What Constitutes ICT Supplier Capabilities? A Scoping Review and Integrated Framework*

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Abstract

Public sector organizations rely on private sector suppliers to deliver digital welfare services. Since private suppliers play key roles in providing and implementing digital technologies for governments, it is important to develop an understanding of their capabilities. However, research devoted to understanding information and communication technology (ICT) supplier capabilities in this context remains sparse. Therefore, this study aims to build a theoretical framework for understanding these capabilities and answer the research question (RQ): What constitutes ICT supplier capabilities? The research is based on a scoping literature review. Through this review, our study integrates research on outsourcing, digitalization, and digital transformation into a compound framework based on a capability view. This framework is a step towards an integrated approach to studying supplier capabilities in the context of digital government.

Keywords

Digitalization, Dynamic Capabilities, Managing e-government projects, Outsourcing, Supplier Capability

1. Introduction

The provision of public welfare services faces many challenges due to changing demands and constrained funding [1, 2]. Public welfare organizations frequently attempt to address these challenges with digitalization efforts, such as communication interfaces for elder care recipients or automation of administrative processes [1, 3, 4, 5, 6]. Unfortunately, public sector ICT projects are associated with frequent failures and cost overruns [7, 8]. Government organizations responsible for welfare provision rely on private suppliers of digital welfare solutions and regularly outsource the development of ICT [9, 10]. This makes it important to understand the role of private sector ICT suppliers in designing and implementing digital technologies in the public sector and examining the capabilities of these firms.

While extensive research has been devoted to digitalization, digital transformation [11, 12, 13], and outsourcing [14, 15], the ICT supplier perspective is scarcely explored in the digital government literature. As this paper shows, many important concepts related to ICT suppliers exist in extant literature, but there is a need to synthesize them in a systematic way.

Thus, it remains unclear what it takes for ICT suppliers to operate effectively in the public sector [16] and how this can be approached empirically. The capability view has been used extensively in the Information Systems domain as it offers ways to study organizational practices and resource utilization patterns relating to the use of digital technologies [17, 18]. Furthermore, since organizational capabilities may be highly context-specific [19, 20], the need arises to situate and adapt any conceptualizations. A more informed understanding of ICT-supplier firms' abilities

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and factors that influence them may further the discourse on public welfare digitalization and contribute to relevant input to practitioners of the field.

Against this backdrop, the purpose of this paper is to develop a framework for examining the capabilities of ICT suppliers. By doing so, we aim to answer the research question (RQ): *What constitutes ICT supplier capabilities?*

The paper is structured as follows: Section 2 presents the research method used for the scoping literature review. The findings from this review are presented in Section 3. The paper ends with a concluding discussion in Section 4.

2. Research methods

The literature on ICT supplier capabilities is fragmented, and thus, incorporating several strands of research in the review is necessary. To achieve this, the paper builds on a scoping review. This form of review is appropriate to clarify concepts, identify a breadth of evidence on a particular topic or field, and inform further reviews or studies of this topic [21, 22].

Factors relevant to the concept of ICT supplier capabilities are studied across many disciplines and sub-disciplines, not necessarily using similar terminology or categorizations. The review results were iteratively interpreted and categorized based on their relevance to the research aim, i.e., eliciting how ICT supplier capabilities can be conceptualized. The literature uses the terms vendor and supplier interchangeably, even though the term supplier may imply a more comprehensive relationship with the client. This paper will use the term supplier when referencing both. Meanwhile, the terminology surrounding ICT is broad, involving terms such as "digitalization" and "digital transformation." We use them interchangeably here [12, 23], even though they have slightly different meanings [23, 24]. To analyze the literature, we adopted the approach suggested by Arksey & O'Malley [25]:

1. Stage 1: Identifying the research question. The RQ in scoping reviews is often broader than in systematic reviews, allowing for the incorporation of multiple strands of literature. The main challenge in this first step is to retain a balance between ensuring no key references are omitted while maintaining a manageable number of sources in the sample.
2. Stage 2: Identifying relevant studies. To identify relevant literature, we used a snowball sampling strategy adapted from Wohlin [26]. This strategy involves initiating the sampling process with a starting set of papers and tracing references backward (through the reference lists) and forward (via citing literature) to iteratively build a sample. We started by selecting a tentative set of papers found by searching Google Scholar, Scopus, and Web of Science, using various combinations of the search terms (TITLE) DIGITAL*, SUPPLIER*, CAPABILI*, VENDOR*, IT*, ICT, SUCCESS FACTOR*, OUTSOURC*, COMPETEN*, TRANSFORM*, ABILITY*.
3. Stage 3: Study selection. We read the papers yielded by these searches, scanning for relevancy to the research aim. As noted by Arksey & O'Malley [25], in scoping reviews, criteria for inclusion and exclusion of papers are formulated post hoc, after researchers have familiarized themselves with the corpus. We included studies that could progress the findings with relevant capabilities, for example, in the form of "success factors" or exemplars of outsourcing and private/public partnerships. This procedure was then repeated until no more novel categories were found with relevance to our study and resulted in a final sample size of 55 papers.
4. Stage 4: Charting the data. Here, we relied on "sifting, charting, and sorting material according to key issues and themes" [25, p.26]. This stage involved extracting relevant terms from the papers that can be grouped into "types" of capabilities. It should be noted that there are several overlaps in the literature. Some individual papers contributed to multiple themes, and certain capability types were relevant across several themes.

5. Stage 5: Collating, summarizing, and reporting the results. To synthesize our findings, we summarized them in the results section using emerging themes as headings. These headings were then used to construct an integrative framework encompassing several dimensions of ICT supplier capabilities.

In line with our scoping review approach, this method enabled us to address the broad purpose of the paper while mapping and classifying ICT supplier capabilities [22]. Notably, although this sampling technique did not capture all relevant papers on the topic, it supported the development of a framework that can be assessed and expanded through further research.

3. Results

In this section, the findings from the scoping review are presented. We identified five key dimensions in the literature relevant to the study of organizational capabilities of ICT firms: organizational capabilities, dynamic capabilities, digitalization capabilities, supplier capabilities, and antecedents and moderators. These dimensions are described and discussed in the following subsections and form the constituent parts that comprise our integrated framework.

3.1. Organizational capabilities

Organizational capabilities as a concept are an extension of the resource-based view of the firm [19], which originally was devised to explain sources of competitive advantage [27]. While lacking a standardized terminology, the term capability refers to an organization's ability to utilize its resources for a given purpose. Capabilities consist of combinations of competencies/skills used to deploy assets through organizational processes [19, 28, 29, 30]. The position taken here views assets (employees, knowledge, hardware, patents, etc.) as being utilized by competencies (individual/team expertise), bundles of which form organizational-level capabilities [31, 32]. A capability does not refer to ad hoc behavior or one-time occurrences but denotes systematized patterns of action [29, 30, 31].

3.2. Dynamic capabilities

Dynamic capabilities refer to factors that enable an organization to change its incumbent mode of operations [19, 29, 30, 31]. These capabilities modify operational capabilities, competencies, or assets to support, for example, innovation or novel modes of value creation [17, 19].

3.3. Digitalization capabilities

Digitalization capabilities can be viewed as dynamic capabilities as they refer to the ability to change organizational modes of operation [11]. Such capabilities enable organizations to combine and use digital assets, resources, and networks to create novel (digital) solutions [11, 33]. Digitalization or digital transformation processes are inherently social [12] and necessitate focused managerial practices [34], with digital leadership being a key element in guiding organizations in such efforts [11]. As concluded in the methods section, the literature covers a multitude of theoretical perspectives. However, certain recurring themes emerge as relevant dimensions of ICT supplier capabilities, with a pervading focus on managerial practices, as outlined in the sub-sections below.

3.3.1. Strategy and leadership capabilities

Strategy and leadership are described as the most central factors of successful digitalization efforts. This capability refers to the ability to deploy resources and competencies to develop and align digitalization strategies or organizational arrangements with firm goals, communicating an idea or vision of how technical artifacts can be implemented and utilized [35, 36, 37]. The transformation of strategy and the understanding of how the organization's role within the ecosystem must also be

coordinated with other actors [18] is particularly relevant for supplier/client relations. On a tactical level, benefit management and project management are practices are also important to realize the value of digitalization initiatives [38, 39].

3.3.2. Change management

A key aspect of digital leadership involves promoting change [37]. The ability to systematically address cultural issues, sensemaking, and fostering a shared understanding of risks or opportunities can be summarized as change management capabilities that support organizational strategy and goal realization. The engagement of stakeholders in change management efforts constitutes an important success factor for digitalization initiatives [13, 35, 40].

3.3.3. Manage legal and policy aspects

Public sector digitalization is influenced by regulatory frameworks and standards to govern, e.g., personal integrity, security, or policy outcomes [41, 42]. The ability to act and function efficiently in such contexts requires leveraging the legal and institutional frameworks while proactively engaging with the political levels and relevant stakeholders to influence future policy. This includes managing funding models, procurement practices, and policy goals [12, 43]. It follows that the political institutions themselves also benefit from having the ability to devise policies conducive to digitalization and enact them through, e.g., reforms [37, 44, 45].

3.3.4. Infrastructure management

The ability to create and maintain ICT infrastructures that are flexible, adaptive, and fit for ecosystem utilization has become central to most organizations [12, 42]. A robust operational backbone with well-managed IT platforms can ensure operational efficiency and the capacity for change. The influence of past design choices significantly impacts present and future possibilities for digitalization and process development. Since public sector organizations often carry high levels of technical debt, obsolete or constraining IT infrastructures make development costly and risk-prone [10, 36, 42]. Data critical to business processes, often used in applications across multiple organizations, can reside in obsolete systems [42]. Any moderations to an incumbent architecture may require significant investment to mend, at the risk of service disruption.

3.3.5. Information and data management

Efficient management of data and information is an important aspect of any organization's capabilities [7, 18, 46]. Having the ability to efficiently use and exchange data to power processes, services, and knowledge creation is central to many public sector applications. Since municipal welfare organizations operate within ecosystems, the interoperability and transferability of data and information are important. Evidence-based approaches to decision-making and data-supported insights contribute to digitalization and organizational dynamism as they support sense-making and adoption [13, 18]. The utilization of data and information also necessitates compliance with security and regulatory requirements [18].

3.3.6. ICT competence management

Beyond developing specific technological skills such as coding, there is a fundamental need to understand what constitutes realistic, feasible, or desirable applications of digital technologies. This requires good domain knowledge, including an understanding of the values and logic of the various practitioners' fields where the technology is to be applied. In other words, the ability to make sense of what digitalization or digital transformation entails is an ability in itself [1, 3, 38].

3.3.7. Knowledge management

Knowledge management refers to the process of creating, capturing, and using knowledge from an organization's intangible assets to improve operations and development. Organizational routines that enable knowledge and skills to develop may be required to realize value from multi-sector cooperative efforts [40]. To leverage both internal and external knowledge, it is important to understand different frames of reference and goals within a complex system of actors [35].

3.3.8. Business and process agility

Business agility and process agility are key aspects of digitalization capabilities, contributing to both efficient operations and transforming organizations [3, 12, 47]. The term business agility refers to the organizational ability to adapt business models or strategies or infrastructure to novel situations [47]. Process agility, on the other hand, refers mainly to agile practices in workflow and project management used to support fast-paced, incremental, decentralized decision-making and efficient teamwork. These practices enable an organization to adapt to changing requirements or conditions [13].

3.3.9. Cooperation and stakeholder management

Cooperation, ecosystem management, networking, and stakeholder management are essential for successful digitalization and digital transformation. As ICT solutions are frequently used or produce information that flows between organizational entities, the ability to create and manage networks of actors and technologies becomes important [11, 38]. Such inter-organizational networks benefit from fostering mutual understanding of technology within their respective social and organizational contexts [44]. The capability to cooperate and network may be especially important for smaller or resource-constrained organizations [43].

3.3.10. Customer experience management

The capability to utilize user-centric (or citizen-centric) approaches to digitalization and digital transformation is frequently emphasized in the literature [5, 12, 13, 40]. Digitalization in the public sector is associated with conflicting interests and ambiguous needs, which often result from a lack of alignment between citizen/user needs and ICT solutions [7]. Failure to comprehend the core values specific to the context due to a lack of skills or knowledge can lead to negative outcomes [1], as understanding how digital solutions shape (or fit) the mode of value creation in any given context is instrumental to efficient ICT utilization [5].

3.4. Supplier capabilities

Outsourcing as a real-world phenomenon prompts a need to focus on suppliers and clients as distinctive roles with specific capabilities [32, 48]. Public sector organizations tend to be externally justified [49], subject to political volatility, focused on non-economic values [50], constrained by bureaucratic procedures, and often operate in silos [16]. They also face significant environmental complexity, which may be reflected in their application of ICT solutions [16]. As a result, ICT solutions implemented in the public welfare sector need to be adapted to fit certain modes of operation, value systems, and local conditions [50, 51]. Here, research shows how the variability associated with the public sector and welfare professions pose challenges for private ICT suppliers [1, 3].

Despite the abundance of outsourcing literature, the IT-supplier perspective did not garner much initial attention [52]. This is arguably still the case when it comes to ICT outsourcing in the public sector [16]. Even though research on supplier capabilities has been sparse and dispersed [15, 16, 53, 54], some general tendencies can be found in the extant literature.

Levina & Ross [52] found that ICT suppliers' value creation was linked to the application of methodological, relational, and human resources management competencies. Human resources

management refers to the supplier's ability to train and recruit personnel with relevant knowledge-characteristics. Methodological competence refers to the ability to develop and execute efficient and systematic work procedures. Relational competencies refer to skills and practices that support communication, stakeholder management, and shared understanding [52, 55]. Lacity et al. [15] made similar findings, highlighting capabilities relating to technology and method, human resource management, and relational management, adding domain understanding - the knowledge the suppliers have of the clients' business, context, and practices.

Here, research on outsourcing and digital transformation collectively highlights dynamism and interconnectivity [24, 56], which entails, i.e., capabilities to proactively identify stated and unstated needs of the customers [56, 57]. The ability to build and orchestrate networks to support the integration of resources in ecosystem settings and to manage partners and subcontractors constitute an increasingly important capability for ITC-suppliers to maintain [24, 56, 57].

Digital ecosystem efficiency requires common standards for information exchange and interoperability, and for this reason, utilizing and contributing to standardization constitute important abilities [57, 58]. To access and analyze information within a joined-up context represents another important capability that supports the generation of insight and response mechanisms that leverage the acquired knowledge. Such capability relies on advanced data retrieval and analytical techniques [24, 56, 57].

As with digitalization and digital transformation, supplier capabilities are to a substantial degree co-constructed or complementary, where client-side factors are found to influence the abilities of the supplier and vice versa [15, 55]. Such capabilities include relational management, contractual management, risk management, and absorptive capacity (i.e., the capability for sensing and utilizing knowledge) [15]. Jain & Khurana [59] found that systematic client/vendor relational work, such as communication, tech value sharing, knowledge sharing, and actions to support adaptability, is associated with positive outcomes.

The literature also stresses the importance of situated domain knowledge. The implication of this is that any supplier needs to build the capability to understand the client's specific needs and contextual constraints [54].

3.5. Antecedents and moderators

Capabilities, both ordinary (zero-order) and dynamic (higher-order), are influenced by antecedents and moderating factors, comprising, e.g., organizational structure, culture, resource bases, other capabilities, and environmental factors, existing on multiple levels of analysis and originating from different organizational entities [19]. The notion of antecedents and moderators indicates that capabilities are highly context-specific [19, 20], which underscores the need to situate and adapt any capabilities framework to its intended topic area.

4. Concluding discussion

The notion of organizational ICT-related capabilities is potentially broad, and this paper attempts to offer a way to structure the analysis of firm-level capabilities (to support welfare digitalization) by combining components (made essential by the purpose of researching public sector outsourcing and digitalization) from the extant literature.

Table 1 illustrates the findings from the literature in an integrated framework that encompasses dimensions that make up the concept of “ICT supplier capabilities”, together with the antecedent and moderator dimensions.

Table 1
Theoretical framework of ICT supplier capabilities.

Dimension	Description	Example components
Organizational capabilities	Organization-level (conscious) patterns of action utilizing competencies and assets.	Operational work processes, conducted by bundles of competencies, using software.
Dynamic capabilities	Higher order capabilities concerning the ability to change other capabilities and resources.	Modes of operation to facilitate innovation and change of the incumbent resources.
Digitalization and digital transformation capabilities	Specific capabilities that enable digitalization or digital transformation.	Digital leadership practices and/or data management practices.
Supplier capabilities	Specific capabilities enabling the act of supplying.	Relational management that enables a firm to access domain knowledge in a client organization.
ICT supplier capabilities	Specific capabilities that enable the act of supplying digital technology. Encompassing supplier capabilities and digitalization capabilities.	Combinations of the dimensions above.
Antecedents and moderators	Environmental or organizational factors that antecede or moderate the enactment of capabilities.	Factors like organizational complexity and/or ICT legacy that influence capabilities.

The advantage of this framework is that it combines digitalization capabilities and supplier capabilities into a unified concept. Additionally, this concept captures both the operational aspect (e.g., continuous service delivery) and the dynamic aspect (i.e., digitalization and digital transformation) intrinsic to the act of supplying digital technology.

The capabilities in question are specific to ICT firms and concern the act of supplying (maintaining and developing) ICT solutions to public welfare organizations. Operationalizing the framework in empirical investigations in the domain of digital public welfare services requires contextualization based on local conditions and study objectives. Thus, as capabilities are deployed in a context, there will be environmental and organizational factors influencing their development and constitution. These factors also moderate how a capability is enacted in any given situation. We can assume that the various cooperative constellations in the public welfare sector will render different results, depending on boundary conditions and researchers' operationalization.

4.1. Limitations and future research

This study was not without limitations. First, as it is based on a scoping review, there is a risk that relevant articles may be missing from our material. By applying the framework in an empirical setting, it can be extended and validated. Thus, our next step in this research is to deploy the framework in a case study of ICT supplier firms involved in supplying municipalities with digital services. We also see opportunities for additional use of this framework, primarily to study integrated resources and resource utilization patterns in cross-organizational digitalization processes.

Declaration on generative AI

During the preparation of this work, the authors used Grammarly and GPT-4o to check grammar and spelling. After using these tools, the authors reviewed and edited the content as needed and take full responsibility for the publication's content.

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