

HUMAN CENTERED DESIGN FOR STRONGER CO-PRODUCTION IN E-GOVERNMENT

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Abstract: Digital transformation in the public sector is not only about technology, but about ensuring that every innovation truly serves people. Human Centered Design (HCD) offers a way to put citizens at the heart of digital services, making them not just use but active partners in co-production. This study explores how HCD strengthens IT enabled dynamic capabilities (ITDC) in e-government, with evidence from Southeast Sulawesi Province, Indonesia. Using a quantitative approach with Partial Least Square Structural Equation Modeling (PLS-SEM), data were collected from 70 civil servant involved in policy, system development, and service delivery. The findings reveal that applying HCD principles continuous feedback, multi stakeholder collaboration, modular architecture and data driven adaption, significantly enhances the ability of organizations to sense needs, seize opportunities and reconfigure processes. Statistical results (outer loading 0.832-0.918; $R^2 = 0.624$; $\beta = 0.541$, $p < 0.01$) confirms that HCD driven ITDC improves e-government performance and legitimacy. More importantly, HCD builds transparency and public trust, ensure that digital services reflect real community needs. The study shows that when governments integrate HCD with ITDC, digital transformation becomes more inclusive, resilient and sustainable creating public value that matters in people's everyday lives.

Keywords: Human Centered Design, Co-Production, IT enabled Dynamic Capabilities, E-Government, Public Value

1. Introduction

Human-Centered Design (HCD) ensures that technology solutions remain focused on the needs, expectations and well-being of the end user which fundamentally puts humans at the core of every phase of the design and development process. While it starts with technological capabilities, it starts with a deep empathy to understand users, their problems and their environmental and social contexts. By actively engaging users from start to finish through interviews, HCD observation and testing guarantees that the resulting information system product is not only functional, but also truly usable, relevant and provides a positive experience. The provision of IT system application services must be citizen-centric and assist the public in solving technical problems in the field. This is in line with the core principles of HCD, where design is based on an explicit understanding of users, their tasks and environments. The development of IT system services uses an approach based on the perspective of the user, namely the community, not solely from the perspective of the government and provides a feedback cycle for better performance. This user engagement and iterative (iterative) process is a pillar of HCD that ensures solutions are continuously refined based on user-centric

evaluation. The sustainability challenge of an IT organization is the ability to respond quickly to user complaints and increase their satisfaction.

The essence of Human-Centered Design (HCD) in public service is not just to make the interface "friendlier" but to change the logic of work, where success is measured by how accurately the service solves individual problems in the context of the social problems that occur. According to Melles et al, the three pillars of HCD include understanding the user and context of the problem, stakeholder engagement throughout the cycle, and a systematic approach to encourage sustainable inclusive solutions, not just limited to momentary appropriate technical results (Melles et al., 2021). In the realm of e-government, the latest synthetic evidence shows good user experience (UX), accessibility, clarity of flow, personalization and trust that correlate with adoption intentions and citizen satisfaction. Many failures stem from the focus on technology that ignores the needs of the residents (Aldrees & Gračanin, 2023). The policy framework supports the same direction, the OECD formulates public service design principles that demand inclusion, accessibility, feedback-based iteration and responsible use of data as well as cross-agency design governance that directs governments to build design capabilities that are not just applications.

WHO's digital strategy emphasizes co-creation, equity by design and sustainable feedback governance to maintain public trust as users of system services. This concept is relevant for government digital services that face inequality of access and literacy (WHO, 2021). The global picture of the UN E-Government Survey underscores the importance of user-centred services as well as e-participation channels to deepen public engagement in service design and evaluation (United Nations Department of Economic and Social Affairs, 2022). From the perspective of dynamic capabilities, HCD provides mechanisms for sensing, seizing, transforming, empathic and participatory research to strengthen sensing, co-design, prototyping and modular architecture to accelerate seizing, data-driven iterative cycles secure rapid learning, evidence-based decisions and real-time monitoring of community experiences (Liao et al., 2023). The practice of co-production in public administration shows citizens not only as end users but also as value-creating partners. Such a qualitative study in Austria documents how platforms, feedback apps and participatory channels improve service quality while demanding vigilance of digital boundaries and biases (Edelmann & Mergel, 2021). The latest discourse also reminds that co-production should not widen the digital divide so that design must mitigate exclusion and ensure meaningful participation in vulnerable groups (Kirklies et al., 2024).

This research study aims to review the urgent need of continuous feedback loops through system user tests to understand direct needs, robust metrics (uptime, speed, satisfaction) as well as user communities to share experiences and uncover latent unmet needs. This approach is combined with customization, intuitive and responsive interface design across devices, and fast user support that is all geared towards the fundamental human goal, control, convenience and value of people's time.

2. Literature Review

Dynamic capabilities enabled by IT (ITEDC) are dynamic organizational capabilities that are enabled and enhanced with the help of IT where these capabilities are utilized by organizations through IT resources, IT competencies and their combination with other organizational resources and capabilities to cope with the rapidly changing business environment. IT-enabled dynamic capabilities have a positive impact on an organization's competitive performance (van

de Wetering & Mikalef, 2017)(Mikalef, 2018)(Kaur & Mehta, 2017)(Pappas et al., 2017)(Kaur & Mehta, 2016).

Information Technology-enabled dynamic capabilities (ITEDC) enable public organizations to respond to opportunities/problems and capitalize on them through informed decisions/designs and "reconfigure" resources to align with the changing environment. The ability to detect new needs/problems and the ability to change structures and processes to suit environmental demands have a significant effect on the performance of e-government. This is very correlative and relevant in the practice of Human Centered Design (HCD), namely the discover, define, develop, deliver phase, basically a "sensing, seizing, reconfiguring" system (Teece et al., 2009). HCD essentially places citizens as the main actors in the design and implementation of digital services. In this case, it emphasizes the importance of ITDC to be reviewed as a prerequisite for the HCD process to truly produce strong co-production.

If examined more deeply, "sensing" is the discover/define phase of HCD which emphasizes the importance of the ability of public agencies to listen to the needs of citizens through empathic research, digital surveys, and feedback loops. Research on citizens' needs through the prediction of critical points of needs and service contexts makes the HCD concept a strong evidence to improve the accuracy of understanding the needs of public users and enrich the evidence base for service decisions (Kirklies et al., 2024)(Bee-Ah Kang, Manvi Poddar, Aditi Luitel, Rajiv N. Rimal, Biruk Melaku, 2025). "Sensing" signifies the ability of organizations to detect service needs in the context of public service delivery, understand citizens' expectations and respond to signals of changes in the digital environment. In the framework of HCD, this corresponds to the discover and define phase where public needs are empathetically mapped (Venesaar et al., 2022)

"Seizing" is a Co-design/ideation and design decision that is part of a co-production that involves citizens, frontliners and cross-actor partners during the formulation of digital solutions that magnify service opportunities that meet the needs and values of the public. This shows that an organization's ability to utilize information and translate it into a public participation-based service prototype determines the success of co-production. Studies show user-oriented co-production approaches to be a lever for digital transformation and public value creation (Scupola & Mergel, 2022). Organizations in this case are able to mobilize IT resources, human resources and new ideas to develop digital services. In HCD, this parallels the co-design and ideation phase where citizen information is transformed into prototypes and collaborative solutions through resource acquisition (Lember et al., 2019).

"Reconfiguring" is the phase of delivering an iteration system and ecosystem orchestration that explains that the bureaucracy's ability to change processes, rules or IT infrastructure adaptively and becomes the foundation for HCD product services to be truly sustainable and able to respond to the needs of dynamic citizens. Modular architecture, open APIs and continuous feedback mechanisms allow for quick reconfiguration against changing needs/rules. A cutting-edge synthesis of the dynamic capabilities of the public sector places "sense-making, connecting, shaping" as key elements for reimagining the way government works and collaboration networks (Kattel, 2022). The ability to change and reorganize processes, structures and resources indicates the agency's ability to adjust bureaucratic processes, update work structures and actively involve the public in the provision of services. This is synonymous with the deliver and iterate phase in HCD, where solutions are tested, adjusted and improved together with residents (Kleinhans et al., 2022).

In practical terms, the Dynamic Capabilities generated by Information Technology (ITDC) provide the "organizational muscle" so that HCD actually produces stronger production. Without data-driven sensing and participation channels, discover in HCD will be signal poor

without the ability to absorb seizing and change processes/technologies (reconfiguring), HCD prototypes are difficult to upgrade to widely adopted services. Cutting-edge evidence shows that the design of technology systems determines the value of co-production and participation features, process transparency and user control drive value creation. Inclusive session design improves the quality of digital co-production and the platform's attributes (procedural fairness and clarity of control) influence citizens' intention to participate. It emphasizes that HCD (empathy, iteration, participatory) and ITDC (organizational agility and platform engineering practices are mutually reinforcing pairs (Mu et al., 2022) (Perikangas & Tuurnas, 2024)(Kirklies et al., 2024). Therefore, it can be stated that the Dynamic Capabilities generated by IT with the HDC indicator have a strong influence on the competitive performance of IT as a hypothesis (Fig.1).

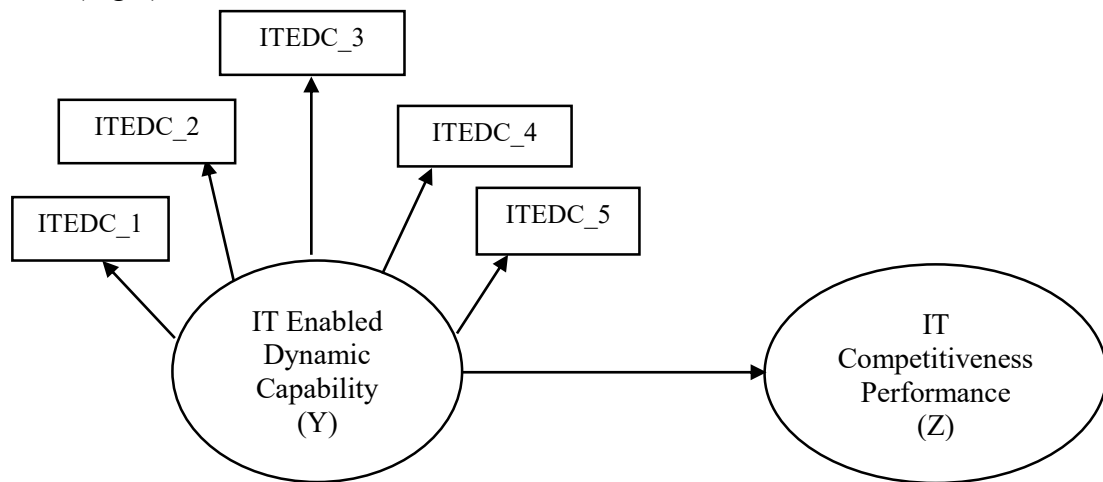


Figure 1: Research Conceptual Framework
Sources: (Puspitafuri, 2025)

Lember et al (2022) show that digital co-production requires a combination of inclusive system design and the ability of organizations to adapt to citizen feedback (Lember et al., 2019)(Uster, 2025). Clarke et al.'s (2023) study on human-centric digital delivery emphasizes the importance of HCD so that public sector digital transformation is not just technical efficiency, but actually increases the importance of HCD so that public sector digital transformation is not just technical efficiency, but actually increases public value (Hirsch-Kreinsen, 2024). Meanwhile, Tonurist & Hanson (2022) in their synthesis of the dynamic capabilities of the public sector explain that sense-making, connecting, shaping are the core for creating digital innovations based on co-production (Venesaar et al., 2022). In fact, the latest study by Voorberg et al (2024) emphasizes that the success of digital co-production is greatly influenced by platform design that allows for fair citizen participation. The integration of ITDC and HCD is key to strengthening co-production in e-government. Without ITDC, HCD would only be a participatory design ritual, on the other hand, without HCD, ITDC would be at risk of giving birth to digital services but very lacking in public value. The combination of the two ensures that e-government is more responsive, inclusive and sustainable.

3. Method

This study uses a quantitative approach or uses the positivism paradigm, namely thinking about cause and effect, hypotheses using measurement and testing theory. This study is an

explanatory survey research with the aim of explaining the cause and effect between variables. The quantitative data used in this study was obtained by the method of distributing questionnaires given to employees who were considered appropriate to provide their responses and perceptions to questions and statements related to the research context. The population in the study is all civil servants in the Regional Apparatus Work Unit (SKPD) of the Communication and Information Service in Southeast Sulawesi Province which totals 70 employees with priority structural positions, functional positions, professional experts, and staff (excluding honorary and contract employees). The data analysis technique uses PLS-SEM research instrument tests and data analysis to test hypotheses.

The dynamic capability variable generated by IT (ITDC) is defined as an organization's ability to integrate, build and reconfigure IT resources and other competencies to respond to rapidly changing business environments. ITDC enables organizations to cope with the rapidly changing business environment and improve the competitive performance of organizations. HDC in this study is integrated in ITDC variable indicators such as the theoretical-based framework proposed by Pang, et al. in Goh & Arenas (2020) which suggests that IT resources enable public sector organizations to develop HDC-based IT capabilities thereby directing public organizations to advance the boundaries of public value. IT capabilities in this case are the ability of a company to mobilize and deploy IT-based resources in combination or present together with other resources and capabilities. This variable includes several dimensions that can be measured, including: Public Service Delivery (ITEDC_1), Resource Acquisition (ITEDC_2), Innovation (ITEDC_3), Co-Production (ITEDC_4), Public Engagement (ITEDC_5) (Puspitafuri, 2025).

4. Result and Discussion

The dynamic capabilities generated by IT are the ability of an organization to adapt, innovate and transform itself quickly and effectively in response to changes in the dynamic environment. Information Technology (IT) plays a key catalyst in strengthening dynamic capabilities. HCD is integrated in indicators that are interpreted as a dimension that is measured by the level of influence as a factor in building ITDC variables. The ITDC variable built from the foundation of the HCD dimension is assumed to have an effect on the competitive performance of the e-government system with strong public value.

Table 1 presents a summary of the results of surveys or research related to a variable called Dynamic Capabilities Generated by IT. This variable measures various aspects that are built integrated with the HCD concept such as public service delivery, resource acquisition, innovation, co-production and public engagement. This variable shows the frequency distribution and the average value of respondents' answers to each question item is 4.22 and is a variable with a very strong influence on respondents. The dimension integrated with the HDC concept has a strong influence in interpreting the meaning of sensing, seizing and reconfiguring which greatly contributes greatly in shaping the ITDC variable.

Table 1. A recapitulation of the answers of dynamic variables generated by IT

Items	Respondent Answer Frequency (F) & Percentage (%)										N	Mean	Criterion
	SS(5)		S(4)		N(3)		TS(2)		STS(1)				
	F	%	F	%	F	%	F	%	F	%			
Y.1.1	30	42.9%	26	37.1%	12	17.1%	2	2.9%	0	0.00	70	4.20	Good
Y.1.2	24	34.3%	29	41.4%	14	20.0%	3	4.3%	0	0.00	70	4.06	Good
Y.1.3	34	48.6%	24	34.3%	11	15.7%	1	1.4%	0	0.00	70	4.30	Excellent
Y.1.4	23	32.9%	28	40.0%	17	24.3%	1	1.4%	1	0.01	70	4.01	Good

Items	Respondent Answer Frequency (F) & Percentage (%)										N	Mean	Criterion
	SS(5)		S(4)		N(3)		TS(2)		STS(1)				
	F	%	F	%	F	%	F	%	F	%			
Y.1.5	20	28.6%	37	52.9%	10	14.3%	1	1.4%	2	0.03	70	4.03	Good
Public Service Delivery											70	4.12	Good
Y.2.1	45	64.3%	17	24.3%	7	10.0%	1	1.4%	0	0.00	70	4.51	Excellent
Y.2.2	44	62.9%	19	27.1%	6	8.6%	1	1.4%	0	0.00	70	4.51	Excellent
Y.2.3	26	37.1%	30	42.9%	11	15.7%	3	4.3%	0	0.00	70	4.13	Good
Y.2.4	38	54.3%	22	31.4%	8	11.4%	2	2.9%	0	0.00	70	4.37	Excellent
Resource Acquisition											70	4.38	Excellent
Y.3.1	28	40.0%	32	45.7%	13	18.6%	1	1.4%	0	0.00	70	4.24	Excellent
Y.3.2	30	42.9%	32	48.6%	12	17.1%	1	1.4%	0	0.00	70	4.29	Excellent
Y.3.3	24	34.3%	38	44.3%	7	10.0%	1	1.4%	0	0.00	70	4.21	Excellent
Innovation											70	4.25	Excellent
Y.4.1	24	34.3%	32	45.7%	13	18.6%	1	1.4%	0	0.00	70	4.13	Good
Y.4.2	23	32.9%	34	48.6%	12	17.1%	1	1.4%	0	0.00	70	4.13	Good
Y.4.3	31	44.3%	31	44.3%	7	10.0%	1	1.4%	0	0.00	70	4.31	Excellent
Co-Production											70	4.19	Good
Y.4.1	20	28.6%	31	44.3%	16	22.9%	2	2.9%	0	1.4	70	3.96	Good
Y.4.2	29	41.4%	33	48.6%	7	10.0%	1	0.0%	0	1.4	70	4.27	Good
Y.4.3	32	45.7%	30	44.3%	7	10.0%	1	0.0%	0	1.4	70	4.31	Excellent
Public Engagement											70	4.18	Excellent
Dynamic Capabilities												4.22	Excellent

Sources: (Puspitafuri, 2025)

Table 2. External Loading Variable IT Dynamic Capabilities

Variable	Original Sample (O)	T Statistics (O/STDEV)	P values
Dynamic Capabilities -> ITEDC_1	0.918	38.748	0.000
Dynamic Capabilities -> ITEDC_1	0.917	30.541	0.000
Dynamic Capabilities -> ITEDC_1	0.872	18.973	0.000
Dynamic Capabilities -> ITEDC_1	0.832	18.856	0.000
Dynamic Capabilities -> ITEDC_1	0.869	18.863	0.000

Sources: (Puspitafuri, 2025)

Table 3. R-square value

Variable	R-square
Dynamic Capabilities	0.624

Sources: (Puspitafuri, 2025)

Table 4. Direct Impact Data Table

VARIABLE	Original sample (O)	t-statistics (O/STDEV)	P values
Dynamic Capabilities -> Competitive Performance	0.541	6,194	0.000

Sources: (Puspitafuri, 2025)

User Service Feedback Continuity

Based on the results of data on the Dynamic variables generated by IT developed from the concept of Human-Centered Design (HCD), it is interpreted that all dimensions measured, namely *Public Service Delivery*, *Resource Acquisition*, *Innovation*, *Joint Production*, and *Public Engagement*, show positive achievements. In more detail, *Resource Acquisition* obtained the highest average score of 4.38, followed by *Innovation* at 4.25, *Co-Production* at 4.19, and *Public Engagement* at 4.18. This explains that the application of the HCD concept allows public agencies to consistently listen, understand, and obtain real evidence of citizens' needs, so that the use of information technology for the implementation of e-government can be optimized in every policy formulation process. By placing society at the heart of all design and development phases, HCD not only increases the relevance of services, but also strengthens the legitimacy of public policy in the era of digital transformation. In accordance with the four principles, *Human Centered Design* (HCD) focuses on humans as implementers, exploring real problems, acknowledging that every element is part of the system and designing human-oriented policies. (Babich, 2017)

In this discussion, the analysis of data variables is carried out by means of PLS-SEM. The results showed that the *ITEDC Dynamic Ability* variable had an original sample (O) value ranging from 0.832 to 0.918. This indicates that any increase in *Dynamic Capabilities* built into all dimensions of the ITEDC indicator will increase *ITEDC's Competitive Performance* by 83%–92%, a value that can be categorized as high. Furthermore, *T-statistics values* are used to test the significance of the relationship between variables. The results of the data interpreted that the analysis value showed a range of *T-statistics values* of 18.8 to 38.7, which means that the value was above the minimum value that should be (1.96 for the 95% confidence level). Thus, the relationship between variables can be concluded to be very significant. Meanwhile, a *p-value* of 0.000 (<0.01) further confirms that the relationship between variables is significant at a very strong level. These findings provide an interpretation that all indicators have a substantial influence in building the *ITEDC Dynamic Capabilities*.

Furthermore, the results of the calculation of R-square (R^2) showed a value of 0.624. This means that *Dynamic Ability* can be explained by 62.4% by exogenous variables in the research model, while the rest is influenced by other factors outside the model. According to the interpretation criteria put forward by Hair et al. (2019), the R^2 value of 0.75 is categorized as substantial, 0.50 moderate, and 0.25 weak. Thus, the R^2 result of 0.624 can be categorized as strong, so it can be concluded that the concept of *Human-Centered Design* (HCD) has considerable ability to comprehensively explain the ITEDC variable. The higher the R^2 value, the greater the model's ability to explain endogenous variables based on the exogenous variables that affect them. These findings are in line with the opinion of Piening (2013), who emphasizes the importance of *Dynamic ability* in public organizations to respond to environmental change through mechanisms of continuous learning, innovation, and adaptation. In other words, the application of HCD principles that strengthen *Dynamic Capabilities* makes a real contribution to improving *Competitive Performance*, especially in facing the complexity of IT governance in the digital era. Then for the Direct Influence variable, it shows that *Dynamic Ability* has a positive and significant effect on *Competitive Performance* with a coefficient of 0.541, *T-Statistics* 6.1194, and a value of 0.000. These results strengthen Teece's (2018) theory that *Dynamic Ability* is a key factor in maintaining a sustainable competitive advantage. The better the organization is at detecting change, responding to opportunities, and transforming, the higher the competitive performance achieved.

The results of the analysis of ITEDC variables show that the realization of the concept *Human-Centered Design (HCD)* in context *E-Government* can be achieved through a process *sensing*, *seizing*, and *Transforming* supported by a mechanism User Service Feedback Continuity. Feedback continuity serves as a mechanism for continuous improvement of dynamic variables, so that the resulting policies are more targeted because they are based on empirical evidence derived directly from community experience. In real terms, sustainably collected feedback enables governments to: (1) detect changing societal needs (*Sensing*), (2) respond quickly to service improvement opportunities (*seizing*), and (3) make iterative-based policy and process adjustments (*Transforming*). Thus, the existence of a feedback cycle not only maintains the relevance of public services, but also strengthens the adaptive and evidence-based learning capacity of organizations. This finding is in line with the view of Teece (2018) who affirms that *Dynamic Capabilities* Acting as a key driver in creating a sustainable competitive advantage. In other words, the results of this study show that ITEDC has a significant influence on *Dynamic Capabilities* in improving IT competitive performance. Through the integration of HCD principles, public organizations are not only able to improve the quality of services, but also ensure that every policy and innovation designed truly reflects the real needs of the community. This ultimately creates a sustainable impact on the competitiveness of the organization in the digital era.

Multi-Stakeholder Collaboration

Multi-stakeholder collaboration within the *framework of Human Centered Design (HCD)* has proven to be the key to strengthening organizational capabilities to seize opportunities. From the description above, it shows that the involvement of government officials, IT system developers, and the public as users is not only formal, but is the main mechanism that increases transparency, responsiveness, and public trust. By involving all of these stakeholders from problem formulation, design, to testing, organizations are able to create technology solutions that are more relevant, inclusive, and of public value. This emphasizes that multi-stakeholder collaboration strengthens social legitimacy and accelerates the adaptation of digital services to the real needs of the community.

The results of the analysis show that respondents consistently assess multi-stakeholder collaboration as one of the influential factors in improving IT dynamic capabilities. Thus, the practice of co-production is able to expand the source of innovation, deepen the relevance of services, and encourage the creation of real public value. The integration between HCD and these dynamic capabilities ultimately strengthens IT's competitive performance, making the e-government system more adaptive, sustainable, and trusted by the community.

Scupola and Mergel (2022) in their research that public administration invests in digital transformation not only to improve the efficiency of internal administrative processes, but also to strengthen citizen-oriented services. This transformation is carried out through the *Co-production* involving various stakeholders in the formulation and implementation of digital strategies, so as to create synergy between the government, the private sector, and the community. This approach has been proven to be able to improve the quality of services while producing four main types of public value, namely value for citizens through increased accessibility and ease of service, economic value through efficiency and innovation, administrative value through improved governance and transparency, and social value through strengthening public participation and inclusion (Scupola & Mergel, 2022).

Edelmann and Mergel (2021) show that the digital transformation of public administration does not only focus on the application of technology, but emphasizes the active involvement of all

stakeholders. In his research, it is emphasized that public service co-production is a key factor in improving service quality and encouraging public sector innovation. Through cross-actor collaboration, digitalization is not only a technical efficiency, but also a means of strengthening social legitimacy and creating sustainable public value (Edelmann & Mergel, 2021).

Multi-stakeholder collaboration within the framework of Human Centered Design (HCD) is proving to be a crucial strategy to strengthen the dynamic capabilities of information technology and improve the competitive performance of e-government systems. The active involvement of the government, system developers, and the community from the formulation stage to implementation allows for the creation of digital solutions that are more adaptive, transparent, inclusive, and of public value. The practice of co-production not only expands the source of innovation, but also deepens the relevance of services and strengthens social legitimacy. In line with the findings of Scupola and Mergel (2022) and Edelmann and Mergel (2021), citizen-oriented digital transformation through coproduction produces comprehensive public value such as economic, administrative, social, and citizen services, making digitalization not just a technical efficiency, but a strategic instrument to build public trust and create sustainable services.

Collaboration with stakeholders is one of the important keys in improving the quality of public services. This collaboration can help the government obtain better information about the needs of the community and provide more effective and efficient services (Alderwick et al, 2021). Stakeholder can be interpreted Talking about public services also means talking about how to meet every community need. As has also been defined, public services are a series of forms of activities or activities carried out by institutions and bureaucracies that have the main purpose of meeting each form of needs and interests of their citizens (Alderwick et al., 2021).

In this case, public service always refers to every effort that can be made to fulfillment. Again, the goal in public service is to serve and meet every form of community needs. This is a form of the government's obligation to serve its community. However, in an effort to meet the needs of the community, public services provided by the government must have various obstacles. One of the obstacles that hinders the existence of public services is the lack and lack of integration of collaboration between existing stakeholders. Public service providers often face difficulties in establishing relationships with relevant stakeholders in order to build support systems for services and legitimacy for strategic operational decisions. (Andrews et al., 2017).

Modular architecture and data-driven adaptation

The implementation of Human Centered Design (HCD) has proven to be an important catalyst in strengthening IT-based dynamic capabilities (ITDC). The results of the PLS-SEM analysis show an R^2 value of 0.624 and an influence coefficient of 0.541 ($p < 0.01$) which indicates the significant influence of HCD on improving IT competitive performance. Theoretically, these findings strengthen the dynamic capabilities framework developed by Teece et al. (1997), namely sensing, seizing and transforming mechanisms that allow organizations to detect change, capture opportunities and enable organizations to detect changes, capture opportunities and rearrange resources adaptively. In the context of e-government, the HCD principle gives legitimacy to each stage of the process, because digital services are built on the basis of real needs of the community, not just the encouragement of technical efficiency. Thus, the integration of HCD and ITDC plays a direct role in building a sustainable competitive advantage in the midst of the dynamics of a complex digital environment (Teece et al., 1997). The HCD principle encourages organizations to adopt modular architecture as a strategic framework in managing digital systems. Modularity allows for system flexibility, where

technology components can be updated or replaced separately without disrupting the overall infrastructure. This is in line with the findings of Mikalef et al (2021) who affirm that a flexible IT architecture is an important prerequisite for the formation of IT-enabled dynamic capabilities that have direct implications for organizational performance. With a modular architecture, the public bureaucracy can reconfigure quickly, ensuring services remain relevant, inclusive and sustainable (Mikalef et al., 2021) . More importantly, this modularity creates space for digital co-production practices, where various actors, namely government, society and the private sector, can contribute collaboratively in developing innovative solutions that have high public value (Lember et al., 2019).

In addition, data-driven adaptation practices strengthen the empirical legitimacy of HCD principles by providing a more accurate and real-time decision-making basis. Through the continuity of digital feedback, the government can detect new needs of the community (sensing), respond quickly to service improvement opportunities (seizing) and adjust IT policies and infrastructure iteratively (transforming). Data-driven cycles allow public organizations to conduct adaptive learning faster, so that every digital policy is truly evidence-based. Thus, the combination of modular and data-based adaptation makes public organizations more resilient, responsive and competitive. The integration of HCD principles with this foundation ultimately results in e-government that is not only efficient, but also inclusive, trustworthy and able to create public value in a sustainable manner.

5. Conclusions

This study shows that digital government becomes stronger when it starts from people, not just from technology. By integrating Human Centered Design (HCD) with IT-enabled dynamic capabilities (ITDC), public organizations in Southeast Sulawesi were able to better sense citizens needs, seize opportunities for innovation and adapt their systems responsively. The statistical result confirm that this integration significantly improves performance, but beyond numbers, it also builds something more fundamental, legitimacy, trust and relevance. The evidence highlights that HCD is not simply about creating friendly interfaces, but about shaping, governance that listens, learns and co-creates with society.

To make this transformation sustainable, several policy directions are needed. First HCD must be institutionalized as a guiding principle of governance, ensuring inclusivity and meaningful citizen participation in every stage of digital service design. Second, multi stakeholder collaboration between government, IT developers and communities should be strengthened to build legitimacy and shared ownership of innovations. Third, adopting modular and flexible IT architectures will allow governments to adjust quickly to changing needs without costly overhauls. Finally, data driven adaptation should become a cultural norm, where continuous feedback and real time evidence inform policies and strengthen public trust. In this way, digital transformation is not efficient but also human centered, resilient, and truly capable of creating lasting public value in people's everyday lives.

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