

A Capability Theory of Cloud Utilization Maturity for Agile Development

Gardner Mwansa ^{1*}

* iYunivesithi Walter Sisulu, South Africa
gmwansa@wsu.ac.za ¹

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ABSTRACT

Cloud computing has become central to digital transformation and agile software development, yet Information Systems research still explains cloud utilization mainly through adoption determinants or stage-based maturity models, leaving limited theoretical insight into how organizations build the capabilities needed to sustain value from cloud use after adoption. The primary objective of this study is to develop a capability-based theoretical explanation of Cloud Utilization Maturity (CUM) that addresses this gap. Using a conceptual, theory-building research design, the study synthesizes and integrates literature on cloud adoption, post-adoption value realization, cloud maturity, and agile software development, drawing on the Technology-Organization-Environment framework, Dynamic Capabilities Theory, and the Resource-Based View. Through this integration, CUM is reconceptualized as a higher-order organizational capability comprising five complementary first-order capabilities: Technological, Organizational, Cloud-Agile Integration, Adaptive and Strategic, and Sustainability Capability. The main conceptual outcome is a capability framework explaining how these domains jointly constitute CUM and proposing operational, strategic, and sustainability outcomes as consequences, extending cloud maturity research beyond stage-based assessment. The study concludes that mature cloud utilization is best explained as a continuously developed organizational capability rather than a fixed technological state, providing a theoretical foundation for future empirical measurement and validation.



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I. INTRODUCTION

Cloud computing has become a foundational technology for digital transformation, enabling organizations to achieve scalable computing, flexible resource management, and rapid deployment of digital services [1]. Beyond infrastructure provisioning, cloud computing now underpins agile software development, cloud-native architectures, DevOps, continuous integration and continuous delivery (CI/CD), platform engineering, and data-driven innovation, allowing organizations to respond more effectively to evolving business and technological demands [2], [3]. As cloud technologies have become integral to organizational strategy, the focus of cloud computing has shifted from technology deployment to the realization of sustained organizational value.

Despite this evolution, Information Systems (IS) research has predominantly focused on explaining the determinants of

cloud computing adoption. Established theoretical perspectives, particularly the Technology-Organization-Environment (TOE) framework, have significantly advanced understanding of the technological, organizational, and environmental factors influencing organizational cloud adoption [4], [5], [6], [7]. While these studies have provided valuable insights into technology adoption, they offer comparatively limited explanation of how organizations develop the capabilities required to derive sustained value from cloud technologies after implementation, a gap that subsequent post-adoption research has only partially addressed [8], [9].

This limitation has become increasingly important as organizations move beyond cloud migration towards cloud-enabled digital transformation. Contemporary cloud environments support cloud-native architectures, DevOps, platform engineering, FinOps, and AI-assisted operations, requiring organizations to integrate technological resources

with governance, software engineering, organizational learning, and strategic decision-making [3], [10]. Consequently, organizational success depends not only on adopting cloud technologies but also on continuously developing the organizational capabilities required to govern, integrate, optimize, and strategically adapt cloud-enabled resources within dynamic business environments.

Recognizing that adoption alone is insufficient, both researchers and practitioners have proposed numerous cloud maturity models to evaluate organizations' progression in cloud utilization [11]. These models have made important practical contributions by providing structured approaches for assessing cloud adoption, migration, governance, and operational maturity, thereby helping organizations benchmark and guide their cloud transformation efforts. However, most existing maturity models conceptualize maturity as progression through predefined technological or operational stages, providing comparatively limited theoretical explanation of how organizations develop the organizational capabilities through which mature cloud utilization emerges.

The foregoing discussion reveals an important theoretical gap within the cloud computing literature. Although previous research has substantially advanced understanding of cloud adoption, post-adoption utilization, and cloud maturity assessment, these research streams remain theoretically fragmented. For instance, 1) Adoption research explains why organizations initially select cloud services but not how they subsequently develop the capabilities needed to sustain value; 2) Maturity models describe observable stages of progression but not the mechanisms that move an organization between stages and; 3) Post-adoption research offers only partial theoretical integration of how these complementary capabilities develop and interact. As cloud computing increasingly functions as a strategic organizational capability rather than merely an infrastructure technology, there is a need for a theoretical perspective that explains cloud utilization maturity in terms of organizational capability development rather than technological progression alone.

To address this theoretical gap, this study reconceptualizes Cloud Utilization Maturity (CUM) as a higher-order organizational capability and develops a capability-based conceptualization explaining how the interaction of technological, organizational, cloud-agile integration, adaptive and strategic, and sustainability capabilities gives rise to mature cloud utilization. Drawing on the complementary theoretical perspectives of the TOE framework [7], Dynamic Capabilities Theory (DCT) [12], [13], and the Resource-Based View (RBV) [14], the study provides a theoretical foundation for understanding how organizations develop, coordinate, govern, and renew cloud-enabled capabilities to achieve sustained organizational value in dynamic digital environments. As a conceptual study, the proposed framework is intended to guide future operationalization, empirical validation, and refinement

rather than to provide empirical evidence of the proposed capability relationships.

This study makes three principal contributions to IS research. First, it extends cloud computing research beyond the dominant adoption paradigm by reconceptualizing CUM as a higher-order organizational capability rather than a progression through predefined maturity stages. Second, it integrates the TOE framework, DCT, and the RBV into a unified theoretical foundation for explaining post-adoption cloud utilization. Third, it identifies five complementary first-order capabilities, including cloud-agile integration and sustainability, which together constitute CUM and extend existing cloud maturity research. Collectively, these contributions establish a foundation for the future operationalization, empirical validation, and refinement of CUM.

II. METHOD

This study follows a conceptual, theory-building research design rather than an empirical one, an approach that is well established for developing new theoretical constructs when a phenomenon is not yet adequately explained by existing theory [15], [16]. Jaakkola's [15] typology distinguishes four templates for conceptual research, namely theory synthesis, theory adaptation, typology development, and model building. This study follows the theory synthesis template, which integrates multiple established theoretical perspectives to explain a phenomenon that existing theory addresses only partially, rather than adapting a single theory to a new context or building an entirely new typology from observation. The objective was accordingly not to test a model against data but to integrate established theoretical perspectives into a novel explanatory framework, and, following Gregor's [17] taxonomy of theory types in Information Systems, the resulting framework is intended primarily as a theory for explaining, since its purpose is to provide a richer account of how mature cloud utilization develops rather than to predict outcomes or prescribe design interventions.

The framework was developed in three stages. First, a targeted review of literature on cloud adoption, post-adoption value realization, cloud maturity models, and agile software development was conducted to identify the theoretical gap. Second, the TOE framework, DCT, and the RBV were selected as complementary theoretical lenses: TOE explains contextual conditions, DCT explains capability development and reconfiguration, and RBV explains the potential strategic value of coordinated organizational capabilities [15]. Third, the literature synthesis and these complementary theoretical lenses were used to identify five first-order capability domains and conceptualize CUM as a higher-order organizational capability.

The number and boundaries of the five domains were established through theory-informed synthesis rather than a one-to-one mapping between theories and capabilities. Consistent with Whetten's [18] criteria for theoretical contribution, candidate domains were retained when the

literature indicated a distinct organizational capability function not adequately represented by another domain. TOE therefore provides contextual antecedents and boundary conditions across the framework; DCT explains the sensing, seizing, and transforming processes through which capabilities are developed and reconfigured; and RBV explains their potential strategic value. This approach balances theoretical comprehensiveness with parsimony [18].

III. RESULTS AND DISCUSSION

A. Literature Synthesis and Theoretical Gap

Developing a capability-based conceptualization of CUM requires integrating research on cloud adoption, post-adoption value realization, cloud maturity, agile software development, and sustainable digital transformation. Although these streams provide important insights into organizational cloud utilization, they have largely evolved independently and offer only partial explanations of how organizations develop mature cloud capabilities. This review therefore synthesizes the literature around four issues: the transition from adoption to post-adoption value realization, the contributions and limitations of cloud maturity models, the organizational capabilities associated with agile and sustainable cloud utilization, and the unresolved theoretical gap that motivates the proposed conceptualization of CUM.

As cloud computing became embedded in organizational operations, research increasingly extended beyond the initial adoption decision toward post-adoption assimilation, routinization, and value realization [8], [9], [19]. This evolution reflects a broader shift in IS research from explaining whether and why organizations adopt technologies toward understanding how technological resources become integrated into organizational processes and contribute to sustained organizational value.

Although adoption is a prerequisite for cloud utilization, technology implementation alone does not ensure organizational value. Post-adoption value realization depends on how effectively cloud-enabled resources are integrated into organizational processes, governed, optimized, and adapted to evolving strategic and operational requirements [3], [10], [19]. From this perspective, cloud utilization is not a discrete implementation outcome but a continuous organizational process through which technological resources are embedded within business operations and progressively aligned with organizational objectives.

Despite these advances, post-adoption research provides comparatively limited theoretical explanation of how these complementary capabilities interact and develop collectively to produce mature cloud utilization. This limitation directs attention to cloud maturity research and whether existing maturity models adequately explain organizational progression beyond technology implementation.

Recognition that cloud transformation extends beyond technology adoption has stimulated the development of cloud maturity frameworks that assess organizational progression in

cloud adoption, capability development, management, and value realization [20], [21], [22]. These frameworks extend attention beyond the initial adoption decision by providing structured approaches for evaluating and improving cloud utilization.

Existing cloud maturity frameworks commonly represent maturity through explicit stages, levels, or progressive benefit realization [20], [21], [22]. Such approaches are valuable for assessment and benchmarking; however, their structured progression provides comparatively limited theoretical explanation of the organizational mechanisms through which mature cloud utilization develops. Identifying maturity dimensions or desirable practices does not, by itself, explain how underlying organizational capabilities develop, interact, and adapt over time to support sustained cloud-enabled value creation.

A related issue concerns the theoretical explanation of capability development. Existing maturity research incorporates technological, organizational, governance, and managerial dimensions, but the relationships through which these dimensions collectively contribute to mature cloud utilization remain comparatively underdeveloped theoretically, consistent with the broader assessment of the cloud computing literature offered in [11]. This limitation becomes increasingly important as contemporary cloud utilization requires organizations to coordinate cloud technologies with governance, agile software development, organizational adaptation, and sustainability considerations [3], [10], [23].

Collectively, these limitations motivate a shift in analytical emphasis from assessing maturity primarily as progression through predefined stages toward explaining the organizational capabilities through which mature cloud utilization develops. This capability-based perspective is not intended to replace stage-based maturity assessment but to complement it by addressing the mechanisms underlying mature cloud utilization.

An organizational capability perspective explains cloud utilization in terms of what organizations are able to do with cloud-enabled resources rather than the technologies they possess. Sustained value arises when cloud resources are combined with governance, organizational knowledge, managerial processes, and complementary competencies that enable their integration into operational routines and strategic decision-making [8], [9], [19], [24]. Mature cloud utilization therefore depends on the coordinated development of technological, organizational, and managerial capabilities rather than on infrastructure deployment alone.

Contemporary cloud environments further strengthen this perspective because cloud-native engineering, DevSecOps, Infrastructure as Code, platform engineering, and cloud governance require coordinated action across software development, operations, security, management, and strategy [23], [25]. These interdependencies indicate that CUM is better explained through the development, integration, and renewal of complementary capabilities than through isolated

technological advancement. This capability perspective provides the conceptual basis for examining the roles of agile software development and sustainability in the following section.

Agile software development has fundamentally transformed the development and delivery of software-intensive systems by emphasizing iterative development, continuous integration, rapid feedback, and adaptive planning [2], [26]. These practices are increasingly enabled through cloud-native environments incorporating DevOps, DevSecOps, continuous integration and delivery (CI/CD), and Infrastructure as Code (IaC), which enable rapid deployment, scalability, and operational resilience [23]. Consequently, effective cloud utilization within agile environments depends not only on cloud infrastructure but also on organizational capabilities that integrate software engineering, governance, security, and operational processes.

Alongside these developments, sustainability has emerged as an increasingly important objective of digital transformation. Contemporary organizations are expected to optimize cloud resources not only for operational performance and cost efficiency but also for environmental sustainability, responsible governance, and long-term organizational resilience [3]. Consequently, mature cloud utilization extends beyond technical optimization to encompass continuous capability development that simultaneously supports operational excellence, strategic adaptability, and sustainable value creation.

Collectively, agile software development and sustainability demonstrate that mature cloud utilization requires organizations to coordinate technological, organizational, operational, strategic, and sustainability capabilities rather than optimize individual technological components in isolation. However, these complementary perspectives remain only partially integrated within existing cloud maturity research, providing limited theoretical explanation of how they collectively contribute to mature cloud utilization. This observation provides the final foundation for identifying the theoretical gap addressed by this study.

The preceding review shows that cloud computing research has evolved from explaining adoption toward post-adoption utilization, organizational value realization, cloud maturity, agile software development, and sustainable digital transformation [3], [8], [9], [11], [19], [21]. These streams collectively explain important aspects of cloud adoption, assimilation, governance, software delivery, and digital transformation, but remain fragmented in their treatment of the organizational capabilities underlying mature cloud utilization.

To address this gap, this study develops a capability-based conceptualization of CUM. Drawing upon the TOE framework, DCT, and the RBV, the study conceptualizes CUM as a higher-order organizational capability through which organizations develop, integrate, govern, and continuously reconfigure complementary technological, organizational, cloud-agile integration, adaptive and strategic,

and sustainability capabilities to achieve sustained operational, strategic, and sustainability outcomes within dynamic digital environments. In doing so, the study provides a unified theoretical explanation of mature cloud utilization that complements existing research on cloud adoption, post-adoption utilization, and cloud maturity while establishing a conceptual foundation for future empirical operationalization and validation. The following section presents the theoretical foundations underpinning this capability-based conceptualization.

When considered collectively, each literature stream is informative but only partially explanatory. Adoption research explains why organizations initially select cloud services but not how they subsequently develop capabilities for sustained value; cloud maturity frameworks describe progression but provide less explanation of the mechanisms through which maturity develops [20], [21], [22]; and agile and DevOps research focuses primarily on software delivery practices rather than the broader organizational capabilities required to sustain them [24], [27]. This fragmented coverage motivates an integrative, capability-based account of CUM.

B. Theoretical Foundations of Cloud Utilization Maturity

The TOE framework, developed by [7], is one of the most widely applied theoretical perspectives for explaining organizational technology adoption. The framework proposes that organizational decisions regarding the adoption and implementation of technological innovations are shaped by three interrelated contexts: the technological context, the organizational context, and the external environmental context. Owing to its comprehensive consideration of technological, organizational, and environmental influences, TOE has been extensively applied in Information Systems research to explain the adoption of cloud computing and other digital technologies.

Within cloud computing research, TOE has provided a robust theoretical foundation for explaining the determinants of organizational cloud adoption by examining factors such as technological readiness, organizational resources, managerial support, competitive pressure, and regulatory influences [4], [6], [7]. These studies demonstrate that successful cloud implementation depends not only on technological characteristics but also on organizational structures, leadership commitment, and environmental conditions that shape organizational decision-making.

Although TOE provides a comprehensive explanation of the organizational contexts influencing technology adoption and implementation, it offers comparatively limited explanation of how organizations continuously develop and renew the capabilities required to realize sustained value from cloud utilization following adoption. Consequently, while TOE establishes the contextual conditions under which mature cloud utilization can emerge, it does not explain the dynamic organizational processes through which complementary capabilities are developed, integrated, and reconfigured over time.

DCT extends the RBV by explaining how organizations sustain competitive advantage within rapidly changing environments through the continuous renewal of organizational capabilities [13], [28]. Rather than focusing solely on the possession of valuable resources, the theory emphasizes an organization's ability to sense emerging opportunities and threats, seize opportunities through appropriate strategic responses, and transform or reconfigure organizational resources and capabilities in response to changing technological and competitive conditions. Consequently, DCT provides a process-oriented explanation of how organizations continuously adapt to environmental change.

Within cloud computing environments, organizations operate in rapidly evolving technological landscapes characterized by continuous innovation, changing business requirements, evolving cybersecurity threats, and increasing demands for organizational agility. Sustained value from cloud utilization therefore depends not only on adopting cloud technologies but also on continuously integrating, governing, optimizing, and renewing cloud-enabled organizational capabilities. DCT provides an appropriate theoretical perspective for explaining these ongoing organizational processes because it emphasizes continuous adaptation, learning, and capability renewal rather than one-time implementation decisions [3], [12].

Within the CUM framework, DCT explains how organizations continuously develop and reconfigure the complementary technological, organizational, cloud-agile integration, adaptive and strategic, and sustainability capabilities required to respond effectively to evolving digital environments. These dynamic processes enable organizations to integrate new technologies, refine governance mechanisms, strengthen organizational learning, and continuously improve cloud-enabled operations. Consequently, DCT provides the theoretical mechanism through which CUM is understood as an evolving organizational capability rather than a static organizational condition.

The RBV explains sustained organizational performance by emphasizing the strategic value of organizational resources and capabilities [14]. According to RBV, organizations achieve sustained competitive advantage when they possess resources and capabilities that are valuable, rare, difficult to imitate, and effectively embedded within organizational processes. Rather than viewing technology alone as a source of competitive advantage, RBV argues that value is created through the effective combination of technological resources with complementary organizational capabilities, managerial expertise, and organizational routines.

Within cloud computing environments, technological infrastructure is increasingly standardized and widely accessible, limiting its ability to provide sustained competitive advantage on its own. Consequently, organizational performance depends less on access to cloud technologies than on the complementary organizational

capabilities through which cloud resources are governed, integrated, and strategically deployed. These capabilities include effective governance structures, organizational learning, software engineering practices, managerial expertise, and strategic alignment, which collectively enable organizations to derive sustained value from cloud utilization [14], [19].

From the perspective of CUM, the RBV explains why mature cloud utilization depends upon the development of complementary technological, organizational, cloud-agile integration, adaptive and strategic, and sustainability capabilities rather than technological infrastructure alone. These complementary capabilities constitute valuable organizational assets that support operational excellence, organizational resilience, strategic adaptability, and sustainable value creation. Accordingly, RBV provides the theoretical foundation for conceptualizing CUM as an organizational capability that creates enduring organizational value through the coordinated deployment of complementary resources and capabilities.

The preceding discussion demonstrates that no single theoretical perspective provides a sufficiently comprehensive explanation of CUM. Although the TOE framework, DCT, and the RBV each offer valuable insights into organizational cloud utilization, they emphasize different but complementary dimensions of organizational capability development. Individually, these theories explain the contextual conditions influencing technology adoption, the strategic value of organizational resources and capabilities, and the dynamic processes through which capabilities are developed and renewed. Collectively, however, they provide a more comprehensive theoretical foundation for explaining how organizations achieve sustained value from cloud utilization than any single theory alone.

Within the proposed framework, the TOE framework provides the contextual foundation for understanding cloud utilization by identifying the technological, organizational, and environmental conditions that shape organizational decisions regarding cloud technologies [7]. These contextual factors influence the availability of technological resources, organizational readiness, managerial support, governance structures, and external pressures that collectively create the conditions under which cloud utilization develops. However, while TOE explains the organizational context surrounding cloud utilization, it does not fully explain how organizations continuously develop and renew the capabilities required to sustain value within rapidly changing digital environments.

This integration also provides a theoretical basis for understanding the five capability domains identified through the literature synthesis, rather than treating their selection as arbitrary. The TOE framework provides contextual conditions that shape the development and utilization of these capabilities, with its technological, organizational, and environmental contexts influencing the conditions under which cloud utilization occurs. DCT explains how the capabilities are developed and reconfigured over time through

processes of sensing, seizing, and transforming [12], [13], while the RBV explains their potential strategic value when complementary capabilities are effectively coordinated and embedded within the organization. The five capability domains are therefore not derived through a one-to-one mapping to the three theoretical perspectives; rather, they represent distinct but complementary capabilities identified through the literature synthesis and theoretically informed by TOE, DCT, and RBV.

Guided by this integrated theoretical perspective, the proposed framework conceptualizes CUM through five complementary capability domains: Technological Capability, Organizational Capability, Cloud-Agile Integration Capability, Adaptive and Strategic Capability, and Sustainability Capability. Collectively, these capability domains operationalize the complementary contributions of the TOE framework, DCT, and the RBV by explaining how organizations develop, integrate, govern, and continuously reconfigure cloud-enabled capabilities to achieve sustained operational, strategic, and sustainability outcomes. The following section builds upon this integrated theoretical foundation to formally conceptualize CUM as a higher-order organizational capability.

DCT's three microfoundations, sensing, seizing, and transforming [12], [13] operate across the five capability domains rather than mapping one-to-one onto individual domains. Sensing is evident in Technological Capability through the continuous evaluation of emerging cloud architectures and security threats; seizing is evident in Cloud-Agile Integration Capability through the translation of identified opportunities into DevOps and delivery pipelines; and transforming is evident in Adaptive and Strategic Capability through resource reconfiguration and strategic realignment. Organizational Capability draws on sensing and transforming as governance structures, leadership, and competencies are reviewed and renewed, while Sustainability Capability draws particularly on transforming as resource use is adjusted to economic and environmental objectives. DCT therefore functions as a cross-cutting mechanism across the framework rather than as the theoretical foundation for any single capability domain.

Applying the RBV to cloud utilization further clarifies the potential strategic value of CUM. Cloud infrastructure itself is increasingly standardized and commercially accessible and is therefore unlikely, on its own, to provide a sustained source of competitive advantage. Greater strategic value may instead arise from the organizational capabilities through which cloud resources are governed, integrated with agile practices, adaptively reconfigured, and managed for long-term sustainability. From an RBV perspective, such capabilities may contribute to differentiated and sustained organizational value when they become valuable, rare, difficult to imitate, and difficult to substitute through accumulated organizational learning, embedded routines, and context-specific coordination. The framework therefore does not assume that CUM or its constituent capabilities inherently satisfy VRIN

conditions. Rather, whether particular CUM capability configurations exhibit these characteristics, and whether they contribute to sustained competitive advantage, remains an empirical question for future research.

C. A Capability-Based Conceptualization of CUM

Building upon the integrated theoretical foundation developed in the preceding sections, this study conceptualizes CUM as a higher-order organizational capability that explains how organizations achieve sustained value from cloud utilization. Rather than conceptualizing maturity as progression through predefined technological or organizational stages, the proposed perspective explains the organizational capability development processes through which mature cloud utilization emerges. This capability-based conceptualization reflects the complementary contributions of the TOE framework, DCT, and the RBV, providing a unified theoretical explanation of how organizations develop, integrate, govern, and continuously renew cloud-enabled capabilities within dynamic digital environments.

Accordingly, CUM is defined as an organization's higher-order capability to develop, integrate, govern, and strategically reconfigure complementary technological, organizational, cloud-agile integration, adaptive and strategic, and sustainability capabilities to achieve sustained operational, strategic, and sustainability outcomes within dynamic digital environments.

This conceptualization distinguishes CUM from several related constructs within the cloud computing literature. First, CUM differs from cloud adoption, which focuses primarily on the organizational decision to implement cloud technologies. Second, it differs from cloud readiness, which evaluates an organization's preparedness for cloud implementation. Third, it differs from conventional cloud maturity models, which primarily assess organizational progression through predefined maturity stages. While these perspectives provide valuable insights into technology implementation and organizational assessment, they provide comparatively limited theoretical explanation of how the complementary organizational capabilities required for mature cloud utilization develop, interact, and are continuously renewed. In contrast, CUM is proposed as an explanatory construct that accounts for the organizational capability development processes through which mature cloud utilization is achieved.

Fourth, CUM differs from cloud capability as the term is commonly used in the IS literature, which typically denotes a single, undifferentiated organizational competence in using cloud technology. CUM instead specifies five analytically distinct first-order capabilities and a higher-order construct that explains how they jointly generate value, rather than treating capability as a unitary variable. Fifth, CUM differs from digital maturity, a broader construct spanning an organization's overall digital transformation across multiple technologies and business functions [24]. CUM is

deliberately scoped to the cloud-enabled and cloud-agile dimension of that broader digital maturity, providing a domain-specific theoretical account rather than a general-purpose digital maturity index.

Conceptualizing CUM as a higher-order organizational capability recognizes that sustained cloud utilization does not arise from isolated technological competencies or individual organizational practices. Instead, mature cloud utilization emerges through the coordinated interaction of multiple complementary capabilities that collectively enable organizations to govern cloud technologies, integrate agile software development practices, adapt to technological and organizational change, and pursue long-term strategic and sustainability objectives. Consequently, CUM represents an integrative organizational capability through which organizations continuously align cloud utilization with evolving technological opportunities, organizational priorities, and environmental conditions.

Consistent with this capability-based conceptualization, CUM comprises five complementary organizational capability domains. Technological Capability provides the technological foundation for secure, scalable, and reliable cloud-enabled operations. Organizational Capability encompasses governance structures, leadership, organizational learning, and resource coordination that enable effective cloud utilization. Cloud-agile Integration Capability reflects the organization's ability to integrate cloud technologies with agile software engineering practices, including DevOps, DevSecOps, continuous integration and continuous delivery (CI/CD), Infrastructure as Code (IaC), and cloud-native development. Adaptive and Strategic Capability enables organizations to sense emerging opportunities, respond to changing business and technological conditions, and strategically reconfigure cloud-enabled resources. Sustainability Capability ensures that cloud utilization contributes to long-term economic, organizational, and environmental sustainability. Although analytically distinct, these capability domains are interdependent and collectively explain how organizations achieve mature cloud utilization.

The proposed conceptualization represents a fundamental shift in how CUM is understood within Information Systems research. Rather than asking how mature an organization's cloud utilization is according to predefined stages, the framework explains how maturity develops through the continuous interaction of complementary organizational capabilities. In doing so, it complements existing research on cloud adoption, post-adoption utilization, and cloud maturity by providing a theoretically grounded explanation of the organizational capability development processes that underpin sustained cloud utilization. The following section builds upon this conceptualization by presenting the capability framework through which CUM is operationalized.

The term maturity in CUM does not imply a fixed sequence of stages that every organization must pass through, as in conventional stage-based models; rather, it refers to the

degree to which the five capabilities have been developed and coordinated at a given point in time. The capabilities may develop unevenly. For example, an organization may demonstrate strong Technological Capability while its Sustainability Capability remains less developed, resulting in an uneven capability profile rather than placement within a predetermined maturity stage. This has direct implications for operationalization: each capability domain should be measured separately using validated multi-item measures, while their collective contribution to CUM should be assessed through an empirically validated higher-order measurement model. An overall representation of CUM may therefore be possible, but it should reflect the empirically established contribution of the five formative capability domains rather than a simple unweighted composite or predetermined maturity level.

Accordingly, CUM is conceptualized as a formative, multidimensional higher-order construct. The five capabilities are not interchangeable reflections of a single underlying trait; they are distinct constitutive components that, together, define CUM. This is consistent with established guidance on modeling formative higher-order constructs when the dimensions are conceptually distinct and not expected to move together [29]. These criteria remain to be examined in future measurement research because no instrument has yet been developed or validated for CUM.

D. Capability Framework for Cloud Utilization Maturity

Building upon the capability-based conceptualization developed in the preceding section, this study proposes a conceptual framework for CUM comprising five complementary organizational capability domains: Technological Capability, Organizational Capability, Cloud-Agile Integration Capability, Adaptive and Strategic Capability, and Sustainability Capability. Collectively, these capability domains explain how organizations develop, integrate, govern, and continuously reconfigure cloud-enabled capabilities to achieve sustained operational, strategic, and sustainability outcomes within dynamic digital environments.

The proposed framework conceptualizes CUM as a higher-order organizational capability that emerges from the coordinated interaction of these complementary capability domains rather than from progression through predefined technological or organizational maturity stages. Although each capability domain represents a distinct aspect of organizational cloud utilization, none is independently sufficient to explain mature cloud utilization. Instead, organizational maturity develops through the continuous interaction of technological resources, organizational structures, agile software development practices, strategic adaptation, and sustainability-oriented management. Consequently, the framework adopts an integrative perspective in which mature cloud utilization reflects the organization's ability to coordinate, govern, and continuously

renew complementary capabilities in response to evolving technological, organizational, and environmental conditions.

Figure 1 illustrates the proposed capability framework for CUM. The framework is informed by the integrated theoretical perspectives developed in the preceding section and positions CUM as the higher-order organizational capability through which the five complementary capability domains interact to produce sustained organizational value. Rather than representing sequential stages of organizational development, the framework emphasizes the dynamic and mutually reinforcing relationships among the capability domains. Improvements in one capability domain influence, and are influenced by, developments in the others, thereby supporting continuous organizational learning, cloud-enabled innovation, operational resilience, strategic adaptability, and sustainable digital transformation.

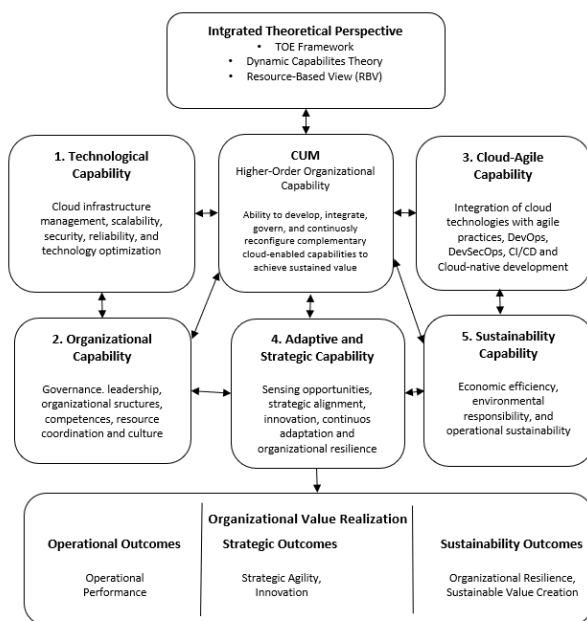


Figure 1. Capability framework for Cloud Utilization Maturity (CUM).

The five capability domains are introduced in the following subsections. Each domain represents a distinct but interdependent organizational capability that contributes to mature cloud utilization. Together, they provide a theoretically grounded explanation of how organizations move beyond cloud adoption towards the continuous development, integration, governance, and renewal of cloud-enabled capabilities.

Technological Capability refers to an organization's ability to develop, manage, secure, and optimize cloud-enabled resources that support scalable, reliable, and resilient digital operations. Within the CUM framework, it extends beyond cloud adoption to encompass the competence to architect, integrate, automate, and govern cloud technologies in ways that generate sustained organizational value. It therefore provides the technological foundation for the other capability domains.

Effective cloud utilization depends not only on access to cloud technologies but also on the capability to design secure and interoperable architectures, automate deployment and operations, optimize resource utilization, maintain service reliability, and integrate cloud services with enterprise systems. These technological capabilities enable organizations to exploit cloud computing as a strategic organizational resource rather than simply an IT infrastructure. They also support cloud-native development, scalable digital services, and continuous operational improvement, thereby strengthening the organization's ability to respond to evolving business and technological requirements.

Although Technological Capability is fundamental to CUM, it is not sufficient on its own. Mature cloud utilization emerges through its interaction with organizational governance, cloud-agile integration, strategic adaptation, and sustainability capabilities. Accordingly, Technological Capability provides the foundation upon which these complementary capabilities are coordinated to achieve sustained cloud-enabled value. The following subsection examines Organizational Capability, which provides the governance and managerial mechanisms necessary to realize this potential.

Cloud capabilities support agile software development through specific mechanisms [30]. Elasticity enables on-demand test and staging environments, shortening feedback cycles. Cloud-native CI/CD pipelines automate build, test, and deployment, increasing deployment frequency and reducing lead time. Infrastructure as Code (IaC) makes environments reproducible and version-controlled, while cloud-based DevOps toolchains integrate monitoring and incident response into delivery pipelines. Together, these mechanisms show that cloud-agile Integration Capability operationalizes cloud elasticity and automation to support shorter, more reliable delivery cycles.

Organizational Capability encompasses the governance structures, leadership, policies, competencies, and processes required to manage and sustain cloud utilization effectively. It captures the managerial and institutional mechanisms through which organizations align cloud initiatives with business objectives, coordinate resources, strengthen organizational learning, and support continuous improvement. This capability therefore provides the governance and coordination mechanisms through which technological potential is translated into organizational value.

Effective cloud utilization depends on organizational practices that facilitate decision-making, resource allocation, change management, knowledge sharing, and workforce development. Governance mechanisms ensure that cloud technologies are deployed securely, comply with organizational and regulatory requirements, and support strategic priorities. Leadership commitment and organizational learning further enable organizations to develop the competencies needed to adapt to evolving technologies and business requirements, thereby

strengthening the long-term effectiveness of cloud-enabled operations.

Although Organizational Capability provides the governance and managerial foundation for mature cloud utilization, its effectiveness depends on complementary technological, cloud-agile integration, adaptive and strategic, and sustainability capabilities. These capabilities reinforce one another to enable coordinated capability development and continuous organizational renewal. The next subsection examines Cloud-Agile Integration Capability, which explains how cloud technologies and agile software development practices are integrated to support continuous delivery, innovation, and operational responsiveness.

Cloud-Agile Integration Capability refers to an organization's ability to integrate cloud technologies with agile software development and modern engineering practices to support continuous delivery, operational responsiveness, and innovation. It operationalizes the technological and organizational foundations of CUM through practices such as DevOps, DevSecOps, CI/CD, Infrastructure as Code (IaC), and automated testing, enabling reliable, rapid, and secure software delivery.

The integration of cloud computing and agile practices enables organizations to shorten development cycles, improve collaboration between development and operations teams, automate deployment processes, and respond more effectively to changing business requirements. Cloud-native architectures, containerization, orchestration, and automated infrastructure management further strengthen this capability by supporting scalable application development and continuous service improvement. Consequently, Cloud-Agile Integration Capability enhances organizational flexibility and accelerates the delivery of digital services while maintaining quality, reliability, and security.

Although Cloud-Agile Integration Capability strengthens software development and operational performance, its effectiveness depends on complementary technological, organizational, adaptive and strategic, and sustainability capabilities. Together, these capabilities enable organizations to continuously develop, deploy, and refine cloud-enabled solutions that create sustained organizational value. The following subsection examines Adaptive and Strategic Capability, which explains how organizations continuously sense, adapt to, and capitalize on technological and environmental change.

Two additional dimensions were considered but not retained as separate first-order capabilities. Financial and cost management was incorporated within Sustainability Capability because cloud cost optimization forms part of efficient, long-term resource utilization. Workforce and talent capability was treated as an enabling condition within Organizational Capability because skills development operates through governance, organizational learning, and resource coordination. This boundary-setting logic supports a parsimonious five-domain structure in which each retained

domain represents a distinct capability function identified through the literature synthesis.

Adaptive and Strategic Capability refers to an organization's ability to identify emerging opportunities and challenges, maintain strategic alignment of cloud initiatives, and reconfigure cloud-enabled resources in response to technological, organizational, and environmental change. Through continuous adaptation and strategic renewal, this capability supports organizational agility, innovation, resilience, and alignment with evolving business priorities.

Organizations operating in dynamic environments must continually adapt their cloud strategies to changing customer needs, technological advances, competitive pressures, and regulatory requirements. This capability therefore encompasses strategic decision-making, organizational learning, innovation, and the continuous renewal of cloud-enabled resources and processes. By aligning cloud utilization with organizational goals and proactively responding to change, organizations are better positioned to sustain competitive advantage and maximize the long-term value of their cloud investments.

Adaptive and Strategic Capability complements the technological, organizational, cloud-agile integration, and sustainability capabilities by ensuring that cloud utilization evolves alongside organizational and environmental change. Together, these complementary capabilities enable organizations to continuously strengthen CUM rather than viewing maturity as a fixed or static state. The following subsection examines Sustainability Capability, which extends the framework by emphasizing the long-term economic, organizational, and environmental sustainability of cloud utilization.

The operational, strategic, and sustainability outcomes shown in Fig. 1 are conceptualized as consequences of CUM rather than components of the construct. Operational outcomes concern efficiency and reliability, including deployment performance, resource utilization, and service stability. Strategic outcomes reflect organizational agility, innovation responsiveness, and time-to-market, while sustainability outcomes concern the long-term economic, environmental, operational, and governance viability of cloud-enabled operations. This distinction clarifies that the five capabilities constitute CUM, whereas the three outcome categories represent consequences to be examined in future empirical research.

Sustainability Capability spans four complementary dimensions: economic sustainability through cost and resource optimization; environmental sustainability through reduced energy use and carbon impact; operational sustainability through long-term reliability and resilience; and governance sustainability through responsible data management and regulatory compliance. These dimensions are treated as facets of one capability because they are often pursued through overlapping cloud-governance and resource-management routines.

Sustainability Capability complements the technological, organizational, cloud-agile integration, and adaptive and strategic capabilities by ensuring that cloud utilization remains viable and valuable over time. Together, these complementary capabilities enable organizations to achieve CUM through the continuous development, integration, and renewal of cloud-enabled organizational capabilities. The following section explains how these five capability domains interact to collectively constitute CUM as a higher-order organizational capability.

The five capability domains proposed in this framework should not be viewed as independent organizational competencies but as complementary first-order capabilities that collectively constitute CUM. Their interaction reflects the dynamic processes through which organizations develop, integrate, govern, and continuously renew cloud-enabled capabilities to achieve sustained organizational value. Consequently, CUM emerges from the coordinated development and reinforcement of these capabilities rather than from excellence in any single capability domain.

Technological Capability provides the digital infrastructure upon which cloud utilization depends, while Organizational Capability establishes the governance, leadership, and coordination mechanisms necessary to manage these technological resources effectively. Cloud-Agile Integration Capability operationalizes cloud technologies through agile software development and modern engineering practices, enabling organizations to deliver reliable and innovative digital services. Adaptive and Strategic Capability ensures that these capabilities evolve in response to changing organizational priorities, technological advances, and environmental conditions, whereas Sustainability Capability guides their long-term application by promoting economically viable, socially responsible, and environmentally sustainable cloud utilization. Together, these capabilities reinforce one another, creating a continuous cycle of capability development, integration, adaptation, and renewal.

This interaction distinguishes the proposed framework from conventional cloud maturity models that primarily evaluate organizational progression through predefined maturity stages. Rather than conceptualizing maturity as a static organizational state, the proposed framework views CUM as a dynamic organizational capability that evolves through the continuous interaction of complementary first-order capabilities. As organizations strengthen these capabilities and their relationships over time, they become better positioned to realize sustained operational, strategic, and sustainability outcomes from cloud utilization.

E. Conceptual Model and Research Propositions

Building on the capability framework in Fig. 1, Fig. 2 translates CUM into theoretically specified relationships for future empirical examination. The model distinguishes two relationship types. First, Technological Capability, Organizational Capability, Cloud-Agile Integration

Capability, Adaptive and Strategic Capability, and Sustainability Capability jointly constitute CUM as a higher-order organizational capability. Second, CUM is expected to contribute to operational, strategic, and sustainability outcomes.

This distinction is important because the five capability domains are conceptualized as formative dimensions of CUM rather than interchangeable manifestations of an underlying construct. Each capability therefore contributes a distinct element to mature cloud utilization, and weakness in one domain cannot necessarily be compensated for by strength in another. CUM consequently reflects the coordinated development, integration, governance, and renewal of these complementary capabilities rather than excellence in any single capability domain. This conceptualization is consistent with the preceding argument that mature cloud utilization emerges through the interaction of multiple organizational capabilities rather than progression through predetermined maturity stages.

Accordingly, the first proposition concerns the constitution of the higher-order CUM construct. Unlike the subsequent propositions, P1 specifies a constitutive rather than a consequential relationship. The five first-order capabilities represent conceptually distinct but complementary organizational capabilities that jointly form CUM.

P1. Technological Capability, Organizational Capability, Cloud-Agile Integration Capability, Adaptive and Strategic Capability, and Sustainability Capability jointly constitute CUM as complementary first-order organizational capabilities.

The model further distinguishes CUM from the organizational outcomes expected to arise from mature cloud utilization. Operational, strategic, and sustainability outcomes are therefore conceptualized as consequences of CUM rather than dimensions of the construct itself. This distinction enables future empirical research to examine whether and to what extent the coordinated development of the five constituent capabilities translates into organizational value.

Operational outcomes reflect the effectiveness and efficiency with which organizations manage and deliver cloud-enabled digital services. When the five constituent capabilities are effectively developed and coordinated, CUM should enable organizations to combine secure and scalable cloud infrastructure with appropriate governance, automated delivery practices, adaptive resource management, and sustainable operations. This coordinated capability is expected to improve service reliability, deployment efficiency, resource utilization, and operational responsiveness.

P2. CUM is positively associated with operational outcomes.

Strategic outcomes reflect the extent to which cloud utilization supports organizational priorities, innovation, and responsiveness to changing competitive and technological conditions. By coordinating technological resources, organizational governance, cloud-agile practices, strategic

adaptation, and sustainability considerations, CUM should strengthen an organization's capacity to identify and respond to emerging opportunities, reconfigure cloud-enabled resources, accelerate digital service delivery, and maintain alignment between cloud utilization and strategic objectives. These capabilities are expected to contribute collectively to organizational agility, innovation responsiveness, strategic alignment, and faster time-to-market.

P3. CUM is positively associated with strategic outcomes.

Sustainability outcomes refer to the realized long-term economic, environmental, operational, and governance consequences of cloud utilization. They are conceptually distinct from Sustainability Capability, which concerns the organizational routines and competencies used to manage cloud resources responsibly and sustainably. When Sustainability Capability is coordinated with the technological, organizational, cloud-agile integration, and adaptive and strategic capabilities that constitute CUM, organizations should be better positioned to translate mature cloud utilization into sustained cost efficiency, reduced environmental impact, operational resilience, and continued regulatory compliance. Sustainability outcomes therefore represent realized consequences of CUM rather than practices or capabilities incorporated into the construct itself.

P4. CUM is positively associated with sustainability outcomes.

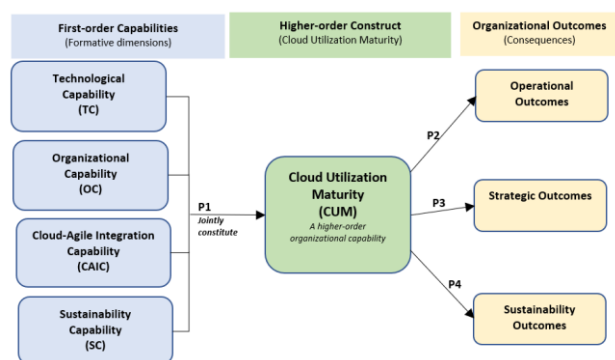


Figure 2. Conceptual model of Cloud Utilization Maturity and proposed relationships

F. Boundary Conditions

The proposed CUM framework is not expected to operate uniformly across all organizational contexts. Although the five capability domains are conceptualized as constitutive components of CUM, their development, configuration, and contribution to mature cloud utilization may vary according to organizational and environmental conditions. Similarly, the extent to which CUM is associated with operational, strategic, and sustainability outcomes may depend on the context in which cloud utilization occurs. Four boundary conditions are particularly relevant to the proposed framework: organizational size, industry and regulatory environment, cloud deployment model, and degree of dependence on cloud services.

Organizational size is proposed as a boundary condition because differences in organizational resources and readiness may affect the development and coordination of cloud-related capabilities [4]. Organizational size may therefore influence how the five constituent capabilities are developed and coordinated rather than determining CUM through a single uniform pathway.

Industry and regulatory environment may also influence the configuration of CUM. Organizations operating in highly regulated sectors face requirements concerning data governance, security, privacy, auditability, and regulatory compliance [31]. These requirements may constrain how cloud technologies are deployed and governed and may increase the relative importance of particular organizational and sustainability capabilities. Consequently, the configuration of capabilities associated with mature cloud utilization may differ across industries and regulatory environments.

Cloud deployment model represents a further boundary condition because public, private, and hybrid cloud environments impose different technological, governance, integration, and security requirements. Private and hybrid deployments may require greater in-house technological capability than extensively managed public cloud environments [21]. Deployment choices may therefore influence the relative importance and configuration of the constituent CUM capabilities.

Finally, the degree of dependence on cloud services is proposed as a boundary condition because organizations differ in the extent to which their critical business processes and digital services rely on cloud infrastructure. As cloud services become more deeply embedded in core organizational activities, requirements for resilience, governance, strategic adaptability, and sustainability are expected to become more consequential. The significance and configuration of CUM may therefore vary according to the extent of organizational dependence on cloud services.

These factors are conceptualized as boundary conditions rather than additional dimensions of CUM. The present study does not specify uniform moderating effects for each boundary condition because the direction and magnitude of such effects have not yet been empirically established. Future research should therefore examine whether and how these contextual conditions influence the development and configuration of CUM and the relationships between CUM and operational, strategic, and sustainability outcomes.

G. Comparison with Existing Maturity Frameworks

Existing cloud maturity frameworks provide structured approaches for assessing organizational progression in cloud adoption, capability development, management, and value realization. However, these frameworks differ in how maturity is conceptualized, the dimensions emphasized, and the assumptions made about organizational progression. Table I systematically compares selected cloud maturity frameworks with the proposed CUM framework to clarify

areas of overlap and the distinctive contribution of the capability-based conceptualization.

TABLE 1.
COMPARISON WITH EXISTING CLOUD MATURITY FRAMEWORKS

Framework/Study	Conceptualization and Focus	Maturity Structure	Distinction from Proposed CUM
Moonasar and Naicker [20]	Cloud capability maturity across organizational domains, incorporating technological, organizational, and environmental considerations.	Five maturity levels across six domains, with activities supporting progression across the maturity continuum.	Provides structured progression through maturity levels while recognizing organizational context. CUM instead conceptualizes maturity as the degree of development and coordination of complementary organizational capabilities without requiring progression through predetermined stages.
Müller et al. [21]	Examines cloud-computing benefits from a maturity-model perspective and the progressive realization of cloud-enabled benefits.	Applies a business-IT maturity model as an analytical framework to identify levels of cloud-computing benefits.	Emphasizes the progressive realization of cloud benefits. CUM focuses on the organizational capabilities that jointly constitute mature cloud utilization and treats operational, strategic, and sustainability outcomes as consequences of CUM.
ITU-T Y.3524 [22]	Defines cloud-computing maturity through technology, management, and effectiveness and addresses customer, resource, service, and security management.	Defines explicit cloud-computing maturity levels within a multidimensional functional framework.	Provides a structured framework for assessing and improving cloud-computing maturity. CUM instead provides a theory-driven explanation of mature cloud utilization as a higher-order organizational capability constituted by five complementary capability domains.
Proposed CUM framework	Technological, Organizational, Cloud-Agile Integration, Adaptive and Strategic, and Sustainability Capabilities.	Formative higher-order organizational capability; no predetermined maturity stages.	Explains how five complementary first-order capabilities jointly constitute CUM and proposes operational, strategic, and sustainability outcomes as consequences of CUM

Table I shows that existing cloud maturity frameworks provide structured approaches to assessing organizational progression, capability development, and cloud-enabled benefits. The proposed CUM framework complements these approaches by shifting the emphasis from predetermined maturity levels to the coordinated development of organizational capabilities. Its key distinction is the conceptualization of CUM as a higher-order capability constituted by five complementary capability domains, with operational, strategic, and sustainability outcomes treated as consequences of CUM.

H. Theoretical Contributions

The proposed CUM framework addresses the limited theoretical understanding of how organizations develop mature cloud utilization beyond technology adoption and stage-based maturity assessment. By conceptualizing CUM as a higher-order organizational capability comprising five complementary first-order organizational capabilities, the framework shifts attention from evaluating organizational maturity levels to explaining the organizational capabilities that underpin sustained cloud-enabled value creation. In doing so, it provides a theoretically grounded perspective for understanding how organizations develop, integrate, and

continuously renew cloud-enabled capabilities within dynamic digital environments.

The framework also demonstrates that mature cloud utilization is not achieved through technological capability alone but through the coordinated interaction of technological, organizational, cloud-agile integration, adaptive and strategic, and sustainability capabilities. This capability-based perspective complements existing cloud maturity models by providing an explanatory framework for understanding how organizations continuously strengthen cloud utilization to achieve sustained operational, strategic, and sustainability outcomes.

This study makes three principal contributions to the Information Systems literature. First, it reconceptualizes CUM as a higher-order organizational capability rather than a progression through predefined maturity stages. While existing maturity models remain valuable for assessing organizational maturity, the proposed framework complements these models by explaining the capability development processes through which mature cloud utilization emerges.

Second, the study integrates the TOE framework, DCT, and the RBV into a unified theoretical perspective for explaining post-adoption cloud utilization. Rather than applying these theories independently, the framework

demonstrates how organizational context, strategic resources, and capability renewal collectively shape mature cloud utilization.

Third, the proposed framework identifies five complementary first-order organizational capabilities that collectively constitute CUM. By incorporating cloud-agile integration and sustainability alongside technological, organizational, and adaptive capabilities, the framework provides a more comprehensive explanation of sustained cloud-enabled value creation and establishes a foundation for future empirical research.

Theoretically, this study extends DCT and the RBV by applying them jointly, rather than independently, to cloud utilization, a domain where their combination has previously been underdeveloped. It modifies conventional cloud maturity theory by replacing a stage-based ontology with a capability-based one, in which progress is explained through the interaction of five capability domains rather than through movement along a predefined scale. It also challenges the implicit assumption in prior cloud maturity models that technological sophistication is the primary driver of maturity, proposing instead that organizational, cloud-agile integration, adaptive and strategic, and sustainability capabilities are equally constitutive of mature cloud utilization.

I. Practical Contributions

For practitioners, the framework offers a capability-based perspective for organizations seeking to realize sustained value from cloud computing. Rather than viewing cloud maturity solely as the successful implementation of cloud technologies or progression through predefined maturity stages, the framework encourages organizations to assess and strengthen the complementary capabilities that collectively support effective cloud utilization. This perspective enables managers to view cloud transformation as a continuous organizational capability development process rather than a one-time technology initiative.

The framework can also support strategic decision-making by helping organizations identify capability strengths and areas requiring further development. The five capability domains provide a holistic perspective for evaluating cloud utilization across technological infrastructure, organizational governance, cloud-agile integration, strategic adaptability, and sustainability. This broader perspective encourages balanced investment in both technological and organizational capabilities, reducing the risk of emphasizing technology while overlooking the governance, strategic, and organizational factors required for sustained value creation.

Finally, the framework provides a conceptual foundation for developing organizational assessment tools and capability improvement initiatives. Although the proposed framework is not intended as a maturity assessment model, its capability domains may guide the design of diagnostic instruments that help organizations evaluate their cloud utilization capabilities and prioritize continuous improvement efforts. Such applications have the potential to support more informed

decision-making and enhance long-term digital transformation outcomes.

J. Limitations and Future Research

These contributions should nonetheless be interpreted in light of several limitations. First, this study is conceptual in nature and does not provide empirical evidence for the proposed relationships among the five capability domains. Consequently, the framework should be regarded as a theoretically grounded foundation for future empirical investigation rather than a validated model of organizational cloud utilization.

Second, the framework was developed through the synthesis of the Information Systems, cloud computing, and organizational capability literature. Although this approach provides a comprehensive theoretical perspective, the relative importance of individual capability domains and their interactions may vary across industries, organizational sizes, and institutional contexts. Future empirical studies are therefore needed to examine the applicability and generalizability of the framework across diverse organizational environments.

These limitations provide several opportunities for future research. A priority is the development and validation of measurement instruments for the five first-order capability domains and for CUM as a higher-order organizational capability. Empirical research using survey, case study, longitudinal, and mixed-methods approaches could examine the relationships among the capability domains and evaluate their influence on operational, strategic, and sustainability outcomes. Comparative studies across industries, organizational contexts, and countries would further enhance understanding of how CUM develops under different environmental and institutional conditions. Such research would not only validate and refine the proposed framework but also contribute to a deeper understanding of post-adoption cloud utilization and sustained digital transformation.

A further limitation is that the four propositions advanced in Section III.E have not yet been empirically tested. They are offered as a basis for future survey, case study, or mixed-methods research rather than as findings. The framework, Table I, and the propositions are therefore intended to guide future empirical validation and should not be interpreted as evidence that the proposed relationships have already been demonstrated.

IV. CONCLUSION

Cloud computing has evolved from a technology adoption initiative to a strategic enabler of digital transformation, yet understanding how organizations achieve sustained value from cloud utilization remains an important challenge in Information Systems research. While existing studies have significantly advanced knowledge of cloud adoption, implementation, and maturity assessment, comparatively less attention has been devoted to explaining the organizational

capabilities that underpin mature cloud utilization. In response to the study objective, this study developed a capability-based theoretical explanation of CUM that addresses this gap.

Drawing upon the complementary perspectives of the TOE framework, DCT, and the RBV, the study conceptualized CUM as a higher-order organizational capability comprising five complementary first-order organizational capabilities: Technological Capability, Organizational Capability, Cloud-Agile Integration Capability, Adaptive and Strategic Capability, and Sustainability Capability. The study further established that these capabilities jointly constitute CUM rather than representing predetermined maturity stages, while operational, strategic, and sustainability outcomes are conceptualized as consequences of CUM.

The study contributes to Information Systems research by extending cloud maturity research from stage-based assessment toward a capability-based explanation of mature cloud utilization. It also integrates TOE, DCT, and RBV to explain the contextual conditions, capability-development mechanisms, and potential strategic value associated with CUM. For practice, the framework provides a capability-based perspective through which organizations can identify and strengthen the complementary capabilities required for sustained cloud utilization.

As a conceptual study, the proposed framework and four propositions provide a theoretical foundation for future empirical investigation rather than empirically demonstrated findings. Future research should therefore develop and validate measures of the five capability domains and CUM and test the proposed relationships and boundary conditions across different organizational contexts.

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