust (Chomistriana & Simanjuntak, 2022; Rana et al., 2017), user readiness (Al-Muftah et al., 2018; Kuldosheva, 2021; Sam & Chatwin, 2019), and user's digital literacy (Sandoval-Almazán et al., 2017; UNDESA, 2020; Wilson & Mergel, 2022) on the adoption of digital government initiative. Overall, the adoption of digital government transformation necessitates a shift in people's mindsets and cultures (Elnaghi et al., 2019), as well as the presence of regulatory requirement that mandate collaborative system' adoption (Chomistriana & Simanjuntak, 2022; Nezami, de Bruijne, et al., 2022)

In a social system, there are three primary types of adoption or rejection decisions: the first involves decision-making conducted independently by each individual, the second entails collective decisions based on the deliberation of system members, and the third encompasses authority decisions made by a small number of individuals who hold dominance or technical competence in the system. The primary dimension of resistance in an information system is behavior that opposes changes related to digital transformations, such as information systems (Wang et al., 2020).

2.4 Indonesian Integrated Construction Services Information System (ICSIS)

The government of Indonesia issued Presidential Decree Number 95/2018 on Electronic Based Government System, which calls for the use of information and technology to achieve good governance while also improving the quality of public services and increasing public participation in development. This policy has been strengthened by the issuance of the Indonesian One Data Initiative, with the goal of producing accurate, up-to-date, integrated, and accountable data that is also easily accessible to all national and local government agencies. Construction, as one of the most important sectors of the national economy, is among the first to adopt the policy. Being one of the pivotal sectors in the national economy, the construction industry stands among the early adopters of transformative policies. Addressing the public's call for heightened efficiency, effectiveness, transparency, and accountability in construction business licensing and government procurement services, the Indonesian government has instituted the Integrated Construction Services Information System (ICSIS). This interactive system fosters collaboration among government and private institutions, facilitating the management of data and information through an integrated platform. The ICSIS offers a spectrum of services, encompassing informational, interactional, and transactional categories. Notably, the government has constructed this system within an environment that actively encourages public participation in enriching data and information. At this juncture, the government has forged opportunities to connect and integrate with various stakeholders. This collaboration extends beyond merely opening digital communication channels; it spans processes, data, and technology, symbolizing a comprehensive approach to advancement in the construction sector.

The primary focus of this integrated information system lies in its association with construction procurement and business licensing services, and it boasts interoperability with systems providing diverse data types, including population and taxpayer information. Construction companies are mandated to share their administrative and qualification data to the system. This encompasses details such as professional experiences, ownership of heavy equipment, and business permits. Professional experts are similarly obligated to share information regarding their professional experience and competency certification. Project managers share project' data, covering regional standard unit prices and standard unit price analysis. Additionally, the procurement committee is tasked with sharing bid document data into the system. Importantly, all shared data is accessible to the public, embodying a commitment to transparency and openness.

The ICSIS comprises 10 applications managed by government agencies, 19 applications overseen by construction professional certification agencies, and 12 applications under the management of construction business certification agencies, all seamlessly integrated and interoperable. The primary stakeholders expected to contribute data to the system include 79,899 construction companies, 318,648 construction experts, 2,065 project managers, and 872 procurement committees. Those stakeholders dispersed across Indonesia’s 34 provinces. Users are not only required to utilize the system but also to function as stakeholders responsible for sharing data into the system. Due to the involvement of numerous stakeholders, ICSIS is characterized by a high level of complexity, and its business operations establish government-to-government, government-to-business, and government-to-community relationships.

2.5 Technology Readiness and Acceptance

Enhancing technology integration requires a proper understanding of factors that influence the behavioural intention to use, and actual usage of technology in the construction sector (Nnaji et al., 2023). The orientation of user toward the adoption of services is crucial and requires an understanding of the users’ technological readiness, culture, and values produced (Malodia et al., 2021). Experience with digital transformation shows that the adoption of technology is influenced by factors such as perceived usability, ease of use, computer self-efficacy, subjective norms, perceived credibility, attitudes, and behavioral tensions (Rabaa et al., 2016). Perceived usability plays a major determinant of attitudes toward technology adoption (Rabaa et al., 2016; Veeramootoo et al., 2018). According to experts, users consider the simplicity offered by digital platforms, which enhances the ease of managing digital government transformation, specifically the ability to create face-to-face interactions and improve communication functions. These factors promote the adoption of technology by users.

The Technology Acceptance Model (TAM) is widely employed in the field of information technology innovation (Venkatesh et al., 2012; Venkatesh & Bala, 2008). It has been successfully applied, with or without modifications, to a wide range of empirical studies, aiming to predict and explain the acceptance and adoption of various technologies. As an adaptation of the Theory of Reasoned Action, the model posits that the use of a system is influenced by behavioural intention. This is consequently shaped by user beliefs such as perceived usefulness and perceived ease of use. Those factors serve as predictors of user behaviour (Belanche et al., 2012; He et al., 2018; Ma et al., 2017; Rabaa et al., 2016). Perceive usefulness refers to the extent an individual believes that using a specific system enhances performance, while perceived ease of use pertains to the degree, they believe using a specific system requires minimal effort. Technology acceptance models have been found to account for approximately 40% of the variation in individuals' willingness to use information technology (Venkatesh & Bala, 2008).

Technology readiness is defined as people's proclivity to embrace and use new technology to achieve goals in their personal and professional lives (Parasuraman, 2000). By incorporating technology readiness as a construct, the model aims to more precisely describe the users’ state when adopting information technology. Positive technology readiness and negative technology readiness are the two dimensions of the technology readiness construct. Positive technological readiness entails optimism and innovation, whereas negative technological readiness entails discomfort and insecurity. Optimism is defined as a favorable attitude toward technology and the belief that it can provide people with greater control, flexibility, and efficiency. The ability to be a technology pioneer and thought leader is referred to as innovativeness. Discomfort is caused by a sense of helplessness and being overwhelmed by technology. Insecurity is defined by distrust of technology and doubts about its ability to function properly. The first two dimensions that may increase technology readiness are optimism and innovativeness, whereas discomfort and insecurity are considered barriers to using technology (Nugroho & Fajar, 2017).

The TAM is considered solely insufficient to explain the differences in individual behavior and their ability to realize their intentions (Venkatesh et al., 2016). Several studies used modified or enhanced versions of technology acceptance rather than the original (Hapsara et al., 2017), and the results have been influenced by the introduction of new variables in these modified versions. Technology readiness and acceptance, a hybrid of technology acceptance and readiness theory, is suggested to incorporate psychological theory constructs into the acceptance of new technologies (Chen et al., 2013; Lin et al., 2007; Rinjany, 2020). The unified theory is intuitively related, with technology acceptance, measuring usefulness and ease of use for specific systems, while technology readiness measures general technology beliefs (Chen et al., 2013).

2.6 Value Creation of Digital Technology

Value refers to the perceived importance or benefit by stakeholders in various ways (Project Management Institute, 2021). The value of a digital government transformation project cannot be created unless the system is purposefully and effectively used by users. While utilization is necessary for digital technology success, it is not sufficient, as the ultimate indicator of digital government transformation success lies in value creation (Criado & Gil-Garcia, 2019). Value can be defined by users as the ability to use a specific product feature or function. Organizations may focus on financial value, such as cost reduction and associated benefits. Contributions from a group of individuals, communities, or the environment all have social value. Some values are primarily personal (e.g., integrity, honesty), while others are organizational (transparency, responsiveness). Ethical issues (impartiality, objectivity) and natural outcomes (efficiency, prudence) can also be considered as values (Bannister & Connolly, 2014). Integrated information systems are gaining importance in the construction sector due to their numerous advantages, including collaboration, efficiency, and transparency. These systems assist the industry in adjusting to the challenges of the digital age and fostering ongoing progress (Nezami, de Bruijne, et al., 2022).

3. Hypotheses

There has yet to be research in the construction sector that examines the construction stakeholder's technology readiness and acceptance of digital government transformation in the sector. This study expands on previous research and theory by examining the impact of readiness and acceptance variables on the adoption of integrated information system in the construction sector. Identification of variables, formulation of hypotheses, and development of constructs and measurement indicators are crucial modeling steps. By integrating two theories, namely technology readiness and technology acceptance models, the researcher is paying close attention to the distinctions between various types of constructs. The applicability of various constituent variables from previous studies on the same theory to the context and issues of digital government transformation was investigated. The following research hypothesis was developed based on the relevant literature.

H_1: *The positive technology readiness factors positively influence on perceived usefulness, ease of use and intention to use technology.*

Prior research indicated that positive technology readiness provides a significant benefit to the perceived usefulness, ease of use and intention to use of technology (Al-Muftah et al., 2018; Elnaghi et al., 2019; Kuldosheva, 2021; Sam & Chatwin, 2018).

H_2: *The negative technology readiness factors positively influence on perceived usefulness, ease of use and intention to use technology.*

Prior research indicated that negative technology readiness provides a significant influence to the perceived usefulness, ease of use and intention to use of technology (Chen et al., 2013; Nugroho & Fajar, 2017)

H_3: *The intention to use technology positively influence achievement of digital transformation value.*

Prior research indicated that intention to use technology provides a significant benefit to the achievement of project value. The previous research recognized the value indicator of the digital government transformation (Bai, 2013; Bannister & Connolly, 2014; Cordella & Bonina, 2012; Fischer et al., 2021; Twizeyimana & Andersson, 2019).

4. Methodology

This study employed a quantitative approach based on post-positivist philosophy, involving the quantification of phenomena/symptoms/reality and the classification of results using statistical analysis (Sugiyono, 2016). An explanatory approach was employed to identify causal factors between independent and related variables.

4.1 Survey Instrument and Data Collection

A questionnaire designed with pre-defined variables from previous literature reviews was used to obtain primary data for this quantitative study. It was then validated through focus group discussions with government, business, and professional associations, as well as practitioners and academics. It was structured as a series of questions, to which respondents provided their feedback on a Likert scale rating. The questionnaire aimed to measure respondents' perceptions of integrated information technology adoption and value creation factors. The respondents were asked to rate each indicator reflecting latent variable measurement on a scale of 1 to 4, with 1 representing very low, 2 as low, 3 as high, and 4 as very high. An even-point Likert scale was also employed to eliminate the neutral option. A sector-wide survey was conducted at the end of 2022 to examine the adoption behaviour of related stakeholders, which are project manager, procurement committee, construction company and construction expert. These stakeholders are spread across 34 Indonesian provinces and have varying ages, educational backgrounds, and work experiences, all of which are expected to have a significant impact on their perceptions of technological transformation in business licensing and procurement processes. The investigation team used a sample-based approach as analysis unit, determining the minimum sample size by multiplying the number of the most complex latent variable by 10 (Hair et al., 2012). Instead of selecting all elements from the population, purposive sampling techniques were employed, considering certain characteristics and character specifications.

4.2 Data Analysis Method

Since the precision of data collection procedures significantly influences data quality (Roh et al., 2021), it was imperative to validate and verify the reliability of the questionnaire before distributing it to respondents (Souza et al., 2017). The validity and reliability of the survey instrument were assessed using a sample of thirty prospective implementation respondents. The validity test utilized Pearson's product-moment correlation method, with the total score calculated by summing the scores from each variable. The significance of the correlation results was determined by comparing the r-count with the t-count and t-table values. This two-part test was conducted at a 5% level of significance. Structural equation model (SEM) was employed to investigate the relationships between constructs, as measured by various indicator variables. It is capable of measuring complex model relationships while accounting for the inherent measurement error of the indicators. The data processing devices utilized SMART PLS version 4.0, which facilitated the definition, estimation, assessment, and description of models to demonstrate correlations among complex variables. SEM comprises measurement model and structural model (Hair & Sarstedt, 2021; Xiong et al., 2015). A Cronbach's Alpha values greater than 0.7 indicated the reliability of all constructs or the accuracy and consistency of the indicators. A higher R^2 value, closer to 1.00, indicates a better explanation of the endogenous variables. The bootstrapping process, utilizing the bootstrap resampling method, yields path coefficients and t-statistic or t-value. Path coefficients in the model should have a t-statistic value greater than 1.96, with a confidence level of 5%. The latent variables exhibit influence on other variables when the test results are statistically significant, with a positive value indicating a positive effect, and vice versa.

5. Results

5.1 Respondent Profile

The questionnaire was filled out by 829 individuals, comprising 47 construction company managers, 65 senior construction experts, 165 procurement committee, and 552 project managers. Respondents came from 34 Indonesian provinces, representing all provinces with varying technological infrastructure conditions, and they range in age, educational background, and experience. As shown in Fig. 1, respondent profiles were identified by age, gender, agency affiliation, level of education, and professional experience.

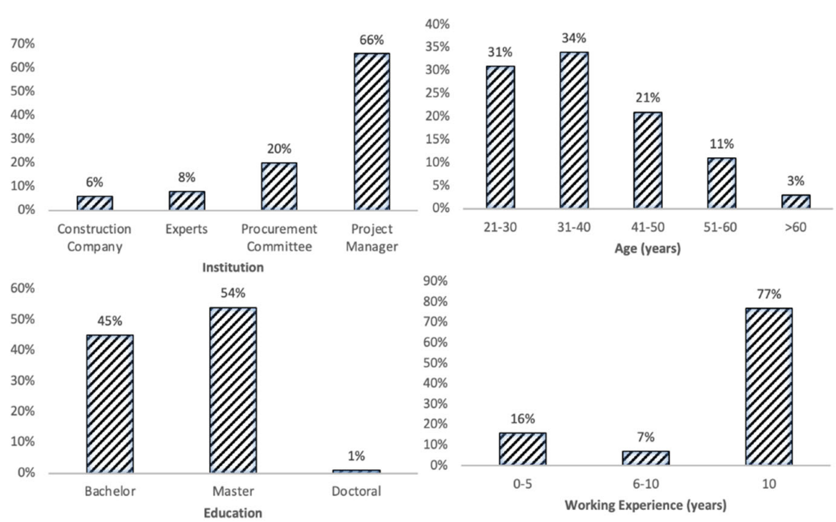

Fig. 1. Respondent Profile

5.2 Measurement Model

The integration concepts of Technology Readiness and Technology Acceptance Model is a more comprehensive framework. The proposition put forth was that technology readiness serves as a causal antecedent to the perception of usability and ease of use, both of which have an impact on users' intentions to adopt information technology systems. Users' intentions to adopt information technology systems were accounted for by negative and positive technology readiness, perceived usefulness, and ease of use. The theory was subsequently supplemented with perceived value creation.

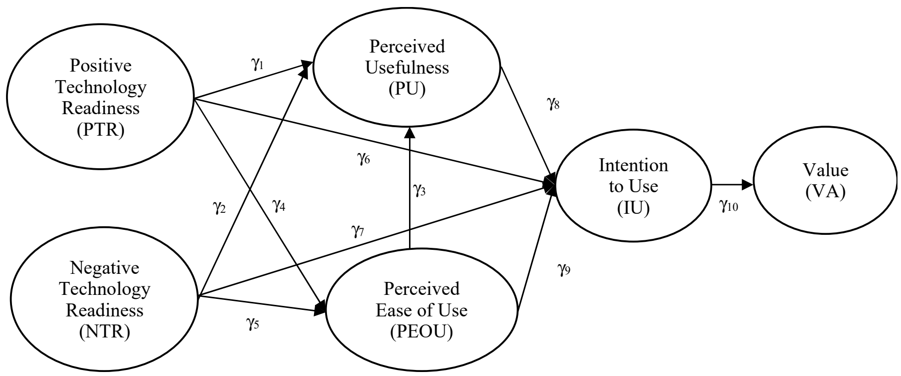

Fig. 2. Causality Relationship of Exogen and Endogen Factor (Path Analysis)

Based on the constructed causality relationship, the following is the adoption structural model and value achievement:

$PU = \gamma_1 PTR + \gamma_2 NTR + \gamma_3 PEOU + \varsigma$
$PEOU = \gamma_4 PTR + \gamma_5 + NTR + \varsigma$
$IU = \gamma_6 PTR + \gamma_7 NTR + \gamma_8 PU + \gamma_9 PEOU + \varsigma$
$VA = \gamma_{10} IU + \varsigma$

γ = relationship of exogenous constructs to endogenous constructs
ς = error term

Fig. 2 illustrates the measurement model that was developed utilizing 829 data points and SMART-PLS 4.0 analysis. By squaring the outer loadings of reflective constructs, the indicator reliability was calculated. This method yielded a comprehensive measurement model by illuminating the relationship between latent variables and their values. A standardized loading factor of 0.5 is essential, with an ideal value of 0.7 (Cheung et al., 2023).

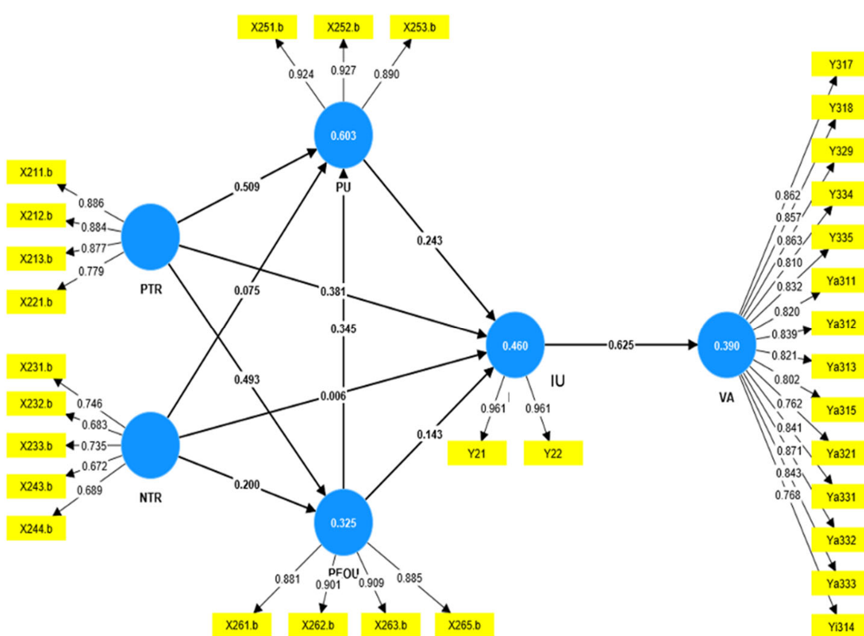

Fig. 3. Diagram SEM of Integrated Information System Adoption Model

Table 1
Model-related constructs and indicators

Variable	Dimension	Indicator	Reference
Positive Technology Readiness (PTR)	Belief/principle/ attitude /optimism in digital technology	X211b. Belief in the ability of digital technology to improve work performance	(Al-Muftah et al., 2018; Elnaghi et al., 2019; Kuldosheva, 2021; Sam & Chatwin, 2018)
		X212b. Belief that digital technology expands the flexibility and simplifies work process	
		X213b. Belief that digital technology can improve efficiency and reduce costs	
	Innovativeness	X221b. An interest in learning more about digital transformation	
		X222b. Capability to deliver access digitalisation technology	
		X223b. Technology implementation capability	
Negative Technology Readiness (NTR)	Insecurity	X231b. Concerns about the security system's dependability	(Chen et al., 2013; Nugroho & Fajar, 2017)
		X232b. Belief that digital evidence is less secure than paper evidence.	
		X233b. Concerns about specific institutions' surveillance of personal information	
	Discomfort	X241b. Concerns about how technology will alter work habits and comfort	
		X242b. Concerns that digital transformation will have a negative impact on many aspects of life	
		X243b. Concerns that technological advancements frequently disrupt construction services	
		X244b. Misinterpretation of digital data and information occurs frequently.	
Perceived Usefulness (PU)		X251b. An integrated information system boosts the performance of the construction sector	(Rabaa et al., 2016; Veeramootoo et al., 2018)
		X252b. An integrated information system streamlines the business licensing and procurement processes for the construction sector	
		X253b. An integrated information system reduces costs and expedites the construction business licensing and procurement process.	
Perceived Ease of Use (PEOU)		X261b. Ease of access to an integrated information system	(Blut & Wang, 2020; Chen et al., 2013; Eom & Lee, 2022; Ma et al., 2017)
		X262b. Ease of interaction and transaction	
		X263b. Ease of understanding/learning how the system works	
		X264b. Interactions between applications are easier to understand (interoperability)	
		X265b. Ease of obtaining data and information	
		X266b. All integrated systems are easy to use.	
Intention to Use (IU)		Y21. Constant enthusiasm for utilizing an integrated information system	(Al-Muftah et al., 2018; Elnaghi et al., 2019; Kuldosheva, 2021; Sam & Chatwin, 2018)
		Y22. Intensity of use of an integrated information system	
Value Creation (VA)	Improving the performance of construction business licensing and procurement services	Y317. Disclosure of data and information in the construction sector	(Sandoval-Almazán et al., 2017; Twizeyimana & Andersson, 2019)
		Y318. Improving the transparency of construction services	
		Y329. Improving the responsiveness of business licensing and procurement services	
		Y334. Improving the cost-effectiveness and timeliness of business business licensing and procurement services	
		Y335. Increasing the security and privacy of data and public information	
		Ya311. Access to construction business licesing and procurement services is simple and flexible	
		Ya312. Participation of stakeholders in the development of the construction services system (inclusive)	
	Improving government administration performance	Ya313. Increase collaboration among agencies in providing construction business licensing and procurement services.	(Twizeyimana & Andersson, 2019)
		Ya315. Reducing the possibility of civil servants committing fraud	
	Increasing the social value	Ya.32. Improving Integrity	(Bannister & Connolly, 2014; Cordella & Bonina, 2012)
		Ya33. Increasing stakeholder involvement in construction services	
		Ya332. Increasing construction stakholder interaction	
		Ya333. Improving the group's impartiality and fairness	
		Yi314i. Increased trust in government	

Table 2 indicates that all indicators were significant, as evidenced by outer loadings exceeding 0.5.

Table 2
Outer-loadings Value

	Outer loadings	Decision		Outer loadings	Decision
X211.b ← PTR	0.838	Significant	X261.b ← PEOU	0.848	Significant
X212.b ← PTR	0.821	Significant	X262.b ← PEOU	0.870	Significant
X213.b ← PTR	0.828	Significant	X265.b ← PEOU	0.894	Significant
X221.b ← PTR	0.764	Significant	X266.b ← PEOU	0.880	Significant
X222.b ← PTR	0.659	Significant	Y21 ← IU	0.961	Significant
X223.b ← PTR	0.632	Significant	Y22 ← IU	0.961	Significant
X231.b ← NTR	0.716	Significant	Y317 ← VA	0.862	Significant
X232.b ← NTR	0.652	Significant	Y318 ← VA	0.857	Significant
X233.b ← NTR	0.712	Significant	Y329 ← VA	0.863	Significant
X241.b ← NTR	0.727	Significant	Y334 ← VA	0.810	Significant
X242.b ← NTR	0.699	Significant	Y335 ← VA	0.832	Significant
X243.b ← NTR	0.684	Significant	Ya311 ← VA	0.820	Significant
X244.b ← NTR	0.700	Significant	Ya312 ← VA	0.839	Significant
X251.b ← PU	0.924	Significant	Ya313 ← VA	0.821	Significant
X252.b ← PU	0.927	Significant	Ya315 ← VA	0.802	Significant
X253.b ← PU	0.890	Significant	Ya321 ← VA	0.762	Significant
X261.b ← PEOU	0.848	Significant	Ya331 ← VA	0.841	Significant
X262.b ← PEOU	0.870	Significant	Ya332 ← VA	0.871	Significant
X263.b ← PEOU	0.909	Significant	Ya333 ← VA	0.843	Significant
X264.b ← PEOU	0.895	Significant	Yi314 ← VA	0.768	Significant

Construct validity was established through the assessment of convergent and discriminant validity (Sarstedt et al., 2017). The factor loadings, composite reliability, and average variance extracted (AVE) of the indicators were considered to establish convergent validity. AVE values above 0.50 indicate that the construct accounts for at least 50% of item variance (Hair & Sarstedt, 2019). Cronbach's alpha, another measure of internal consistency reliability, employs the same thresholds as composite reliability, with a recommended cut-off value of 0.70 (Hair & Sarstedt, 2019). Table 3 shows that, on average, the latent variable explains more than half of the variance in the indicators.

Tabel 3
Construct Reliability and Average Variance Extracted (AVE)

	Cronbach's alpha	Average variance extracted (AVE)
PTR	0.852	0.580
NTR	0.836	0.498
PU	0.901	0.836
PEOU	0.943	0.780
IU	0.918	0.924
VA	0.965	0.687

The discriminant validity of a reflective construct is evaluated to ensure that it has the strongest relationship with its PLS path model indicator (Hair et al., 2021). Discriminant validity at the item level is established when there is a strong correlation between items within the same construct and a very weak correlation between items from different constructs (Henseler et al., 2015). Table 4 shows that all indicators correctly explained their relative construct.

Table 4
Cross Loadings Value

	PTR	NTR	PU	PEOU	IU	VA
X211.b	**0.838**	0.177	0.615	0.462	0.537	0.495
X212.b	**0.821**	0.136	0.598	0.438	0.556	0.478
X213.b	**0.828**	0.160	0.637	0.500	0.520	0.509
X221.b	**0.764**	0.220	0.584	0.432	0.558	0.516
X222.b	**0.659**	0.250	0.418	0.521	0.420	0.410
X223.b	**0.632**	0.267	0.474	0.557	0.420	0.415
X231.b	0.241	**0.716**	0.218	0.244	0.160	0.215
X232.b	0.257	**0.652**	0.289	0.339	0.177	0.215
X233.b	0.190	**0.712**	0.163	0.159	0.162	0.199
X241.b	0.127	**0.727**	0.147	0.228	0.019	0.062
X242.b	0.068	**0.699**	0.083	0.194	-0.045	0.011
X243.b	0.091	**0.684**	0.133	0.116	0.085	0.146
X244.b	0.137	**0.700**	0.149	0.139	0.097	0.144
X251.b	0.683	0.263	**0.924**	0.590	0.562	0.587
X252.b	0.669	0.256	**0.927**	0.605	0.572	0.569
X253.b	0.662	0.232	**0.890**	0.578	0.532	0.565

Table 4
Cross Loadings Value (Continued)

	PTR	NTR	PU	PEOU	IU	VA
X261.b	0.559	0.282	0.568	**0.848**	0.469	0.467
X262.b	0.544	0.256	0.579	**0.870**	0.436	0.453
X263.b	0.583	0.279	0.589	**0.909**	0.457	0.474
X264.b	0.538	0.316	0.545	**0.895**	0.403	0.436
X265.b	0.569	0.302	0.559	**0.894**	0.448	0.463
X266.b	0.559	0.278	0.586	**0.880**	0.463	0.468
Y21	0.654	0.159	0.585	0.479	**0.961**	0.593
Y22	0.620	0.154	0.584	0.494	**0.961**	0.609
Y317	0.557	0.199	0.559	0.480	0.576	**0.862**
Y318	0.538	0.198	0.547	0.477	0.541	**0.857**
Y329	0.507	0.180	0.537	0.442	0.544	**0.863**
Y334	0.492	0.200	0.473	0.410	0.456	**0.810**
Y335	0.516	0.199	0.527	0.395	0.522	**0.832**
Ya311	0.561	0.208	0.560	0.451	0.591	**0.820**
Ya312	0.546	0.180	0.545	0.438	0.555	**0.839**
Ya313	0.512	0.150	0.508	0.427	0.516	**0.821**
Ya315	0.461	0.157	0.467	0.431	0.480	**0.802**
Ya321	0.429	0.153	0.438	0.361	0.458	**0.762**
Ya331	0.491	0.188	0.503	0.399	0.450	**0.841**
Ya332	0.494	0.196	0.535	0.412	0.498	**0.871**
Ya333	0.517	0.223	0.524	0.438	0.493	**0.843**
Yi314	0.545	0.231	0.524	0.462	0.527	**0.768**

5.3 Structural Model

The structural model was evaluated using the coefficient of determination (R^2), statistical significance, and path coefficient relevance. The PLS predict procedure was employed to determine the out-of-sample predictive power of the model (Shmueli et al., 2016). The R^2 value represents the variance clarified by each endogenous variable and measures the model's explanatory power, also known as in-sample predictive power (Rigdon et al., 2017). R^2 values of 0.75, 0.50, and 0.25 were considered substantial, moderate, and weak, respectively (Hair et al., 2019).

The results of the SMART-PLS 4.0 structural model analysis are presented in Table 5 and 6.

Table 5
Test Result of PLS-SEM Model

	Original sample (O)	Sample mean (M)	Standard deviation	T statistics (|O/ STDEV|)	P values	Decision
PTR → PU	0.539	0.538	0.035	15.182	0.000	Supported
NTR → PU	0.039	0.040	0.023	1.695	0.090	Not supported
PEOU → PU	0.293	0.293	0.039	7.599	0.000	Supported
PTR → PEOU	0.589	0.588	0.029	20.596	0.000	Supported
NTR → PEOU	0.170	0.172	0.031	5.544	0.000	Supported
PTR → IU	0.447	0.444	0.050	8.878	0.000	Supported
NTR → IU	-0.046	-0.045	0.030	1.533	0.125	Not supported
PU → IU	0.238	0.239	0.053	4.493	0.000	Supported
PEOU → IU	0.084	0.085	0.044	1.882	0.060	Not supported
IU → VA	0.625	0.627	0.033	18.839	0.000	Supported

Table 6
R-square for PLS Model

	R-square	R-square adjusted
PU	0.596	0.594
PEOU	0.428	0.426
IU	0.476	0.473
VA	0.391	0.390

The model for system adoption and value creation is as follows:

$$PU = 0{,}539\ PTR + 0{,}039\ NTR + 0{,}293\ PEOU + \zeta$$
$$PEOU = 0{,}589\ PTR + 0{,}170\ NTR + \zeta$$
$$IU = 0{,}447\ PTR - 0{,}046\ NTR + 0{,}238\ PU + 0{,}084\ PEOU + \zeta$$
$$VA = 0{,}625\ IU + \zeta$$

PTR = Positive Technology Readiness
NTR = Negative Technology Readiness
PU = Perceive of Usefulness
PEOU = Perceive Ease of Use
IU = Intention to Use
VA = Value creation
ζ = error term

Relationships exist in structural models as direct and indirect effects, with their sum constituting the total effect. In the absence of a mediator, the direct effect represents the influence of exposure on the outcome. The indirect effect, on the other hand, refers to the impact of an independent variable on a dependent variable via a mediator variable.

Table 7
Total Effect of Variables

	Total effects		Total effects
PTR → PU	0.711	PU → IU	0.238
NTR → PU	0.089	PEOU → IU	0.153
PEOU → PU	0.293	PTR → VA	0.416
PTR → PEOU	0.589	NTR → VA	-0.007
NTR → PEOU	0.170	PU → VA	0.149
PTR → IU	0.665	PEOU → VA	0.096
NTR → IU	-0.011	IU → VA	0.625

6. Discussions

All respondents' belief in the ability of digital technology to improve work performance, efficiency, and reduce costs, as well as their desire to learn more about digital technology and its application capabilities, are strong indicators of positive technology readiness. Concerns about how technology will change work habits and comfort, the reliability of security systems, and concerns about personal information surveillance by certain institutions, on the other hand, all reflect negative technology readiness variables.

In line with hypotheses 1 and 2, both positive and negative technology readiness exhibited positive relationships with perceived ease of use and usefulness. Perceived ease of use was expected to increase by 0.589 for every point increase in positive technology readiness. This means that when construction companies, experts, project managers, and the procurement committee are ready for technology, their perception of an information system's ease of use improves significantly.

A coefficient of determination of 0.594 indicates that the exogenous variables of positive and negative readiness for technology, as well as perceived ease of use of the system, explain 59.4 percent of the usefulness perception of the information system, while the remaining variance is explained by other variables. Positive technological readiness has a significant impact on perceptions of the system's usefulness. A high coefficient value of 0.539 can eliminate the influence of negative technological readiness, which has a coefficient of only 0.039. The perceived ease of use of an information system influences its perceived usefulness by only 0.293.

Positive readiness towards technology, perceived ease of use, and usefulness of the system all has a positive relationship with intention to use, according to the SEM model. According to the adjusted R-square value, the adoption model has a coefficient of determination of 0.476, indicating that the model's exogenous variables, namely positive readiness for technology, perceived ease of use, and system usefulness, can influence change the intention to use rate was 47 percent, with the remaining variance explained by other factors. Positive technological readiness had the greatest impact on system intention to use, with a 1-point increase resulting in a 0.447 change in intention. Meanwhile, differences in perceived usefulness and ease of use of the system contribute 0.238 and 0.084, respectively, to intention to use. Negative readiness for technology, on the other hand, has a negative impact on intention to use the system. This result contradicts hypothesis 2.

The analysis revealed that users' trust and ability in digital technology had a significant direct influence on the system's perceived ease of use and usefulness. This is the primary reason for the emergence of intention to use the system. However, trust in digital technology is not the only factor that influences intent to use. It is also influenced by their perception of the system's usefulness. There was a disparity in perception of ease of use of the system as a form of digital transformation offered by the government. These results confirmed that the adoption performance reflected the importance of beliefs about the advantages of technology and the use of specific systems. Users formed perceptions of ease of use regarding a specific system by applying different perspectives on digital technology in general, and adjusting their perspective based on direct experience with a specific platform (Venkatesh, 2000). Important references provided information about the effortlessness of a system, but it did not guarantee individuals' perception of easy usage based on trust in common perception. Instead, belief is influenced by first-hand experience with a specific system (Venkatesh et al., 2003). This conclusion supported Venkatesh et al. (2003), who discovered that perceived ease of use might be less influential in shaping behavioral intentions in future stages of system operation (Aranyossy, 2022; Venkatesh et al., 2003; Venkatesh, 2000; Venkatesh & Bala, 2008). Users who are already familiar with and have direct experience with technology, and understand how it works, are less affected by the convenience of certain systems. They also place less emphasis on perceived ease of use when shaping their behavioral intentions to use the system (Aranyossy, 2022; Venkatesh & Bala, 2008).

In general, users are encouraged to adopt digital technology innovations because they are useful and easy to use. However, users' assessment of ICSIS innovation is driven and facilitated by their own technological readiness, as the total influence of the variables on intention to use is greater than the combined influence of perceived usefulness and ease of use on intention to use. This conclusion is in line with previous study, suggesting that individual’s competence limits their interaction with digital services, resulting in technology being accepted by some users but rejected by others (Meuter et al., 2000). These implied incompetent users were more likely to refuse or postpone the adoption of the information system by undervaluing their benefits. This was evident in the congruence between the readiness of user technology and the perception of system characteristics. In practice, the government should either target services to technologically competent users or make services mandatory for all target users, while also making efforts to increase technological readiness across all segments of the construction stakeholder. The government needs innovation to enhance technological capacity and readiness, creating a construction society that collectively embraces innovation. Technology readiness and acceptance model analysis suggested that in addition to redesigning of system, changes in government intervention strategies by adjusting consumers' technology readiness were other ways of intensifying their adoption intentions. Technology readiness can be used as a basis to determine the segmentation of target users for specific services (Lin et al., 2007; Malodia et al., 2021). Since system characteristics, such as system benefits, also dominate the decision-making process of adoption behavior, the technology readiness and acceptance theory can explain why individuals with high technology readiness do not always adopt a particular service provided (Lin et al., 2007).

Technology readiness and acceptance model shows a shift in emphasis from system service to users, as technology readiness is an individual-specific and technology-independent construct, rather than a system-specific benefit construct (Lin et al., 2007). This highlights the need for the government to focus on individual differences, such as the qualifications of construction companies, experts, project managers, and procurement community. Before the government decides to generalize a particular system and expects to be adopted by the entire segment, it is crucial to identify the characteristics of each user group in terms of their knowledge and experience using information technology, segmentation, and target service users, as well their overall receptiveness to the technology.

The ultimate goal of digital government transformation is value creation. A valid value proposition is expected to entice more target users to use ICSIS. The application of technology readiness and acceptance theory to creation of perceived values by users is also a novel aspect of this study, enriching global research streams and opening up new avenues for investigating the positive impact of digital transformation. The analysis showed the adoption of a system had a significant impact on value achievement, in line with hypothesis 3. A one-point increase in adoption was expected to increase value achievement by 62.5%. These results supported the elevation of technology adoption factors proposed in previous literature regarding the value derived from digital government transformation (Aranyossy, 2022; Malodia et al., 2021). This study also confirmed previous conclusions that digital government transformation created several perceived values, including increased interaction between construction stakeholder (Malodia et al., 2021), greater fairness and absence of partiality (Bannister & Connolly, 2014), more responsive (Bannister & Connolly, 2014; Fischer et al., 2021; Twizeyimana & Andersson, 2019); transparent (Bai, 2013; Cordella & Bonina, 2012; Twizeyimana & Andersson, 2019), business services, as well as open data and information (Sandoval-Almazán et al., 2017; Twizeyimana & Andersson, 2019).

7. Conclusions

The Indonesian government has launched a digital government transformation initiative in effort to force forth the significant changes in construction business licensing and public procurement services. The government believes that this transformation will enhance service efficiency, effectiveness, transparency, and accountability, thereby increasing the national construction sector's competitiveness.

Digital government transformation in the construction sector cannot be viewed solely through the eyes of government organizations; it necessitates the participation of all construction stakeholders. One of the keys to successful transformation is system adoption by all stakeholders through sharing data and information in an integrated system. The level of technology readiness among all stakeholders is the most important determining variable in information system adoption. Governments should identify the characteristics of each user group in terms of their knowledge and experience with information technology, service user segmentation and targeting, and overall technology acceptance.

To further enrich future investigation, a broader range of construction sector stakeholders, particularly those in medium and small construction service business entities, can be considered. Segmenting user respondents into government and nongovernment categories, as well as regions, would enable better understanding of the external factors influencing technology readiness and acceptance. It is important to note that the data used in this study were collected before the effective enforcement of mandatory ICSIS services. Therefore, further investigation would be required when ICSIS becomes mandatory for all Indonesian construction services.

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