Enterprise Architecture – A Value Proposition for Records Professionals

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Abstract—**Modern institutions operate hundreds of business systems or applications to support their institutional activities. Among the key players or actors within any institution are records professionals, whose mandate is the management of records/archives or potential records/archives generated by these hundreds of business systems or applications. Records professionals need to make sense of the vast array of software applications and technological infrastructure, as well as how they relate to one another in supporting the institution's functions and activities. Unfortunately, there is often misalignment between various institutional actors, including business actors, information technology (IT) actors, and records professionals. Enterprise architecture (EA) proponents see it as a promising concept to address this fundamental issue. This article draws from a research study exploring the utility of EA frameworks for records professionals.**

Keywords—business actors, enterprise architecture practice, information technology actors, modelling, records management capabilities

I. Introduction

In the last few years, experts in computational as well as archival sciences have explored and mapped several concepts and methods in both fields, resulting in enriched transdisciplinary efforts. The emerging transdisciplinary field of computational archival science provides a platform to explore emerging methods and technologies as well as new forms of analysis that support historical, social, scientific, and cultural research engagement [6, 23]. There are four major categories of computational thinking: data practices, modelling and simulation practices, computational problem-solving practices, and systems thinking practices (Figure 1) [27].

Based on computational thinking, this article falls under the category of systems thinking practices, focusing on understanding the dynamics within systems and how systems change over time [27].

Modern institutions invest large amounts of resources in building systems in the form of technology platforms and business applications that will support organizational activities. These institutions operate hundreds of business systems or applications to support their activities. Furthermore, each of these systems are aimed at improving the speed, efficiency and quality of a number of business processes within the institution [25]. Among the key players within any institution are records professionals, whose mandate is the management of records/archives or potential records/archives generated by business systems and software applications. Records professionals need to make sense of the vast array of software applications and technological infrastructure, as well as how they relate to each other in supporting the institution's functions and activities [18].

Unfortunately, there is often misalignment of interests amongst various institutional actors, including business actors and information technology (IT) actors, as well as records professionals. Misalignment is usually caused by miscommunication and may result in wasted IT investment, disappointment in IT, and reduced business performance [21]. Doucet, Gøtze, Saha and Bernard [3] see Enterprise architecture (EA) as a concept to address this fundamental issue. They argue that EA has the potential to align strategy, business, and technology elements across an entire enterprise, providing the context and standards for implementing best practices. EA constitutes a collection of special documents (artefacts) describing various aspects of an organization from an integrated perspective. EA is intended to bridge the communication gap between various stakeholders, facilitate information systems planning, and thereby improve business and IT alignment [22]. For this reason, this article sees EA as a promising concept to cope with the complexity caused by multifarious technology ecosystems [25].

This article draws from a research study conducted under the auspices of the InterPARES Trust project that explored the utility of EA frameworks for records professionals [13-15]. InterPARES Trust was the fourth phase of a multi-year project investigating the long-term preservation of authentic digital records [4, 5].

II. Enterprise Architecture Value Proposition

As noted in the Introduction, many modern institutions operate hundreds of computer-based information systems or applications to support their institutional activities [25]. For this reason, these institutions have to constantly align "both short term and long term changes in their IT landscape to their

business plans, strategies and goals" [21]. Ideally, business and IT alignment requires professionals to achieve mutual agreement between all the varied actors involved in decision-making and implementation of IT systems [1].

Discussions on business and IT alignment often concentrate on two main types of actors: business and IT. These actors are further disaggregated into five categories: business executives, IT executives, IT project teams, and business unit managers who occupy different levels of the institutional hierarchy and who fulfill different roles [21]. Their differences in responsibilities, backgrounds, competences, goals, interests, concerns, planning horizons, and mindsets means that they may result in disagreements [21]. Figure 2 illustrates the five actors and their varied interests and responsibilities.

Figure 2 illustrates three types of actor dichotomies represented by the boundaries separating different groups of decision-makers (i.e., business vs. IT, strategic vs. tactical, and external vs. internal). The diagram shows that boundaries result in five broad groups: business executives, IT executives, business unit managers, IT project teams, and third parties [21].

A. Business vs IT Actors

On the one hand, business actors are knowledgeable in business strategy and processes, customer needs, customer preferences, competitive advantages, and competitive disadvantages. However, Kotusev [21] argues that business actors barely understand IT and may consider IT-related talks as irrelevant to the institution's performance.

On the other hand, IT actors are knowledgeable in technologies, systems, programming languages, databases, operating systems, servers, networks, and other hardware. However, Kotusev [21] argues that business actors barely understand the relative importance of different software and hardware for the business performance.

B. Strategic vs Tactical Actors

There is a chasm in the quest for alignment of strategic and tactical perspectives. On the one hand, strategic actors are concerned with long-term planning, global trends in the external environment, organization-wide capabilities, and disruptive influences. However, strategic actors are often unaware of how their high-level plans can be implemented or ignorant of the critical needs, demands, and problems of separate business units [21].

On the other hand, tactical actors are concerned with carrying out specific processes in business units, implementing concrete IT systems or projects, and solving urgent problems. However, tactical actors may not understand how their activities aimed at achieving local short-term objectives contribute to the global long-term vision [21].
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C. Internal vs External Actors

There is a chasm in the quest to aligning the interests of internal and external actors. On the one hand, internal actors are aware of their own organization and understand what business processes, systems, and technologies they have. However, internal actors may be unaware of new prospective technologies, products, or industry best practices [21].

On the other hand, external actors such as consultants and vendors may be aware of the situation in their niche areas and understand their technologies, products, and respective latest industry best practices. However, they may not know specific features of their client companies, their unique needs, peculiarities, legacy-driven standards, or limitations [21].

Figure 2 illustrates the boundaries that prevent effective communication, mutual understanding, and partnership between the five different groups, thereby undermining overall business and IT alignment. This poor communication and the lack of mutual understanding lead to inadequate planning decisions, neglecting the interests of institutional stakeholders [21].

D. Pivotal Role of EA

The preceding section demonstrates how the varied nature of actors and perspectives within an institution could lead to misaligned planning and implementation between business and IT actors. The result is wasted IT investments, disappointment in IT, and reduced business performance [1, 21]. Therefore, the position of EA within an organization is to detect misalignments, resolve redundancies, or spot missing integration links (Figure 3) [25].

Figure 3 illustrates that EA provides an opportunity to establish effective communication between all relevant actors involved in strategic decision-making and implementation of IT systems [22]. For each group of relevant actors, EA documents provide the necessary descriptions of information that satisfy their interests, reflect their concerns, and answer their questions. Furthermore, EA documents help different actors collaborate and achieve mutual understanding despite their disparate roles, interests, and expertise [21].

III. VALUE OF EA TO RECORDS PROFESSIONALS

As noted in the introduction, records professionals are actors within an institution. Ideally, their professional mandate is to ensure the "efficient and systematic control of the creation, receipt, maintenance, use and disposition of records" [10] within a framework that ensures "defined roles and responsibilities, systematic processes, measurement and evaluation as well as review and improvement" [9].

However, in the modern age, many records professionals are confronted by highly complex technological ecosystems. Records professionals have struggled to fulfil their professional mandate because many current practices were developed for a paper rather than the digital environment [16]. Therefore, the challenge is how best records professionals can understand the complexity in a way that allows them to fulfil their professional mandate that entails the identification, capture and management of records for as long as they are required.

Hofman [8] argues that records professionals have had "a long history in which they have been at the tail-end of managing information and records". Dollar [2] called for records professionals to "participate in the design of metadata systems, in order to ensure that they contain the contextual information essential to a full understanding of records and record systems". This paper argues that records professionals, just like other actors, should consider using EA as a strategic instrument to navigate the complex technology ecosystem in modern institutions. [18].

Indeed, this is likely what motivated the ISO Technical Committee 46 Sub Committee 11, which is responsible for records management standards, to begin working on a technical report titled ISO/TR 21965:2019 "Records management in enterprise architecture" in 2015 and eventually publish it in 2019 [12]. The team that developed the technical report had three objectives:

- To explain the core concepts and records management principles to EAs.
- To explain the core concerns of records management as an EA viewpoint.
- To explain the alignment of the records management viewpoint and EA methods [12].

The goal of the technical report is to establish records professionals as key stakeholders in EA giving them a common reference with enterprise architects on "requirements for records processes and systems" [12].

The technical report provides an initial platform for records professionals to explore the world of EA. However, like many such initial efforts the report does not necessarily provide a roadmap to achieving tangible results. This paper suggests two roadmap opportunities for records professionals:

  a) EA abstraction provides a structured understanding of how institutions work.
  b) EA processes provide a structure opportunity to embed into institutional processes.

A. EA Abstraction and Structured Understanding of how Institutions Work

EA improves the alignment of various actors within an organization by capturing "the status of the organizations' business architecture, information resources, information systems, and technologies so that the gaps and weaknesses in their processes and infrastructures can be identified, and development directions planned" [1]. The process of capturing the status, to a large extent, requires modelling. According to Yustianto and Doss [28] modelling is a form of abstraction that serves two purposes. First, the object might be too complex to comprehend in its original size or details. Second, the object might not be discernible, either as an abstract concept, or it may not yet have been materialized. A modern organization may develop a model such as that which is illustrated in Figure 4.

The illustration shows that the institution has five different types of business roles in three different business capabilities, served by seven different business processes, and supported by five different systems that in turn depend on three databases and an integration bus. Figure 4 is an abstraction that offers a simplified version of reality in order to exemplify the main types of components within the technology ecosystem within the enterprise [7]. Without the simplification, a comprehensive reality would have so much detail that it would cloud the essential elements being communicated [8, 17].

EA abstraction using models ensures the simplification of an enterprise's complexity by decomposing it into its major constituent components, each representing a discrete view. Furthermore, EA abstraction links these components together into an interconnected whole, including mapping those responsible for implementing, integrating, operating, and further developing them [7, 19, 25]. According to Hofman [8], this kind of abstraction "provides a rigorous means of deconstructing, decomposing, analyzing and describing complex phenomena, taking different perspectives… identifying the relationships within specific contexts, and zooming in on particular areas without losing the broader context"

Once business capabilities have been modelled appropriately, it becomes easier to identify how records capabilities can be integrated into supporting specific institutional processes. Perroud and Inversini [24] make the argument that EA should be seen in three sets of patterns: business patterns, support patterns, and infrastructure patterns. Support patterns include one set of EA patterns known as *InformationChest*(S2) that covers all the processes of information management. Figure 5 shows the architectural patterns and their relationships.

According to Perroud and Inversini [24], the *InformationChest*(S2) pattern deals with "the management of structured and semi-structured information. It describes how information can be acquired, transformed, delivered, stored, and archived".

In what is called the holistic view in Figure 6, Perroud and Inversini [24] show the four typical processes in the context of information management: users produce, search and retrieve, modify, deliver information and handle all aspects of the information lifecycle.

The first layer is the business view that has the four core processes of managing information: produce information, search and retrieve information, modify information, deliver information and manage the information lifecycle [24].

The second layer is the data and application view that entails all the elements supporting the four core processes:

- Input management that supports production of information.
- Content management that supports searching and retrieval as well as modification of information.
- Output management that support delivering of information.

- Archive management that supports both content and output management by managing the information lifecycle [24].

The third layer is the infrastructure view that constitutes the components, devices, and servers that ensure that the applications in second layer function effectively.

Figure 7 shows the business applications related to input management, content management, archive management, and output management [24].

Modelling records capabilities and connecting them to business applications, as shown in Figure 7, facilitates an understanding between records professionals and IT professionals. With regards to EA, the abstraction developed, such as the abstraction shown in Figure 7, allows alignment with other abstractions within the larger EA modelling, as shown in Figure 5.

B. EA Processes and the Structured Opportunity to Embed Records Professionals into Institutional Processes

Preceding sections have highlighted that modern institutions have a myriad of business capabilities and supporting systems that work in distributed environments or in chains or networks that often "lack effective control in terms of information management, privacy, and security" [8]. Such institutional environments make it difficult for records professionals to even align their requirements into the seemingly impenetrable technology ecosystems.

For this reason, EA processes could offer an opportunity for record professionals to gain access into technology platform development processes. Kotusev [21] demonstrated how EA architects and other actors at an Australian University worked to enable business and IT alignment. The case study outlined the five EA processes undertaken within the institution:

- First, alignment processes started with engagement managers in different business units that identify needs.

- Second, solution consultants gathered high-level business requirements and a solution architect used them to develop a conceptual architecture of the project. These were then approved by enterprise architects based on the overall architecture. This helped business units estimate the scope, value, cost and timelines for all proposed IT projects.

- Third, based on time, cost and value estimates, the ICT steering committee prioritize proposed IT projects, select which projects would be implemented in the coming year, and allocate funding.

- Fourth, once the program of work had been identified, solution architects used maxims, principles, and standards to develop solution designs for each project based on its conceptual architecture.

- Finally, the solution architects transferred the approved solution designs to project managers and project

implementers to implement projects according to the design.

The five processes are illustrated in the Figure 8.

Once records professionals have modelled their requirements, as discussed in section III.A, it would be much easier to organically contribute to EA practices, as described above. ISO/TR 21965:2019 states that there are three main reference scenarios that EA could consider with augmenting records requirements into business applications [11]. The three scenarios are illustrated in Figure 9. These scenarios occur when:

- Records management capabilities are already available within the business application.

- Only some records management capabilities are found in the business application and, therefore, the rest of the capabilities are obtained from external applications.

- None of the records management capabilities are found in the business application and, therefore, all capabilities are obtained from external applications.

IV. CONCLUSION

This article drew from a research study that explored the utility of EA frameworks for records professionals. The article has described the difficulties that records professionals have in integrating their work into complex institutional processes usually supported by a myriad of business applications that work in distributed environments and that often lack effective control mechanisms. Proponents of EA see it as a strategic instrument to control and manage the complexity in modern institutions through structured description of the enterprise and its relationships [26].

For records professionals to take advantage of the opportunities brought about by EA, they need to have a structured way of understanding how institutions work, as well as have a structured way of embedding records requirements and capabilities within EA processes in institutions. There are already efforts to take advantage of EA with the publication of ISO/TR 21965:2019, which gives records professionals a common reference with enterprise architects on requirements for records processes and systems. However, the publication of the technical report should be the beginning of a long journey that helps records specialists explore the emerging opportunities in utilising EA. This study demonstrates how records specialists can harness computational methods, in this case EA, in their quest to fulfilling their professional mandate.

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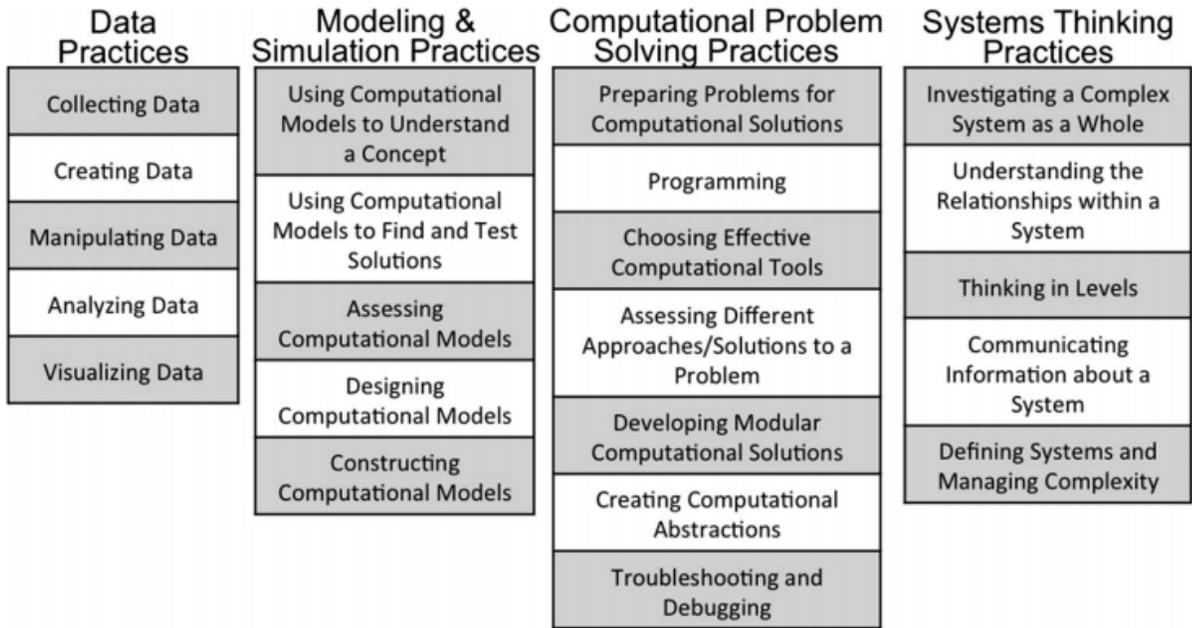
Data Practices

Data Practices
Collecting Data
Creating Data
Manipulating Data
Analyzing Data
Visualizing Data

Modeling & Simulation Practices

Modeling & Simulation Practices
Using Computational Models to Understand a Concept
Using Computational Models to Find and Test Solutions
Assessing Computational Models
Designing Computational Models
Constructing Computational Models

Computational Problem Solving Practices

Computational Problem Solving Practices
Preparing Problems for Computational Solutions
Programming
Choosing Effective Computational Tools
Assessing Different Approaches/Solutions to a Problem
Developing Modular Computational Solutions
Creating Computational Abstractions
Troubleshooting and Debugging

Systems Thinking Practices

Systems Thinking Practices
Investigating a Complex System as a Whole
Understanding the Relationships within a System
Thinking in Levels
Communicating Information about a System
Defining Systems and Managing Complexity

Fig. 1: Computational thinking. Source: [27]

Business Actors ← → IT Actors

Strategic Actors

Business Executives
(Senior business managers responsible for strategic planning and making investment decisions)

What is our business strategy?
What are our core capabilities?
What are our competitive advantages?

IT Executives
(Senior IT managers responsible for organizing the IT department according to the business needs)

What is our IT strategy?
What technologies are we using?
What new technologies can we leverage?

Tactical Actors

Business Unit Managers
(Business managers and operators responsible for running local routine business processes on a daily basis)

What are our business processes?
How are we running our processes?
How can we optimize our processes?

IT Project Teams
(IT specialists and project managers responsible for implementing new IT projects)

What IT projects are we delivering?
Are we delivering our projects on time?
Are we satisfying business requirements?

Third Parties
(Consultants, vendors and outsourcers engaged to deliver specific IT solutions according to industry best practices)

What IT services are we offering?
What are the industry best practices?
How are we applying them for our clients?

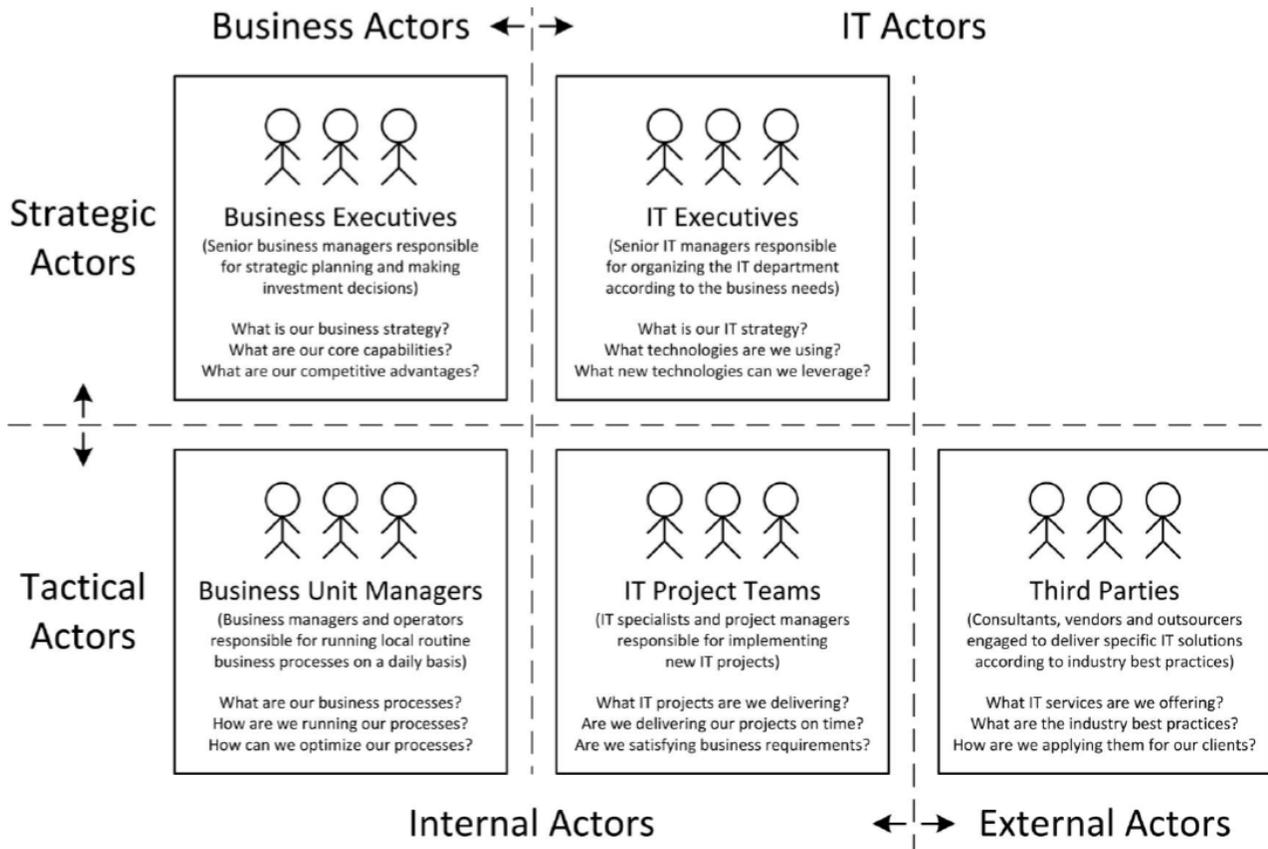**Internal Actors ← → External Actors**

Fig.2: Main groups of actors and boundaries Source [21]
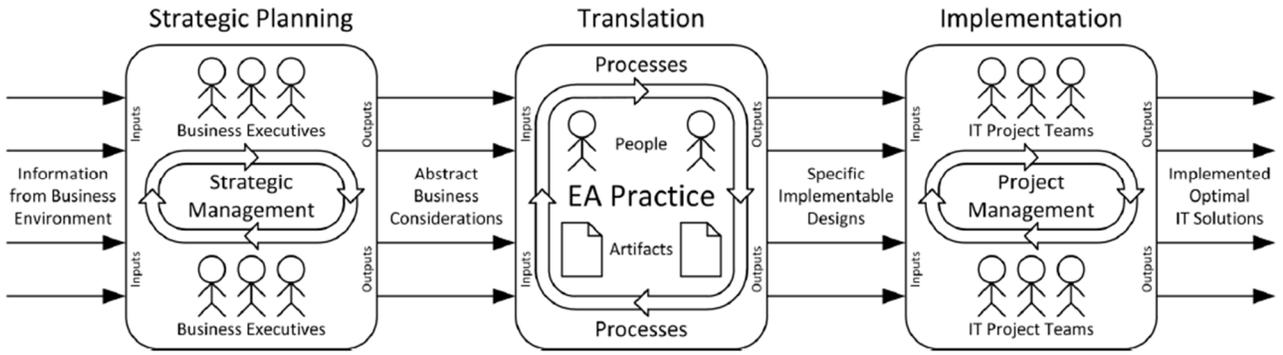
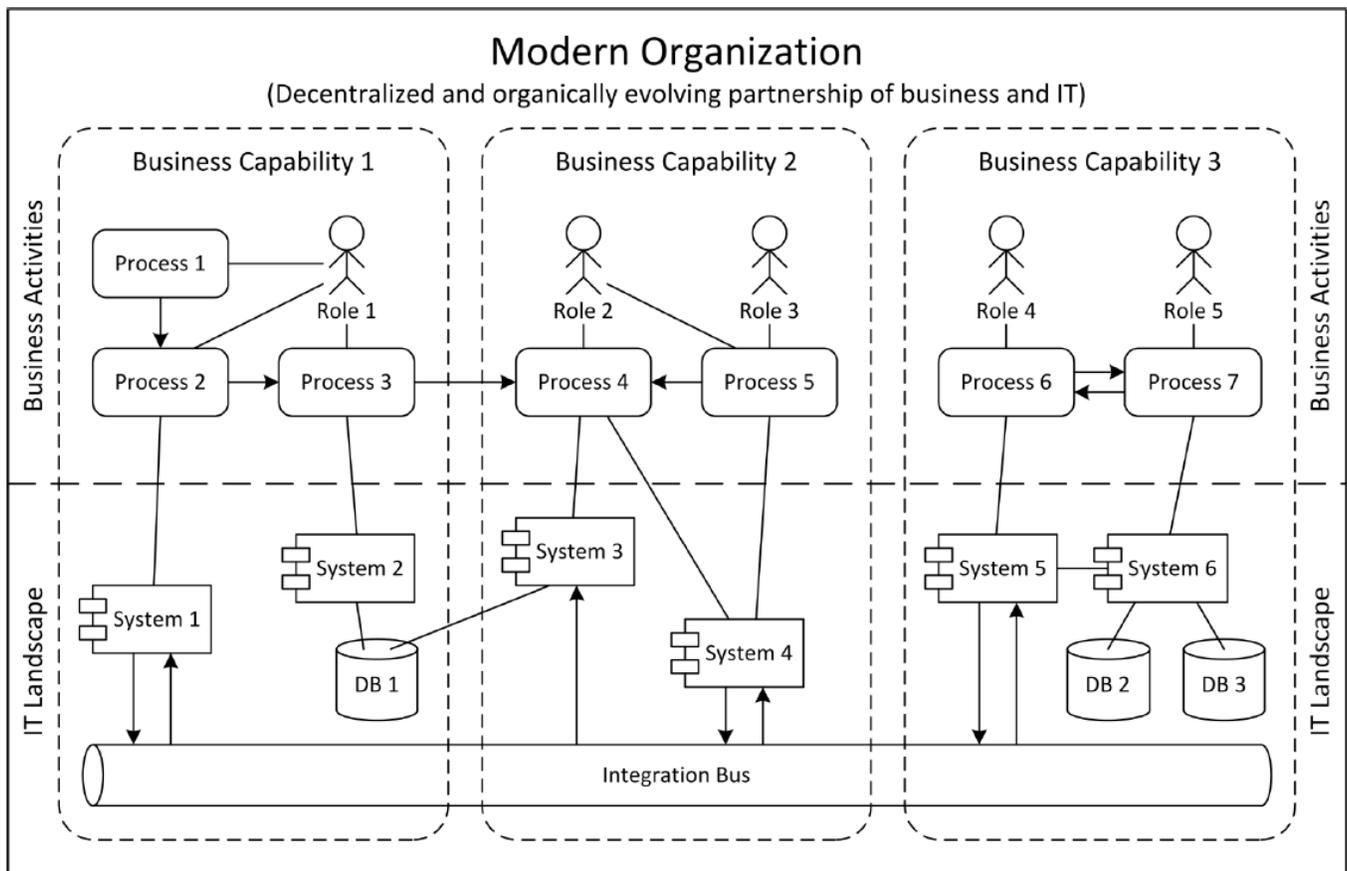Fig. 3: The position of an EA practice within an organization Source: [22]

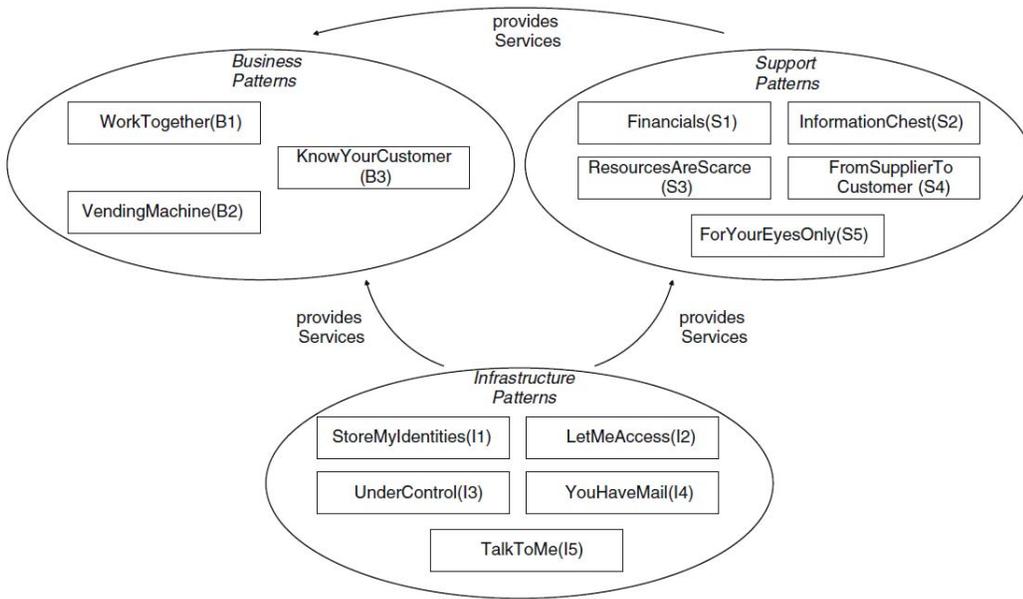Fig. 4: Nature of a modern organization Source: [21]
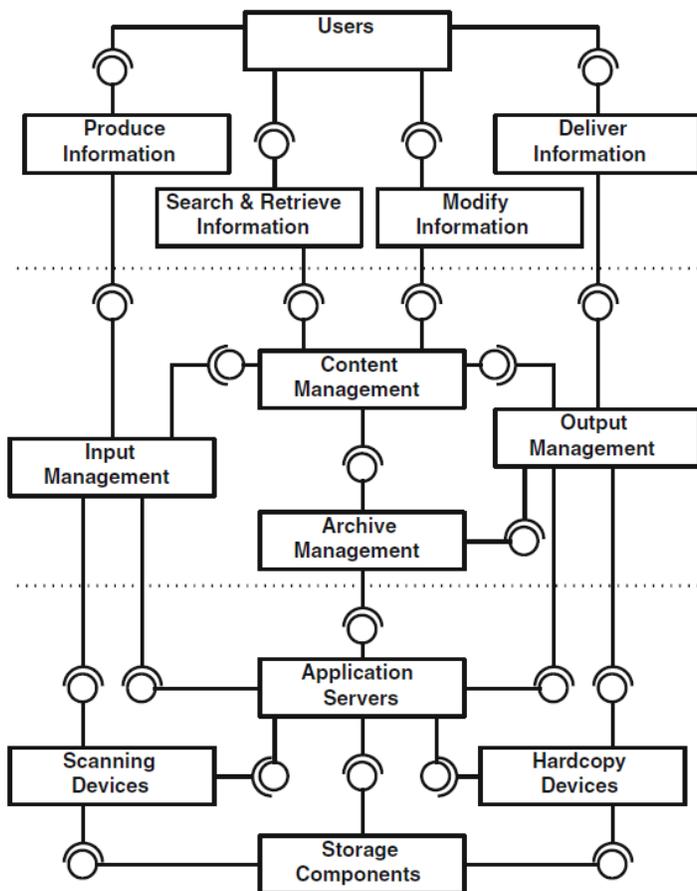
Fig. 5: EA Pattern map Source: [24]
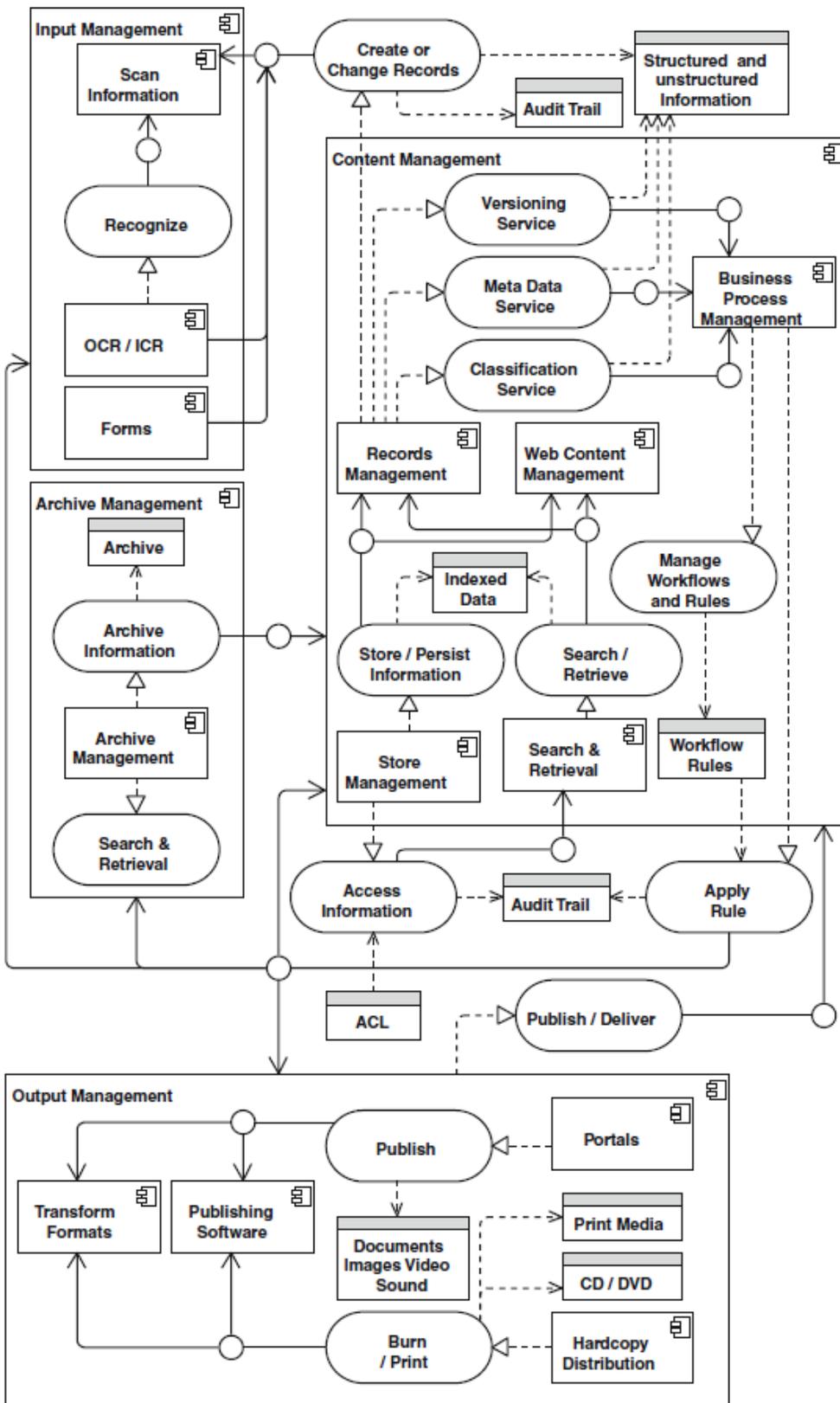

Fig.6: Holistic view Source: [24]

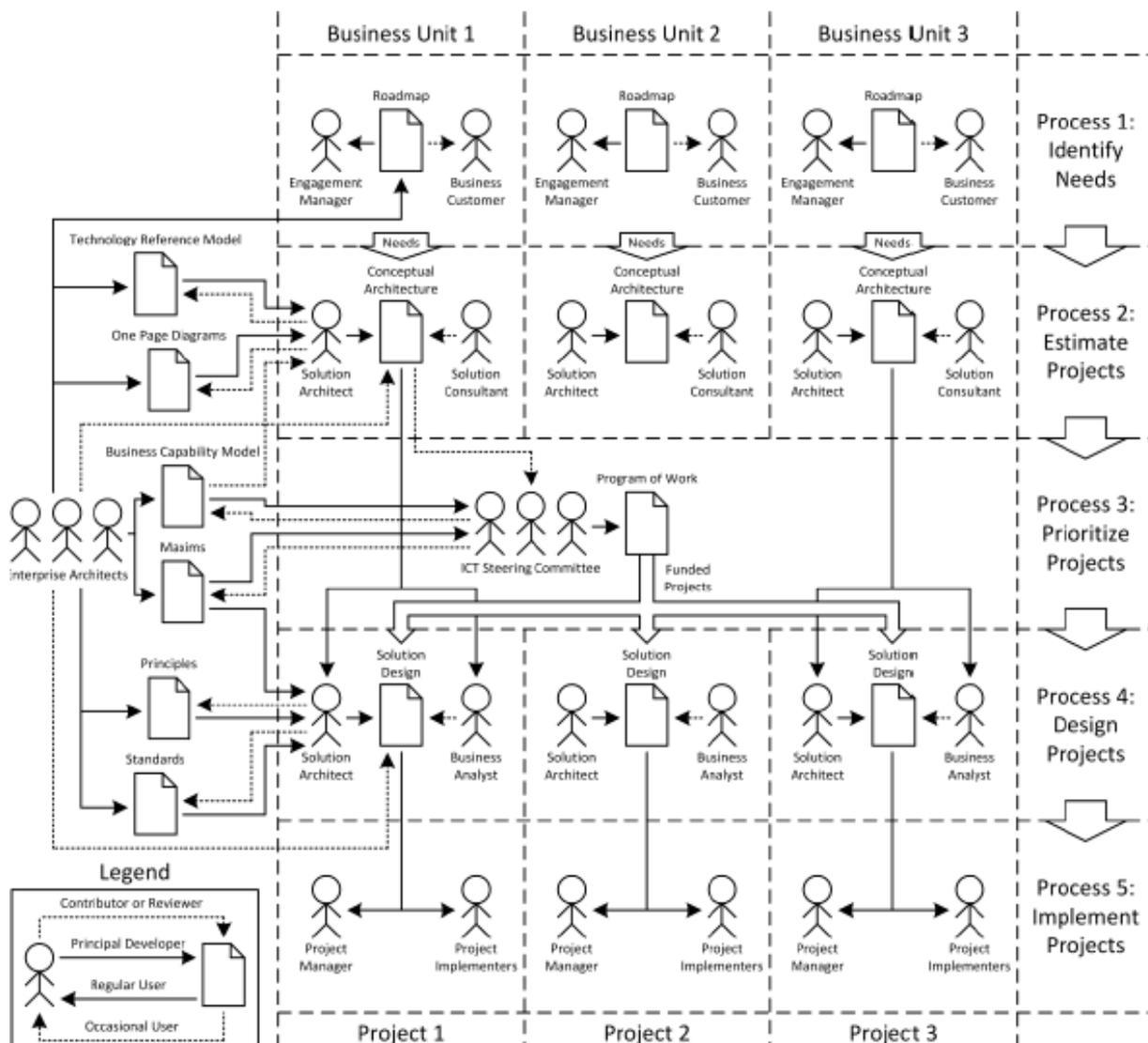Fig. 7: Data and Application view of the InformationChest Source: [24]

Fig. 8: Processes constituting the EA practice at Central Australian University Source:[21]

Business applications realize the required Records Management capabilities

Business application components realize the required Records Management capabilities

Business application have specific components that realize the required Records Management capabilities

Business application components with business capabilities

Records Management component

Business applications use external applications that realize the required Records Management capabilities

Business application components with business capabilities
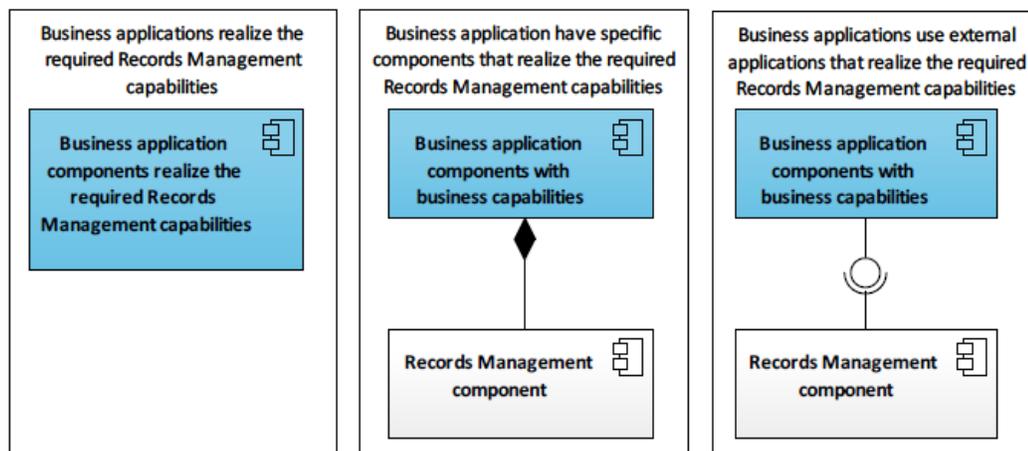
Records Management component

Fig. 9: Records Management Reference Application Scenarios view Source: [11]