THE ROLE OF INFORMATION TECHNOLOGY IN INNOVATION IN PUBLIC ORGANIZATIONS

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ABSTRACT

The need for more research on the role of information technology (IT) on innovation in public organizations motivates this study. Using affordance theory, we conceptualize that three IT affordances related to collaboration, process management, and organizational memory, influence dynamic capabilities in public organizations, which in turn makes the public organization innovative. An important construct, unique to public organizations, namely organizational welfare focus, plays an important moderating role in our theorization. Analysis of data collected from a survey of managers in US public organizations supports our hypotheses. Contributions and implications are discussed.

Keywords: Public organizations, Information Technology (IT) affordances, dynamic capabilities, organizational innovation.

INTRODUCTION AND MOTIVATION

An organization's information technology (IT) arguably has an important influence on its innovation efforts and outcomes [8, 14, 16, 35]. It has been argued that IT helps build organizational capabilities, which are crucial to the organization achieving innovations such as new product/service development [13, 57]. However, the relation between IT and organizational innovation has mainly been studied in the context of private organizations with scholars observing that the IT-enabled transformation of the public sector has been unanticipated, slow, and idiosyncratic [7].

The public sector includes "public service organizations and agencies as well as state-owned enterprises at all levels including local, regional, state, and federal, as applicable in each country" [7, p. 323]. Often, public organizations like governmental agencies are slow to embrace and leverage the transformational potential of IT, with the result that the role of IT on innovation in public organizations is understudied–in fact, it has even been observed that the public sector literature does not often converge upon a clear understanding of organizational innovation [38]. Furthermore, it has been noted that "the public sector…remains largely locked in a predominant focus on efficiency" while paying less attention to reinventing their product and service offerings through innovation [44, p. 330].

Given such observations, it is important that further studies are conducted to better assess the role of IT in organizational innovation, specifically within the context of public sector organizations (a.k.a., public organizations). Such an effort is necessary because public organizations often are vulnerable to socioeconomic changes within the community [20], thereby having their innovational idiosyncrasies. Given large scale disruptions due to socioeconomic factors– such as due to the COVID-19 pandemic –

achieving (and sustaining) innovation in public sector can become challenging [72]. A better understanding the role of IT in innovation within the public sector will thus help on two fronts. One, it will help address some of the limitations in our understanding on innovation in the public sector itself. Two, it will help inform us how to leverage IT to move the public sector (including governments) across the globe to more digitalized, streamlined, and innovative offerings [67]. Given the generally limited focus on IT in the literature on public administration and public organizations, we hope to make a strong case as to how IT can be leveraged to improve public organizations.

The study motivates itself through these observations and contributory requirements. Specifically, we look at the concept of organizational IT affordances and how these affordances can be useful in engendering capabilities for public organizational innovation. In our study, we understand public sector innovation as "the implementation of a new – technical, organizational, policy, service or other – concept that changes and improves the functioning and outcomes of the public sector" [31, p. 478]. IT affordances are understood as the goal-oriented action potential of organizational IT [45]; put simply IT affordances capture what the organizational IT allows the organization to do [73]. Based on previous studies, we theorize that three important affordances –IT collaborative affordance, IT organizational memory affordance, and IT process management affordance [14] [these are defined later] play an important role in engendering dynamic capabilities in public organizations, and thus, continued innovation. A unique aspect of a public organization, namely its welfare focus, (i.e., how focused it is on delivering community welfare), is also included as a key theoretical element that shapes this innovation.

Our study thus answers the call for continued research on key innovation-related factors in public organizations [9, 36, 69] by offering a parsimonious set of IT-related considerations that drive innovation. Coupled with our focus on the IT angle of public organizations, and their capabilities and welfare focus, we deliver an illuminative model that can influence future research and practice on innovation in public organizations. Formally, our research question(s) can be stated as follows: **How does organizational IT influence capabilities that drive innovation in public organizations? And how does the organization's welfare focus, a concept unique to public organizations, play a role in shaping this innovation?**

To answer these research questions, the study proceeds as follows. In the next section, we review literature on IT affordances, dynamic capabilities, and organizational welfare focus. Following that, we develop our research hypotheses that links IT affordances to dynamic capabilities and ultimately to organizational innovation in the context of public organizations. We also theorize how welfare focus plays a key catalyzing role. Then we conduct the empirical study to test the hypotheses and discuss the results. Finally, we illustrate the contributions and implications of this study.

LITERATURE REVIEW

IT Affordances and their Relevance to Public Organizations

The concept of affordances was introduced first by Gibson [29, 30], capturing the idea of "the actor-environment mutuality…[and that] the actor and the environment make an inseparable pair" [46, p. 2]. Affordances were first introduced to studies on IT by Norman [52] and have, since then become an important concept to understand the salience of IT to individuals and human collectives (e.g., organizations). The concept of IT affordances has been discussed in many prominent works on IT and organizations [e.g., 40, 68, 75].

Affordances arise when human beings appropriate IT artifacts [45] and encapsulate the relationships "between users' abilities and features of…technology" [19, p,34]. At the foundational level, IT affordances are sociotechnical constructs, highlighting the interrelation of organizational IT and the social

aspects of an organization [16]. They also identify how the "arranging and rearranging of IT within the social environment (or vice versa) continuously create possibilities for influencing the form and function of an organization" [15, p. 5].

While the literature has discussed many forms of affordances that IT can provide, a parsimonious set of IT affordances relevant for organizations was discussed in a series of works by Chatterjee and colleagues [14-16]. Specifically, three affordances were discussed, which were argued to be crucial to an organization. They were IT affordances for organizational memory, collaboration, and process management. Organizational memory is the "IT-facilitated ability to create, store, transform, refine, access, mobilize, apply, and exploit organizational knowledge" [14, p. 165]. Collaborative affordance can be understood as the "IT-facilitated ability to instill cooperation within an organization, both in a collocated and distributed/virtual setting, on a one-to-one or many-to-many basis" [14, p. 165]. Finally, process management affordance is defined as the "IT-facilitated ability to design, visualize, prioritize, and monitor work processes, as well as allocate and manage appropriate resources to enable action and decision" [14, p. 165].

These three affordances were chosen for our study on public organizations because the aspects of collaboration, organizational memory, and process management are crucial for public organizations. For example, collaboration within a public organization has been observed to be a salient factor in the organization's functioning [12]. Again, as public organizations often grapple with political and socioeconomic issues, organizational memory – especially based on prior experience of addressing such political and socioeconomic issues – is an important factor that shapes how public organizations perform [1]. In fact, IT based organizational memory helps recalling prior experience with community events and is thus crucial to developing an effective and learning public organization [43, 70]. Finally managing processes in public organizations is often a complex issue, due to various internal and external stakeholders including the community members and other government agencies [37]. Therefore, the ability of IT to allow better process management should be an important factor to consider.

Dynamic Capabilities in Public Organizations

Organizational capabilities are grounded in the resource-based view of the firm which advocates the view that "resources and capabilities of a firm can be a source of sustainable competitive advantage" [39, p. 1257]. An important focus of organizational theory has been to abstract from the extant literature so as to develop a parsimonious set of organizational capabilities which are required for organizational innovation [e.g., 56].

A compelling, but parsimonious set of such organizational capabilities are *dynamic capabilities*, which are defined as the "specific capabilities by which organizations reconfigure existing operational capabilities into new ones to better match the environment" [56, p. 444]. These capabilities allow for the careful consideration of an organization's ability to successfully navigate an environment that is hastily changing [57]. Until recent times, as reflected upon by Pavlou and El Sawy, dynamic capabilities had been treated as distant mainly because "dynamic capabilities are abstract, intangible, and difficult to describe" (ibid, p. 251). By developing a set of dynamic capabilities that are easier to conceptualize and operationalize, Pavlou and El Sawy attempt to resolve this issue. They define these capabilities as follows:

- *Sensing capability*: the "ability to spot, interpret, and pursue opportunities in the environment" (ibid, p. 243)
- *Learning capability*: the "ability to revamp existing operational capabilities with new knowledge" (ibid, p. 244)

- *Integrating capability*: the "ability to combine individual knowledge into the unit's new operational capabilities" (ibid., p. 245)
- *Coordinating capability*: the "ability to orchestrate and deploy tasks, resources, and activities in the new operational capabilities" (ibid, p. 246).

The dynamic capabilities approach has been used for studying private organizations, but their application to public organizations have been quite limited. In fact, it has been observed that:

> Although this [dynamic capabilities] theoretical perspective holds potential to enhance our limited understanding of how public organizations change in response to their increasingly turbulent and complex environments, it has **received little attention in the public management field** [59, p. 209, emphasis added in bold].

The eschewing of the rich theoretical lens of dynamic capabilities, we contend, is a serious blind spot in research on management of public organizations. Arguably, the dynamic capabilities (sensing, learning, integrating, and coordinating) hold great salience in public organizations. For example, it is crucial for public organizations to sense community sentiments before and after any planned welfare program implementation [18]. Again, an effective public organization needs to learn from past experiences which are often embedded within the milieu that the organization operates in [43]. Integration of its resources for channelizing efficiency is also an important consideration in public organizations [41]. Finally, public organizations need to satisfy a variety of multiple stakeholders (other government agencies, politicians, community members etc.) and thus the ability to coordinate amongst multiple stakeholders is quite important [27]. Clearly, the dynamic capabilities approach is a valuable one to study public organizations, motivating us to use this perspective in our study.

Welfare Focus of Public Organizations

A distinguishing feature of public organizations is their focus on community welfare. This characteristic, in fact, distinguishes public organizations from private ones. When public organizations innovate, they do so with a welfare focus [61]. A focus on welfare implies that the organization is concerned about community well-being [2]. Thus, it is natural to include the welfare focus of public organizations as part of a study of innovation in public organizations. The extent of welfare focus of a public organization should have a role to play in how much it innovates, as innovation in public organizations is undertaken ultimately with a focus on improving community welfare.

Public organizations with a strong welfare focus share many unique characteristics. They believe in the idea of mutuality, empathy, and trust. Their focus is on the development of sharing and caring for the organizational stakeholders. These organizations try to maintain a high degree of symmetry in social relations [11]. Organizations committed to welfare are often closely connected with the development of citizenship and cooperative action, drawing upon the notion of empowerment and self-determination. These organizations co-opt professional workers and well-trained volunteers, who are focused on addressing community needs through better focus on welfare [49].

HYPOTHESES DEVELOPMENT

This section develops the hypotheses for our study. The research model is shown in Figure 1. We hypothesize that organizational IT affordances positively influence the dynamic capabilities of the public organization. Dynamic capabilities, in turn, positively influence innovation in public organizations, and this relationship is positively moderated by the organization's welfare focus.
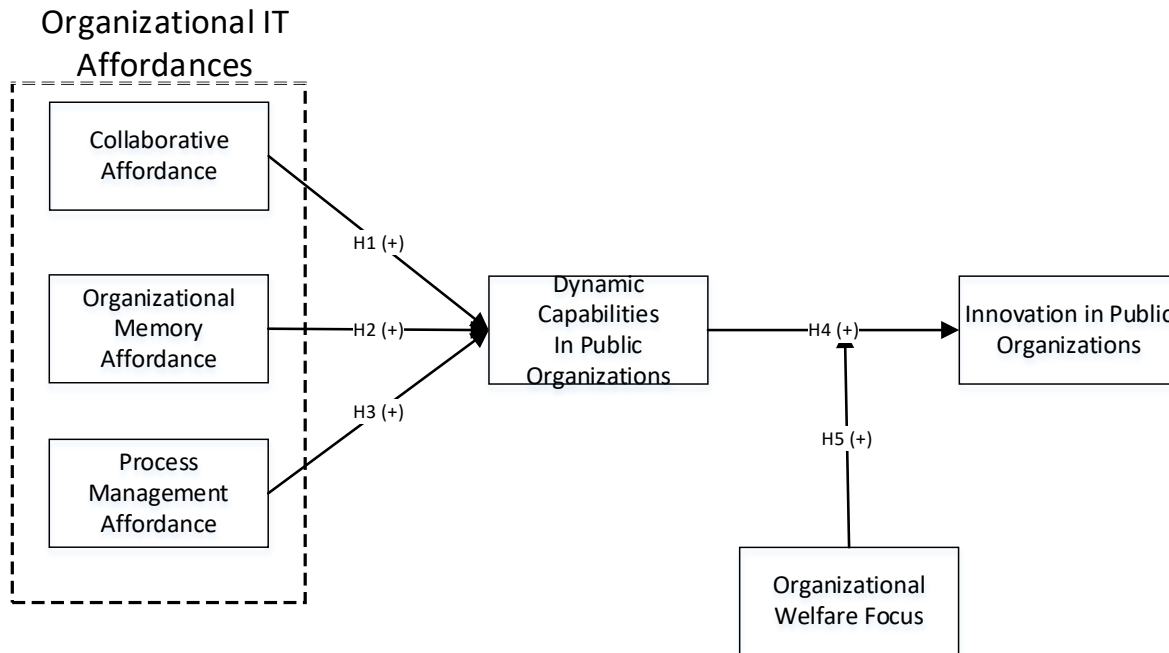
Figure 1. Research Model.

Collaborative IT Affordance and Dynamic Capabilities

Collaboration is a fundamental aspect of any organization, including public organizations. Public organizations need to engage in varied forms of collaboration which include collaborating with other government and public agencies, community members, and even corporate stakeholders [32]. Collaboration helps organizational stakeholders work together and integrate their inputs and knowledge and promote dialogue to address pressing organizational needs, thereby enhancing collective thinking [4].

Today's public organizations are increasingly becoming IT-enabled [7] and thus, the collaborative affordance of IT, to promote dialogue and knowledge exchange in virtual settings, take centerstage. Specifically, the collaborative affordance of IT creates possibilities for mutual learning and organizational action [14]. In a public organization, removing learning barriers is key to the development of dynamic capabilities [59]. By allowing stakeholders in a public organization to collaborate in virtual settings using IT, such learning barriers are removed. For example, it has been documented in existing research as to how large public organizations were able to leverage the collaborative affordance of cloud-based platforms to improve dynamic capabilities like sensing and coordination [6].

Therefore, it is clear that the collaborative IT affordance plays a crucial role in the development of dynamic capabilities in public organizations. Hence, we can hypothesize:

H1. Collaborative IT affordance positively influences dynamic capabilities in public organizations.

Memory IT Affordance and Dynamic Capabilities

Organizational memory affordance focuses on an organization's knowledge base; an organization's memory stores key information related to past organizational experience [70]. Organizational memory serves as a repository of historical and sociological information that captures the organization's past learnings [63]. It has been argued that organizational memories "shape – and are shaped by – present and future choices, behaviors, and strategies in and around organizations" [26, p. 1725]

For example, organizational memory captures prior resolutions which can be referred to when needed [60]. A public organization is embedded within a sociopolitical context that often shapes prior experiences of the organization. For example, how the community reacted to a welfare program developed by the public organization (in the past) would be captured in the organizational memory and allow it to make future sense of the community needs and preferences. Again, "remembering" how it coordinated during a prior crisis would be essential to developing coordinating capabilities for a new crisis which might face the community. For example, the learnings of the public organizations during the COVID-19 pandemic, if captured within their memory, will allow them to develop capabilities to properly sense, navigate, and coordinate if a future pandemic should arise.

It is clear that organizational memory incorporates organizational rules and procedures [54] to improve organizational dynamic capabilities for future action. It plays a serious role in influencing how a public organization operates and reacts to the internal and external environment and addressing issues therein, allowing it to build capabilities to operate in a desired manner. Therefore, if the organizational IT allows for capturing of such organizational memory – which we call the organizational IT memory affordance – it will help develop and sustain the dynamic capabilities necessary for the public organization to operate as desired. The role of IT in developing and sustaining organizational memory is salient. It has been argued that organizational memory is actualized through IT [65] and IT promotes the development of memory systems which are ultimately codified within an organization [51].

Combining the arguments, we can conclude that IT can develop and support organizational memory [24] and this organization IT memory affordance, is crucial to the development of dynamic capabilities in a public organization. We can therefore hypothesize:

H2. Organizational IT memory affordance positively influences dynamic capabilities in public organizations.

Process Management Affordance and Dynamic Capabilities

Process management affordance of IT pays attention to IT support of organizational workflows [42] and arguably influences dynamic capabilities in multiple ways. For example, process management with IT allows the "ability to visualize the entire process in action from 'end to end,' representing it through language, imagery, or physical artifacts to make decisions about next steps when alternative actions can be taken" [75, p. 753], thus, allowing for process interdependencies [5] which in turn allows for better integration and coordination of organizational action. Process management affordance balances, integrates, and coordinates processes making the organization agile and thus improving their dynamic capabilities [50]

Therefore, IT-based process management influences key aspects of dynamic capabilities, such as coordination and integration. In a public organization, managing processes is of utmost importance [47]. Public organizations often have to navigate through external pressures such as community resentment and governmental lobbying [10] – thus it is important that their processes are effectively streamlined so that they react effectively to these external pressures. One further challenge that public organizations face, and which is often unique to them, is "red-tape" or bureaucracy [37]. Under these conditions, if the public organization is to remain consistently dynamic to react to changing sociopolitical contexts, as well as not be bogged down by institutional red-tape, IT becomes a handy tool.

IT can allow a public organization to circumvent processual blocks and remain relevant and reactive in a contemporary environment. It helps unblock bureaucratic constraints and transforms public organizations [58]–thus allowing the public organization to adjust quickly to changing contexts and community

demands. In other words, the affordance of IT to support processes in a public organization is key to the development of its dynamic capabilities. Therefore, we can hypothesize:

H3. Process management IT affordance positively influences dynamic capabilities in public organizations.

Dynamic Capabilities and Innovation in Public Organizations

Organizational innovation is defined as the creation of unique products and/or services by an organization [48]. In the innovation literature – which primarily focuses on private organizations - it is established that innovation in organizations occur due to their dynamic capabilities [e.g., 3]. More specifically, dynamic capabilities influence and organization's efforts for change and innovation [62].

Schreyögg and Kliesch-Eberl [64] theorize that an organization's dynamic capabilities are parallelly involved with innovation practices. Similarly, Teece [66] argues that the usages of dynamic capabilities foster an organization's ability to develop new processes/products thus leading to the idea of innovation. Thus, it is clear that organizational innovation is driven by organizational capabilities [22] and especially dynamic capabilities [33].

We contend that the influence of dynamic capabilities on organizational innovation holds true for public organizations as well. It has been argued that dynamic capabilities in public organizations support organizational learning and creativity [34]. Organizational learning and creativity undoubtedly engender innovation, as it has been observed that learning structures and processes in public organizations improve innovation [21]. In fact, dynamic capabilities help public organizations embrace exploratory and experimental cultures – these are crucial for innovation [15]. Combing the arguments thus far, we can therefore hypothesize:

H4. Dynamic capabilities positively influence innovation in public organizations.

Organization Welfare Focus and Innovation

The role of welfare policies is very important to provide welfare services that meet the public organization's innovation goals. To innovate, the organization needs to evolve constantly and make innovative efforts to provide better welfare.

As theorized earlier, possessing dynamic capabilities is important for public organizations to innovate. However, the extent to which such innovation will happen should also be determined by the organizational focus on welfare. This is because, ultimately such innovations in public organizations are developed for social welfare. Unlike private organizations where innovations are mainly developed for profits and competitive advantage, public organizations innovate to provide better public goods/services to community members. Therefore, a welfare focus should have a salient role in how the public organization leverages its dynamic capabilities to innovate.

Innovation in public organizations is concerned with developing new products and services for community well-being. Dynamic capabilities provide the organizational wherewithal for this innovation, such as by better sensing community sentiments, learning about prior successes/failures, and better integrating and coordinating public organizational stakeholders to conceive and develop new products and services for community welfare. However, conceivably, the public organization needs to be *focused on welfare in the first place* so as to leverage the dynamic capabilities for innovation. If the public organization does not have a strong focus on welfare, then regardless of what dynamic capabilities it develops, it will not be able to innovate for welfare to the desired extent. In other words, it is necessary to have a strong welfare focus that can catalyze the dynamic capabilities for organizational innovation to serve the community. Put in another way, the effectiveness of dynamic capabilities to produce innovation in public organizations is

contingent on the extent of their welfare focus. This implies that welfare focus has a positive moderating effect on the dynamic capabilities->innovation relationship in public organizations. Therefore, we can hypothesize:

H5. Welfare focus positively moderates the influence of dynamic capabilities on innovation in public organizations.

EMPIRICAL STUDY

Sample and Data Collection

The data collection was conducted as part of a larger study on public organizations. We collected data with the help of a reputed market research firm, *Qualtrics.* The mode of data collection was an anonymous online survey of managers in public organizations in the US. Only one respondent per organization was chosen. The key informant strategy was employed in the data collection where the survey respondents know about the phenomenon under investigation [74]. Because of our research focus on IT and innovation, the respondents were screened using appropriate questions to ensure they were knowledgeable about IT and innovation in their respective organizations. If they did not meet the screening criteria, they were not included in the set of survey respondents, as per our contract with *Qualtrics*.

Qualtrics helped us conduct a pilot study with 22 respondents to ensure reliability and validity of our survey instrument. The final data collection was launched thereafter and returned a total of 178 responses (our total contracted sample was 200, including the pilot respondents). These final 178 respondents were used in the data analysis. *Qualtrics* informed us that they had sent out the survey invitation to about 1800 managers in public organizations, for an approximate survey response rate of 11.1%. This rate is consistent with survey response rates in similar studies.

Measures and Controls

Measures for IT affordances were adopted from Chatterjee, et al. [14]. Welfare focus was measured with items adapted from Wang and Hackett [71]. Innovation items were adapted from Mihalache, et al. [48] and customized to the public organizational context.

Notably, we modeled dynamic capabilities as a formative second-order construct, by using the latent scores of the four first-order constructs: sensing capability, learning capability, coordination capability, and integration capability. The measures for the first-order constructs were adapted from Pavlou and El Sawy [55].

All items for this study were measured on a standard Likert-type 7-point scale (from Strongly Agree to Strongly Disagree). An additional anchor, "No Knowledge/Cannot Answer," was also included in case a respondent was unable to answer the question. No subjects selected this option for any question. We also collected individual level demographic and organizational level control variables in our study (please see table 1).

Attribute	Demographic Details
Organizational Sector Distribution (# of organizations in each sector)	Social Care: 17; Health: 37; Education: 18; Utilities: 19; Law Enforcement: 13; Others: 18
Organizational Size	Under 100 employees: 45; 101 to 500 employees: 48; 501-1,000 employees: 27; 1,000 – 5000 employees: 37; Over 5000 employees: 21
Organizational Age	0-10 years: 28; 11-20 years: 58; 21-30 years: 31; 31-40 years: 28; 41-50 years: 14; Over 50 years: 19

Highest Education of Respondents	High school / secondary school or equivalent: 26; Associate degree: 36; Bachelor's degree: 56; Master's degree: 53; Doctoral degree: 7
Total Professional Experience	0-5 years: 16; 6-10 years: 72; 11-15 years: 26; 15-20 years: 34; Over 20 years: 30
Number of Employees Managed	0-10: 42; 11-25: 48; 26-50: 24; 51-100: 39; Greater than 100: 25
Age of the Respondents	18-25 years: 17; 26-35 years: 54; 36-45 years: 58; 46-55 years: 30; Greater than 55 years: 19
Gender of the Respondents	Male: 94; Female: 84

Table 1. Demographic and Control Variables

RESULTS AND ANALYSIS

Measurement Model

We tested the model by Partial least squares (PLS). While developing a new theory, PLS is an appropriate structural equation modeling approach that works even if the data is not normal or if the sample size is relatively small [17]. The tool WarpPLS7.0 was used to analyze the data.

As per Fornell and Larcker [25], the measurement model was evaluated by investigating reliability, followed by convergent and discriminant validities. The composite reliabilities of our constructs were 0.896 (dynamic capabilities), 0.808 (process management affordance), 0.81 (organizational memory affordance), 0.749 (collaborative affordance), 0.798 (innovation), and 0.88 (welfare focus). These reliabilities exceed the threshold recommended (0.7), and demonstrates that our instrument was reliable [53]. Convergent validity was assessed by showing that "t-values of the Outer Model Loadings are above 1.96" [28, p. 97], that is they are significant ($p<0.05$). As shown in table 2, this condition was also satisfied, demonstrating convergent validity.

For discriminant validity, it was ensured that 1) the items loaded higher on their respective constructs as compared to others (see table 2) and 2) the square root of the average variance extracted (AVE) for all constructs was greater than the correlations between the latent constructs (see table 3). Based on the analyses, we were satisfied that our instrument was appropriate.

	Dynamic Capab.	Proc. Mgmt. Afford.	Org. Mem. Afford.	Collab. Afford.	Innov.	Welfare Focus	Std Error	P-value
Note: Dynamic Capabilities is a second-order construct measured using the latent variable scores of the first-order constructs: sensing capability, learning capability, coordinating capability, and integrating capability. The items for the first order constructs are included here. **Dynamic Capabilities: Sensing Capability** My organization… … frequently scans the social, political, and economic environment to identify new opportunities to deliver public value to community stakeholders … quickly discusses changes in preferences among the community stakeholders	**0.836**	-0.099	-0.133	0.013	-0.026	0.168	0.063	<0.001

… periodically reviews the likely effect of changes in its social, political, and economic environment on the community stakeholders … frequently reviews efforts to ensure they match what community stakeholders want								
Dynamic Capabilities: Learning Capability My organization… … has effective routines to identify, value, and import new information and knowledge … has adequate routines to assimilate new information and knowledge … is effective in transforming existing information into new knowledge … is effective in utilizing knowledge in order to develop new products or services for delivering public value to community stakeholders … can successfully integrate our existing knowledge with new information and knowledge acquired	**0.905**	-0.065	-0.006	0.125	0.186	-0.009	0.062	<0.001
Dynamic Capabilities: Coordinating Capability My organization… … is well-coordinated … ensures that the organizational workflows are well-synchronized … ensures an appropriate allocation of resources (e.g., information, time, reports) across and within work groups …ensures that allocation of employees to work processes are based on employee expertise …ensures that the organizational workflows fit together very well	**0.914**	0.107	-0.021	-0.089	-0.066	-0.03	0.062	<0.001
Dynamic Capabilities: Integrating Capability My organization… … we effectively coordinate activities to manage rapidly changing conditions … we have a global understanding of each other's tasks and responsibilities … we carefully coordinate our actions with each other to meet changing conditions … employees manage to successfully interconnect their activities	**0.925**	0.048	0.147	-0.046	-0.094	-0.113	0.062	<0.001
In my organization, computer technology or IT helps manage organizational processes in the following ways:								

Adequately visualize and monitor organizational processes	0.168	**0.754**	-0.334	-0.192	0.192	0.005	0.064	<0.001
Accurately provide information to support organizational processes	-0.157	**0.801**	0.063	-0.109	0.123	0.115	0.064	<0.001
Effectively streamline organizational process workflows	-0.011	**0.856**	0.254	0.068	-0.201	-0.116	0.063	<0.001
Support task/resource allocation, prioritization, and scheduling in order to sustain organizational processes	0.011	**0.817**	-0.02	0.213	-0.087	0.004	0.063	<0.001
In my organization, computer technology or IT is used to store, access, and disseminate information as follows:								
Effectively capture and compile project information	-0.075	0.101	**0.784**	-0.23	0.059	0.076	0.064	<0.001
Effectively capture and reuse project history (e.g., discussions, insights, work data, documents)	-0.115	-0.009	**0.837**	-0.045	0.129	0.013	0.063	<0.001
Effectively store, archive, retrieve, share, and reuse of project information and best practices	-0.048	0.127	**0.814**	-0.093	-0.012	-0.027	0.064	<0.001
Effectively create knowledge communities (e.g., virtual discussion forums) focused on new ideas	0.242	-0.217	**0.805**	0.364	-0.18	-0.06	0.064	<0.001
In my organization, computer technology or IT facilitates intra-organizational collaboration as follows:								
Effectively implement collaboration within the organization	-0.078	0.214	-0.096	**0.82**	-0.001	0.056	0.063	<0.001
Effectively support collaboration	-0.116	-0.193	0.11	**0.738**	0.04	0.03	0.064	<0.001
Effectively achieve real-time collaborative work	-0.039	0.181	-0.031	**0.704**	0.175	-0.069	0.065	<0.001
Effectively enable organizational members to work collaboratively	0.243	-0.222	0.026	**0.727**	-0.209	-0.026	0.065	<0.001
My organization…								
… has introduced new products and/or services to serve community stakeholders	-0.06	0.009	0.134	-0.096	**0.833**	0.075	0.063	<0.001
… has launched new products and/or services to serve community stakeholders	0.077	-0.144	0.061	0.057	**0.755**	-0.09	0.064	<0.001
.. experiments with new products and/or services targeted toward community stakeholders	0.289	0.024	0.049	0.006	**0.78**	-0.123	0.064	<0.001
...develops new products and/or services for community stakeholders	0.04	0.069	-0.04	-0.205	**0.83**	0.027	0.063	<0.001
...promotes new products and/or services for community stakeholders	-0.338	0.032	-0.207	0.256	**0.789**	0.101	0.064	<0.001
My organization...								
…is concerned about promoting social and community welfare	0.039	0.077	-0.093	-0.032	0.032	**0.854**	0.063	<0.001
… is interested in promoting social and community welfare	-0.035	0.055	-0.043	0.084	-0.1	**0.891**	0.063	<0.001
… cares about promoting social and community welfare	-0.002	-0.128	0.132	-0.053	0.069	**0.894**	0.062	<0.001

Table 2. Loadings and Cross Loadings

	Org. Mem. Affordance	Innovation	Collaborative Affordance	Proc. Management Affordance	Dynamic Capabilities	Welfare Focus
Org. Mem. Affordance	**0.810**					
Innovation	0.579	**0.798**				
Collaborative Affordance	0.650	0.555	**0.749**			
Proc. Management Affordance	0.714	0.515	0.703	**0.808**		
Dynamic Capabilities	0.677	0.728	0.641	0.626	**0.896**	
Welfare Focus	0.621	0.455	0.526	0.525	0.600	**0.880**

Table 3. Correlations Among Latent Variable and Sqrt. of AVEs (along the diagonal)

Structural Model

The structural model is shown in figure 2. As noted earlier, dynamic capability was modeled as a second-order construct with the formative first-order dimensions of sensing, learning, coordinating, and integrating capabilities. For this purpose, latent scores from the four first-order constructs were used as formative indicators for the second-order construct of dynamic capabilities. This aggregation of lower-level dynamic capabilities into the higher order construct of dynamic capabilities is consistent with prior research [57]. Pavlou and El Sawy observe the following when justifying the treatment of dynamic capabilities as a formative second-order construct:

> "Because dynamic capabilities are abstract, intangible, and difficult to describe, they are modeled with a second-order model that is formed by the proposed four dynamic capabilities that are measurable. As each first-order dynamic capability is posited to "form" or enable reconfiguration, a formative second-order model is more appropriate… it allows the direct measurement of dynamic capabilities through the first-order measurable constructs" [57, pp. 251-252].

All the path coefficients were significant at the $p<0.05$ level, thus supporting all five hypotheses. The R-squared for the endogenous constructs were also much higher than the recommended benchmark of 10% [23]. The variance explained for innovation was 47%. The variance explained of dynamic capabilities was 56%, demonstrating that our model had high predictive power.
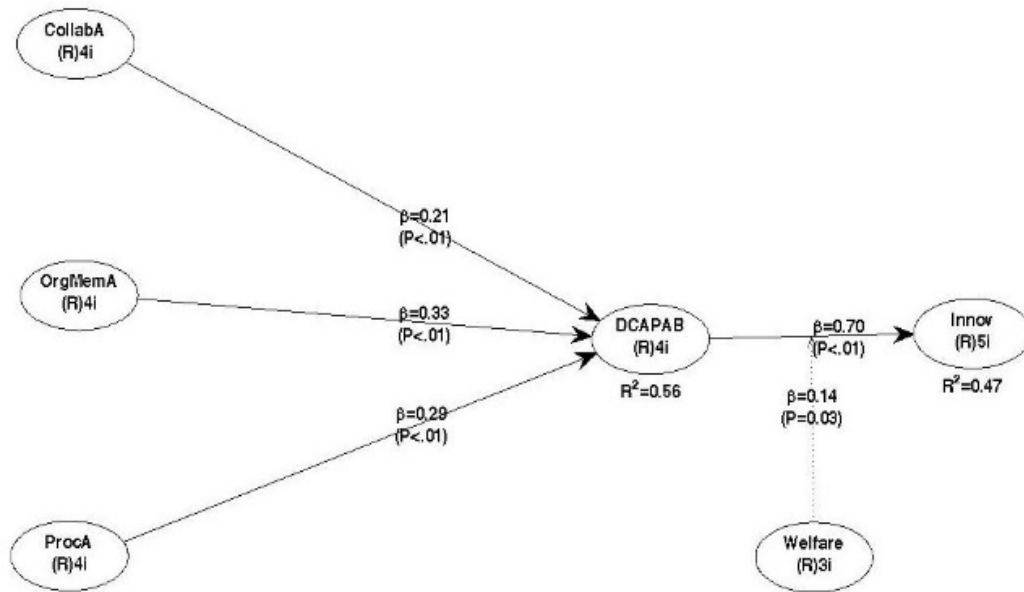
Figure 1. The Structural Model

Post-hoc Investigation of the First-order Dynamic Capabilities

While our treatment of dynamic capabilities as a second-order construct follows precedence and justification established in prior literature, we also investigated each dynamic capability separately to gain granular insights on its role in innovation (the detailed results are omitted here for sake of brevity). We found that of the three IT affordances, the effect of collaborative affordance on sensing and learning capabilities is most prominent. Organizational memory affordance seems to have more of an impact on learning, coordinating, and integrating capabilities. Process management affordance impacts integration capability the most.

The first-order dynamic capabilities also had differential effects on innovation. Innovation is most affected by learning capability, with coordination capability following suit. Sensing capability has less of an effect on innovation. However, perhaps the most unexpected result was the fact that integration capability does not have an effect on innovation.

DISCUSSION

The structural model shows that the three IT affordances strongly influence dynamic capabilities in public organizations, which in turn has a very strong influence on how public organizations innovate. The welfare focus of public organizations also has a significant moderating influence on the relationship between dynamic capabilities and innovation.

Undoubtedly, IT plays a major role in public organizations, as our results show. In addition, the results illuminate the fact that the role of organizational memory affordance is perhaps most salient in developing dynamic capabilities. This is an interesting insight, as it highlights that capturing of past experience (and learning) is perhaps most important for developing dynamic capabilities in public organizations. Due to their embeddedness in the sociopolitical context, social and political history and events assume salience in public organizations. It seems that capturing prior events and using them for learning and adapting purposes is what drives public organizations the most.

The relatively less impact of collaborative IT affordance is perhaps not surprising. Public organizations often continue to rely heavily on hierarchical control mechanisms, which are often not conducive to free-flowing collaboration, especially as compared to private organizations. Collaboration occurs better in organizations with lesser degree of vertical control, and therefore it is not entirely surprising that the effect of collaborative IT affordance is relatively muted (though still significant).

The results also highlight that dynamic capabilities have a very strong influence on innovation. This is the strongest relationship in our structural model. It shows that notwithstanding the uniqueness of public organizations, they do tend to still leverage dynamic capabilities to develop innovation. This is a relationship that is well-established in the private sector, and therefore, our results imply that public organizations can perhaps imitate private organizations to deliver innovation. Even if the focusses of these two types of organizations are different, our results show that they seem to behave in similar ways, at least with respect to the dynamic capabilities->innovation relationship.

The moderating effect of welfare focus, while significant, is perhaps the weakest effect in the model. This may be due to the fact that the salience of welfare focus has been reduced due to the COVID-19 pandemic, with most public organizations struggling to maintain operations and unable to promote a consistent welfare focus (as compared to a more survival focus). However, this result needs to be investigated further, especially once the world recovers from the pandemic. It would be interesting to see if the salience of welfare focus on innovation in public organizations increases post-pandemic.

The post-hoc results highlight that some IT affordances are more relevant for certain dynamic capabilities. Likewise, certain dynamic capabilities are more conducive to innovation. These findings reveal interesting insights about certain affordances and dynamic capabilities gaining more salience in public organizations. Our focus was more on developing a parsimonious framework to explain IT-enabled innovation in public organizations and we find good support for our theory. However, more granular investigations of each of the affordances and dynamic capabilities could be excellent fodder for future research.

CONTRIBUTION AND FUTURE IMPLICATIONS

This study contributes by forwarding two important considerations for innovation in public organizations: IT affordance and dynamic capabilities. Research on public organizations have often eschewed both these concepts, and our research addresses this crucial blind sightedness.

This study shows that organizations with IT affordances are more likely to achieve organizational innovation. By providing this insight, this study shows the salient role that IT plays in sustaining public organizations. Given our limited understanding of the role of IT in the public sector (as compared to the private sector), this study provides three crucial IT-related factors that can highlight the salience of IT to modern public organizations. The set of affordances that we forward can be thought to provide the IT fabric of most public organizations.

The second contribution of this study is that it shows that dynamic capabilities are as crucial to innovation in public organizations as they are in private organizations. This finding has far-reaching implications, as it highlights that the public sector can embrace digital transformation models from the private sector to be successful. Improvement of products and services by public organizations is foundational for community well-being, and our study highlights two crucial factors that inform the design and implementation of this well-being.

The study also has important practical implications. As IT is salient to innovation in public organizations, IT training programs would be beneficial. If the employees are not aware of the potential of IT in the

organization, they will not be able to leverage IT for actualizing the affordances, thus compromising innovation.

The study also contributes by providing opportunities for future research. For example, researchers should test this model in for-profit organizations to see if the same results hold. Perhaps a comparative analysis of public and private organizations with respect to this model could be undertaken. A limitation is that we conducted our study only in the US. This model should be tested in other countries and cultures as well to better understand its generalizability.

On a related note, the study also shows that certain affordances and dynamic capabilities gain more salience when understanding innovation in public organizations. This is an additional insight and could be delved into further by future research which can tease out the role of these affordances and dynamic capabilities in a more granular manner.

Finally, we hope that our model of IT affordances, dynamic capabilities and organizational innovation is a helpful steppingstone that will allow researchers to conduct further research by extending this model. Extensions of this model, and inclusion of other factors will also help administrators with more actionable guidelines so as to make high-quality innovative decisions in dynamic environments.

To conclude, this study shows the connection between IT affordance, dynamic capabilities, and innovation in public organizations. It is hoped that it has provided important insights which can inform considerations when designing policies and practices for addressing public organizational innovation. We hope that our study contributed by highlighting an IT-based pathway to community welfare.

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