# ENTERPRISE ARCHITECTURE MANAGEMENT
# - Insights in the digital context

## Introduction

This position paper presents an overview of key insights pertaining to the management of enterprise architecture in the digital business context, as discussed in the recent academic and practitioner literature. These literature insights, along with insights from subject matter experts, have informed development of IVI's IT-CMF Enterprise Architecture Management (EAM) Critical Capability.

## Relevance of Enterprise Architecture Management in the Digital Context

Today's digitally connected societies continue to integrate and interweave connections as never before. The Internet of Things, for example, potentially allows us to monitor and control anything in real-time, personally, remotely, or automatically [1]–[3]. Newzoo shows that by 2017, 3.5 billion smart phones were sold and that global penetration rates were rising year on year [4]. Boundaries of twenty years ago are already broken. Cash less transactions, for example, can now be completed via mobile phone devices rather than bank issued cards [5].

Society, and the manner in which it interconnects with service and product providers, is changing. Not all new communication channels are viable business options, but being unable to execute using the dominant channels can potentially threaten an organization's existence. Organizations must be digitally cognizant and proficient, have a well-developed digital strategy, and a capability that enables its strategy to be realized. Enterprise architecture assists in strategy formation, dissemination, and alignment of the organization with its strategic objectives; and through standardization, simplifies the organization's implementation and exploitation of the digitization being used. An organization, therefore, should develop an ability to set and manage the enterprise architecture's direction and objectives.

## What is Enterprise Architecture?

Enterprise architecture is a capability to envision, plan, design, lead, manage, and control organizations, systems, and/or processes in current, transitionary, and future states, and the relationships between them. It describes an organization in terms of its strategy, structure, information flows, value streams, physical instantiations, and geospacial spread, as well as its business and transaction models. It also describes the technology, utility connections, and network infrastructure, and may extend to describe supply and distribution chains. Enterprise architecture, when fully developed, builds a holistic information base that effectively describes an organization [6]–[10]. Architecture descriptions/conceptualizations may be layered to represent specific types of relationships – for

example, those between applications, business services, internal IT services, security, networking, data storage, and so on. These descriptions are essential when trying to address issues and problems in large complex organizations.

The blueprints created by enterprise architecture provide a basis for planning, modelling, and optimizing the performance of all, or a part of, an organization. Enterprise architecture can be combined with information from other sources like network maps and detailed data descriptions to improve analysis [8].

## Benefits of Enterprise Architecture

Enterprise architecture enables the business to understand its current composition, utility, costs, and sources of value generation [8], [11], [12]. It is an active participant in strategy formulation - enterprise architecture staff work closely with, and often overlap with, staff in strategic planning and project portfolio management, with enterprise architecture envisioning and developing the programmes and projects necessary to support realization of the organization's future strategic objectives.

Enterprise architecture reduces complexity by indicating the technical standards and operating principles for guiding business solution design and technology choices. It promotes consistency and integration across process, information, application, and infrastructure for optimal business performance. It further reduces business complexity through the reuse and sharing of functional components, and through standardization of technologies and infrastructure.

> "Using the business blueprint, executives can visualize challenges, drill down to the root cause of those challenges, build consensus on the issues to be addressed, define a solution oriented roadmap that engages all constituencies, and drive projects that deliver immediate business value and align with longer term strategies" [11].

Enterprise architecture improves the quality and performance of business processes and enhances productivity across the organization by unifying and integrating data linkages.

With effective enterprise architecture management in place, sound architecture management guidelines, practices, and governance are evident. Organization and project-level risks are minimized and managed through more informed project portfolio and solutions planning. There is a clear vision and leadership for the architecture function and availability of the requisite architectural skills and architecture resourcing [6], [7], [9], [10].

## Approaches to Enterprise Architecture

Developing an enterprise architecture capability is complex. It takes time, careful planning, and requires managerial leadership, resources, and support. Many frameworks have been developed over the years to guide organizations on developing and implementing an enterprise architecture capability. Choosing

a framework that meets the needs of the organization, and that will continue to meet its needs as the organization evolves and its enterprise architecture capability is enriched, is an essential early step [8], [11], [13]–[16]. Building awareness of these frameworks takes time and organizations might be well-served by hiring experts or engaging consultants to guide early decisions. Aside from framework selections, an appropriate toolset is needed to implement enterprise architecture. The toolset should support the generation of conceptualizations that support analysis and understanding, as well as planning and scenario modelling, what-if analysis, and the building and maintenance of an architecture information base. Architecture artefacts must be intelligible by those who need to use them. Selecting a framework and a supporting toolset should be completed before large-scale training programmes are undertaken.

Enterprise architecture needs to work closely with strategic planning and project portfolio management functions, particularly so for those working in the strategy and business layers of the architecture. In these areas, one needs to consider how strategy concepts are expressed and communicated and the boundaries between enterprise architecture and strategic planning. A similar set of considerations is needed at the data layer. For example, 'where does the architectural representation of enterprise data finish and where do functions such as data management takeover'? Who creates data flow diagrams or entity relationship diagrams? Thus, the scope or depth to which architectural descriptions extend should be considered. In addition, applications, networks, server infrastructure layers, and so forth all need to have handover interfaces defined. These must be completed using a language that is understood by all active participants. Getting an organization ready for enterprise architecture often necessitates the provision of training to stakeholders outside the enterprise architecture team [10], [13], [16].

## Managing Enterprise Architecture

Enterprise architecture needs to be managed. Initially, a business case needs to be prepared to justify the setup and initiation costs for an enterprise architecture function. Goals and objectives for the enterprise architecture function need to be set. The delivery of those architectural goals and objectives needs to be managed [8].

Goals and objectives should be expressed in high level business terms [11]. For example, 'restructure to support a doubling in transaction numbers with cost increments not exceeding 10%'. How this objective is to be achieved is open ended and the enterprise architecture team should be allowed to use any mix of techniques to deliver the optimum solution for the organization. An analysis of the architectural blueprints should provide some initial insights on likely bottlenecks. Planning, evaluating, and selecting alternatives should identify potential solutions that could be tested via modelling and simulation. Transition planning and roadmaps should enable the organization transform to the newer more efficient mode of transaction implementation selected [8], [16]. A focus of transition planning is 'business as usual'.

An enterprise architecture governance model that is integrated with the overall organization's governance model will ensure appropriate checks and controls are applied to the expenditure of resources on enterprise architecture activities. While control is necessary, a license to experiment in a structured manner will provide a creative work environment that fosters innovation. A pragmatic value centric focus is also needed to balance explorative research costs with exploitative revenue generation. Controls should be adaptive and applied only as necessary. Architecture checks should be near non-existent on smaller, low impact projects but to the front on architecturally significant projects. Audit logs should be used to enable subsequent audits to measure compliance with governance criteria [8], [17].

Architectural transformations can take months, and even years, to complete. Establishing baselines that measure the key performance indicators around the change effort is essential. These baselines can be taken at the start and when the transformation is completed to demonstrate improvements. Transitional states can also be measured to demonstrate early availability of partial benefits, where appropriate [18], [19].

A programme of continuous improvement should also be developed for enterprise architecture. This will ensure that the organization maintains an effective competitive enterprise architecture capability. Early stages should focus on training and quality, while later stages should focus on performance and the provision of a comprehensive capability. The improvement programme ultimately should leverage research, vendor advocacy, and professional associations to sustain a competitive edge in enterprise architecture [20], [21].

## Conclusions

Enterprise architecture provides a systematic, well-developed approach to aligning organizations and their use of technology and provides alignment across business processes and organization design - operationalizing work and job designs. It is an effective way to introduce digital transformations, be they small or large as enterprise architecture makes obvious the impact of changes in one area on other organization functions.

Research indicates that having a change management approach in place enhances the likelihood of success in digital transformation projects. Selecting a change management approach can be done in strategic planning, project portfolio, or programme management functions, or for smaller changes possibly in project management. Regardless of where the change management approach is selected, enterprise architecture should be leveraged to glean insights into the full extent and likely impact of proposed changes, including those that are temporary or transitionary. Enterprise architecture is the capability that is best positioned to support changes that drive business innovation and digital enablement.

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## Contributing Author

Conor O'Brien, Senior Research Fellow, Innovation Value Institute.

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The Innovation Value Institute (IVI) is a multi-disciplinary research and education establishment co-founded by Maynooth University and Intel Corporation. IVI researches and develops management frameworks to assist business and IT executives deliver digitally enabled business innovation. IVI is supported by a global consortium of likeminded peers drawn from a community of public and private sector organizations, academia, analysts, professional associations, independent software vendors, and professional services organizations. Together, this consortium promotes an open ecosystem of research, education, advisory support, international networking, and communities-of-practice. IVI is supported through Enterprise Ireland's and IDA's Technology Centre programme.

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