

# Three Schools of Thought on Enterprise Architecture

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Three schools of thought on enterprise architecture exist, each with its own belief system (definitions, concerns, assumptions, and limitations). A novel taxonomy of these schools creates a starting point for resolving terminological challenges to help establish enterprise architecture as a discipline.

**W**hat is enterprise architecture? What literature is relevant? When did enterprise architecture first emerge? Is it a mature discipline? It's challenging to answer such questions, given the plethora of terminology and lack of shared meaning in this domain.

The literature often uses the same term with different meanings. For example, "systems" might refer to software applications, systems composed of interrelated people and technological tools, systems of just interrelated people, or systems of numerous interrelated elements (economical, social, technological, and so on). These variations in meaning imply differences in scope, moving from simple, homogeneous systems with relatively small and well-defined boundaries (such as software applications) to heterogeneous complex systems with broad and ill-defined boundaries (such as sociocultural, techno-economic systems—the entire enterprise).

Furthermore, enterprise architecture literature uses different terms with very similar meaning. For example, "enterprise architecting," "enterprise engineering," and "organization design" all seem to refer to activities with the same possible concerns and outcomes. There seems to be considerable interest in the enterprise architecture community in establishing the field as a discipline, but first we must resolve these terminological challenges.

In reviewing the key literature, three schools of thought emerge, each grounded in its own belief system. Consequently, each school has a particular definition of enterprise architecture, specific concerns and assumptions about enterprise architecture, as well as its own insights and limitations.

Here, I present a novel taxonomy of these schools of thought to create a starting point for developing the required shared meaning.

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**Table 1. Enterprise architecture definitions range in scope and purpose.**

Scope	Purpose
The enterprise-wide IT platform, including all components (software, hardware, and so on) of the enterprise IT assets	Effectively execute and operate the overall enterprise strategy for maintaining a competitive advantage by aligning the business and IT strategies such that the proper IT capabilities are developed to support current and future business needs
The enterprise as a sociocultural, techno-economic system, including all facets of the enterprise (where enterprise IT is just one facet)	Effectively implement the overall enterprise strategy by designing the various enterprise facets (governance structures, IT capabilities, remuneration policies, work design, and so on) to maximize coherency between them and minimize contradictions
The enterprise in its environment, including not only the enterprise but also its environment and the bidirectional relationship and transactions between the enterprise and its environment	Help the organization innovate and adapt by designing the various enterprise facets to maximize organizational learning throughout the enterprise

Moreover, I hope to foster a dialogue about these belief systems, which are implicitly held but seldom discussed and are thus at the root of many misunderstandings in the enterprise architecture community.

## Variations in Scope and Purpose

Definitions presented in enterprise architecture literature are unclear in terms of two key elements: scope and purpose (see Table 1). In terms of scope, the term “enterprise” can refer to anything from just the IT platform to all of the socio-econo-techno (and other prefixes) elements that comprise an entire enterprise. Also, although the definitions often present some sort of a purpose, that purpose is rarely related to a clear set of enterprise objectives or outcomes. Many of these definitions are variations of a common theme found in the enterprise architecture literature, which is that of describing (and/or a process for describing) the interrelated components of an enterprise to guide their evolution. But such definitions state no real enterprise objective or outcome but rather a means for an outcome, such as market agility.

Despite the ambiguity present in the definitions, three major beliefs emerged from my review of the literature in terms of aligning the scope and purpose. As Table 1 shows, there are nine possible scope and purpose combinations, but most of the literature falls within three combinations: enterprise-wide IT platform alignment, enterprise coherency, and enterprise-in-environment (or system-in-environment) learning. We can then map these three combinations to three different schools of thought, respectively: enterprise IT architecting, enterprise integrating, and enterprise ecological adaptation (see Table 2). These schools of thought should be

viewed as “ideal” types insofar as authors typically don’t fit perfectly in one school but rather gravitate toward one over another.

## Enterprise IT Architecting

In this school of thought, enterprise architecture is about aligning an enterprise’s IT assets (through strategy, design, and management) to effectively execute the business strategy and various operations using the proper IT capabilities. This school is techno-economic in that it aims to reduce IT costs through technology reuse and eliminating duplicate functionality. IT strategic planning and business enablement are also top priorities.

This school of thought often describes enterprise architecture as “the glue between business and IT.” It’s guided by software engineering practices, which promote a reductionist approach to problem-solving through mantras such as “divide and conquer.” Consequently, its architecting process uses models and views and often tries to neatly divide the enterprise’s IT assets into components and subcomponents designed and assembled according to software engineering best practices.

As inputs to the design process, key items are business strategies and objectives. Often, the latter are exactly that—nothing more than inputs to the process and thus not subject to review. The implicit assumptions here are that the business strategies and objectives, provided by the business portion of the organization, are correct and not to be questioned. In addition, it’s often assumed that IT planning is a rational, deterministic, and economic process, which, if done correctly, will achieve the “correct” results.

Challenges in implementing the strategy arise from inadequate skills and management. The introduction of new technologies is seen as mostly independent from work design and the design of

**Table 2. Schools of thought regarding enterprise architecture.**

	<b>Enterprise IT Architecting</b>	<b>Enterprise Integrating</b>	<b>Enterprise Ecological Adaptation</b>
<b>Motto</b>	Enterprise architecture is the glue between business and IT	Enterprise architecture is the link between strategy and execution	Enterprise architecture is the means for organizational innovation and sustainability
<b>Objectives and concerns</b>	Effectively enable the enterprise strategy Support IT planning and reduce costs Enable business	Effectively implement the enterprise strategy Support organizational coherence	Innovate and adapt Support organizational coherence Encourage system-in-environment coevolution
<b>Principles and assumptions</b>	Apply a reductionist (mechanistic) stance Don't question business strategies Design organizational dimensions independently Don't worry about non-IT dimensions; they're not your concerns	Apply a holist (systemic) stance Don't question business strategies and objectives Manage the environment Jointly design all organizational dimensions	Apply a holist (systemic) stance System-in-environment coevolution Environment can be changed Jointly design all organizational dimensions
<b>Skills</b>	Have technical competence and engineering knowledge	Facilitate small-group collaboration Apply systems thinking	Foster dialogue Apply system and system-in-environment thinking Facilitate larger-group collaboration Foster sensemaking
<b>Challenges</b>	Convince the organization to accept the designed plans	Understand organizational systemic dynamics Collaborate across the organization Encourage systems thinking and paradigm shifts	Encourage systems thinking and system-in-environment paradigm shifts Collaborate across the organization
<b>Insights</b>	Permits the design of robust and complex technological solutions Fosters the creation of high-quality models and planning scenarios	Permits the design of comprehensive solutions Enables significant organizational efficiency by eliminating unnecessary contradictions and paradoxes	Fosters system-in-environment coevolution and enterprise coherency Fosters organizational innovation and sustainability
<b>Limitations</b>	Can produce inadequate or unfeasible solutions for the larger organizational context Struggles with solution acceptance and implementation barriers Susceptible to "perfect" designs that support unsustainable strategies	Susceptible to "perfect" designs that support unsustainable strategies Requires a paradigm shift from reductionism to holism	Requires many organizational preconditions for management and strategy creation

organizational structures, so solutions are often selected without consideration of the latter. Moreover, because the scope is narrow and focused on IT, aspects such as remuneration policies and work design are of no concern—they're just inputs to the design process.

Because of its grounding in engineering, this school is capable of designing robust and complex technological solutions. Moreover, because

much importance is given to "proper" analysis and planning, practitioners often produce high-quality models and planning scenarios.

On the downside, its reductionist stance rarely allows for the design of technological solutions that account for the realities of organizations, so its solutions are often inadequate, unfeasible, and unsustainable in the larger context. Complex organizational dynamics—driven by remuneration

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policies, politics, and sociocultural forces—often present considerable barriers to solution acceptance and implementation. Moreover, its disinterest in the process of generating a business strategy makes this school vulnerable to the syndrome of creating “perfect” designs for unsustainable strategies (that is, strategies that aren’t compatible with the enterprise environment).

Within this school of thought, the enterprise architect is a master planner and designer. With technical competence, engineering knowledge, and rigorous data collection and analysis, the enterprise architect can create models of the present and future to guide transformation of enterprise-wide IT. The key challenges are communication and buy-in, because the architect must get members of the organization to understand and accept his or her own plans, so the enterprise can align initiatives requiring IT capabilities with the master designs (that is, the IT roadmap). A common metaphor used for enterprise architecture in this school of thought is “urban planning,” so the role of an enterprise architect here could be compared to that of an urban planner.

## Enterprise Integrating

For this school, enterprise architecture is about designing all facets of the enterprise. The goal is to execute the enterprise’s strategy by maximizing the overall coherency between all of its facets—including IT. This school is grounded in systems thinking,<sup>1</sup> so it approaches enterprise design holistically or systemically. It aims to eliminate contradictions between various enterprise policies and structures and is often viewed as “the link between strategy and execution.”

The guiding principle is that a reductionist approach to enterprise design and strategy execution isn’t adequate. All aspects of the organization form a complex fabric of reinforcing and attenuating dynamics, so they must be globally optimized and designed. Designing the enterprise in such a manner reinforces wanted dynamics and attenuates unwanted ones.

Similar to the enterprise IT architecting school of thought, key input items to the design process are business strategies and objectives. Again, the implicit assumptions are that the business strategies and objectives, provided by the business portion of the organization, are correct and not to be questioned. This school also views the environment as

a generator of forces that the enterprise must address and manage—but not attempt to change.

Challenges in implementing this strategy arise from an incomplete understanding of the organization’s systemic dynamics. Introducing new technologies is seen as dependent on the existing work and organization design, so all aspects must be jointly designed—you can’t isolate each variable and find a best solution.

Because of its grounding in systems thinking, this school can design comprehensive solutions, taking into account the various aspects of enterprises. Organizations designed according to this school might gain significant efficiency by eliminating unnecessary contradictions and paradoxes. On the downside, similar to the enterprise IT architecting school, this school is vulnerable to the syndrome of creating perfect designs for unsustainable strategies.

Within this school of thought, the enterprise architect’s main role is to be an inquiring facilitator. Because the dynamics present in an enterprise surpass the cognitive capabilities of a single person, the enterprise architect becomes a facilitator to multifunctional team inquiry processes to identify and map systemic dynamics. Consequently, the architect must be able to facilitate group discussions and encourage systems thinking. The architect should also be able to capture systemic dynamics and communicate their meaning across the organization for design purposes.

Because the enterprise “beast” is complex, designs are achieved through team-based processes, so collaboration and enterprise-wide commitment are essential. The difficulty for an enterprise architect lies mostly in revealing all of the systemic dynamics at play to identify contradictions. Moreover, because of the nature of systems, typically multiple elements, which could be (mistakenly) perceived as independent, must be redesigned, so a key challenge is encouraging the members affected by redesigns to collaborate.

This school is often subject to the same resistance barriers as the enterprise IT architecting school. Expert teams usually create the enterprise designs and then struggle to gain organizational acceptance.

## Enterprise Ecological Adaptation

For this school, enterprise architecture is about fostering organizational learning by designing all

facets of the enterprise—including its relationship to its environment—to enable innovation and system-in-environment adaptation.<sup>2</sup> Creating the enterprise strategy and designing the organization are top priorities. Also, similar to the enterprise integration school, this school is concerned with contradictions—but not just within the organization. It also looks for incoherency in the bidirectional relationship between the enterprise and its environment. Its members often describe enterprise architecture as “the means for organizational innovation and sustainability.”

The guiding principle is that a systemic approach alone isn’t sufficient to enterprise design; it’s necessary to achieve environment and enterprise coevolution by purposefully changing the environment, systematically designing the enterprise as well as its relationship to its environment. Enterprise architects have three approaches for achieving such coevolution. First, they make the environment friendlier for the enterprise’s desired goal by reinforcing pockets of desired “futures” in the environment and attenuating unwanted forces. Second, they use environmental learning to adapt the enterprise’s desired goals to be more compatible with the environment. Third, similar to the enterprise integrating school, they focus on intra-organizational coherency. By designing the enterprise to reinforce wanted intradynamics and attenuate unwanted ones, it’s possible to make the organization conducive to ecological learning, environmental influencing, and coherent strategy execution. The key assumptions of this school are that the environment can be changed, system-in-environment coevolution is essential for strategy elaboration, and organizational coherency is necessary for effective strategy execution.

Because of its grounding in systems-in-environment thinking, this school of thought fosters system-in-environment coevolution as well as enterprise coherency. Enterprises designed by this school are conducive to innovation and sustainability. On the downside, as a precondition, this school requires enterprises to be prepared to accept multiple paradigm shifts in management, strategy creation, and the relationship between the enterprise and its environment (which presumably can be influenced).

Within this school of thought, the enterprise architect is a nurturer. Extracting knowledge

from the environment and searching for desirable futures requires a great deal of *sensemaking*—a collaborative process by which people give meaning to experience,<sup>3</sup> creating shared awareness and understanding out of their different perspectives and interest. Sensemaking is required because of the environment’s vast complexity and the subjective nature of human perception. The enterprise architect must be able to foster *sensemaking* processes within the organization that lead to learning. Consequently, the architect must be able to encourage dialogue between members of the organization and promote system-in-environment thinking. Other important skills are larger group facilitation and communication skills—to encourage group discussion and collaboration so various sectors can work together to elaborate on the enterprise strategy. For the same reasons as the enterprise integrating school, team-based processes and enterprise-wide commitment are essential.

The challenges for these enterprise architects are to support sensemaking and transformation processes. The difficulty lies mostly in fostering sense-making with regards to system-in-environment dynamics as well as getting the organization to accept necessary paradigm shifts to support the enterprise.

### A Little Mapping

To further illustrate these schools of thought, Table 3 presents a tentative mapping of items from the literature I reviewed for this article to the framework I propose.<sup>4-19</sup> The mapping is for illustrative purposes only; I don’t mean to unconditionally associate the various authors’ work with rigid, boxed ways of thinking. The mapping was achieved by qualitatively identifying the closest school to the implicit/explicit assumptions, focus, and objectives that emerged from the books. Owing to space constraints, I can’t offer a comprehensive explanation of the mappings. However, the table is an invitation to explore some of the enterprise architecture literature with new eyes and to encourage a dialogue about enterprise architecture and belief systems.

You might be surprised that I don’t propose a mapping for the Zachman’s Framework, despite its popularity in the enterprise architecture community.<sup>20</sup> I omitted it because it’s a taxonomy, not a school of thought, and because its

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**Table 3. Mapping enterprise architecture authors according to the three schools of thought.**

Enterprise IT Architecting	Enterprise Integrating	Enterprise Ecological Adaptation
Clive Finkelstein <sup>4</sup>	Peter Bernus and colleagues (editors) <sup>10</sup>	Jamshid Gharajedaghi <sup>14</sup>
Inge Hanschke <sup>5</sup>	Ronald Giachetti <sup>11</sup>	Tom Graves <sup>15</sup>
Col Perks and Tony Beveridge <sup>6</sup>	Leon Kappelman (editor) <sup>12</sup>	Jan Hoogervorst <sup>16</sup>
Jeanne Ross and colleagues <sup>7</sup>	Martin Op't Land and colleagues <sup>13</sup>	James Martin <sup>17</sup>
Steven Spewak and Steven Hill <sup>8</sup>		Kevin Smith and Tom Graves <sup>18</sup>
Martin van den Berg and Marlies van Steenbergen <sup>9</sup>		James Lapalme and Donald de Guerre <sup>19</sup>

information-centric nature isn't representative of John Zachman's stance on enterprise architecture. In his Society of Information Management guide to enterprise architecture, Leon Kappelman shares an interesting interview he conducted with some key enterprise architecture pioneers, including Zachman.<sup>12</sup> Zachman's statements during the interview put him in the enterprise integrating school, like most of the other interviewees.

In *Strategy Safari*, Henry Mintzberg refers to an Indian fable of blind men and the elephant in which each of the blind men perceives the elephant very differently according to the elephant part he's touching.<sup>21</sup> Mintzberg refers to this fable to illustrate that the various schools of strategy management that he proposes, individually, don't offer a complete view of the strategy "animal," but they do when combined together.

With regards to the enterprise architecture schools of thoughts, this fable doesn't hold. Each school builds by adding more context and content, hence offering a more complete image. Consequently, each school inherits the concerns of the other schools with lesser scope but focuses less on their concerns. The enterprise integrating school of thought includes and transcends the enterprise IT architecting school of thought, and enterprise ecological adaptation includes and transcends enterprise integrating. However, there are fundamental differences in the assumptions and values of the schools—thus the use of the term "transcend." They're not strictly a subset from a system belief perspective—only from a scope perspective. For example, the reductionism of the first school is at the opposite of the holism of the second and third schools.

If organizations are to survive the turbulence of today's markets, they must learn to adapt and innovate. A survey by the Gartner and Forrester

technology market consulting firms shows that current enterprise architecture practices, which are mostly based on the enterprise IT architecture school of thought, aren't doing very well—they lack acceptance and are perceived as organizationally inconsiderate.<sup>22,23</sup> These practices haven't been able to consistently deliver adaptation or innovation in the past, so should we hope that they will in the future? I believe enterprises will have to move to more holistic ways of thinking if they wish to survive and flourish.

In conclusion, this article wasn't about three ways of doing enterprise architecture but rather about three ways of approaching enterprise architecture. It's about the beliefs—not tools—of enterprise architects. ■

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