Positioning IT4IT in the face of classic Enterprise Architecture Frameworks

A critical review

Andreas Hartmann [1], Gunnar Auth [2]

Abstract: IT4IT was introduced by the industry consortium The Open Group (TOG) in 2015 as a new reference architecture for the business view of IT management. Since TOG declared IT4IT to be a new standard and it apparently has an architecture focus, its potential use in enterprise architecture management has become a topic under discussion. In this study IT4IT is reviewed and compared with the classic enterprise architecture frameworks TOGAF and ARIS using evaluation criteria collected from literature. The results show that, although IT4IT has structural and topical similarities to classic EAFs, in particular the architecture focus and different views, its purpose and context of use is clearly different. Conforming to the concept of a service-oriented architecture (SOA), IT4IT is value oriented, service-centric, data driven, and automation focused; its position can be described best as part of an IT-related extension of a comprehensive EAF. Thus, IT4IT calls for integration with a classic EAF – without erroneously replacing or overwriting existing standards.

Keywords: IT4IT; TOGAF; ARIS; enterprise architecture; enterprise architecture framework; management of technology framework

1 Introduction

Firstly introduced by the international consortium The Open Group (TOG) in 2015 [TF19], IT4IT is a recent reference model for analyzing, designing, and improving the value creation of an IT organization aiming at efficiency and agility. With its latest version 2.1 dating from 2017 [Th17b], it addresses both corporate IT departments providing IT products/services to internal customers and IT vendors selling to a buyer market. While IT4IT is based on the process-oriented value chain model by Michael Porter, it describes and explains the "business of IT" [Th17b] from an architectural point of view, covering the dimensions information (data), function, integration and IT service. Consequently, TOG refers to the IT4IT model as a "reference architecture".

According to Winter and Fischer [WF06], Enterprise Architecture (EA) is understood as "the fundamental organization of a government agency or a corporation, either as a whole,

[1] HfT Leipzig, Gustav-Freytag-Str. 43, 04277 Leipzig, hartmann@hft-leipzig.de, https://orcid.org/0000-0003-1340-5325
[2] Meissen University of Applied Sciences, Herbert-Böhme-Straße 11, 01662 Meißen, Gunnar.Auth@hsf.sachsen.de, https://orcid.org/0000-0002-3013-2739

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or together with partners, suppliers and / or customers (“extended enterprise”), or in part (e.g. a division, a department, etc.) [. . .]” and should include both IT and business related artefacts. Following this definition, and in accordance with [Wa16], [Pr16] et al., we review IT4IT as an EAF. In addition to IT departments and IT vendors, IT4IT is also relevant for enterprises with their value chain depending on IT, especially software. Accordingly, TOG promotes IT4IT as “a modern framework for managing a digital enterprise” [Th20b].

On the other hand, IT4IT may not be yet another EAF. According to TOG’s strong value proposition, the model is designed to become “a game-changing foundation for IT” [Th20a]. The core concept of this new foundation is an IT value chain formed by end-to-end value streams and supported by a single integrated system of record containing all relevant IT information. This way, IT4IT aspires to close a “growing capability gap” [Ak16] in today’s IT organizations which results from a combination of rising demand and increasing technology trends. Typical problems IT4IT wants to overcome include “fragmented teams, processes, and tools”, leading to “disorganized handovers from business to the IT function and from development to operations” [Ak16].

As a new EAF, IT4IT is competing with a rich choice of existing EAFs. Sultanow et al. [Su16], for instance, identify and evaluate 55 EAFs. The problem of evaluating and selecting the best fitting EAF for an individual enterprise has been object to research in EAM for over two decades [AKL99]. Over this time, several methods and approaches for evaluating EAFs have been proposed (e. g., [AG06], [BNS03], [Fr09], [Su16], [UM06]). Against this background, we reviewed the new IT4IT framework to understand its characteristics in relation to existing EAFs as well as the appropriateness of common criteria for evaluation. As underlying research questions, we formulated:

1. How can IT4IT be characterized, regarding commonalities/differences and advantages/disadvantages, if comparing it to classic EAFs?
2. Can or shall it be applied alongside, without or even replacing a classic EAF?

For conducting the review, a structured process was applied: first, we reviewed the (sparse) existing literature on IT4IT, including both scientific and professional sources. Then, we collected and analyzed existing evaluation criteria for EAFs from literature. From the result, we created a consolidated set of evaluation criteria, suiting our evaluation objectives. Then the actual review was performed. We decided to include the two classic EAFs TOGAF and ARIS in the review and compared them to IT4IT. TOGAF was selected because of its high profile and because it is also developed by TOG. ARIS, on the other hand, was selected because of similarities to IT4IT in its focus on the IT domain and its basic dimensions (views).

2 EAF Evaluation Criteria

The evaluation of different EAFs is usually targeted at selecting the best-fit EAF for a given purpose. Our slightly different evaluation objective is to characterize the new IT4IT model through comparing it to existing EAFs. Since in both cases the object under evaluation is the same (EAF), we expect evaluation criteria developed for EAF selection to be appropriate for our evaluation objective too. Based on this assumption, we conducted a structured literature review to collect existing criteria for evaluating EAFs, following the recommendations of [vo15]. Starting with the search words 'enterprise architecture framework' + {evaluation | selection | comparison}, we used Google Scholar, Springer Link, IEEE Xplorer, and the ACM Digital Library. From the results, relevant articles were selected via title/abstract and further analysed, including forward and backward search. As expected, we found several criteria which are suitable for our evaluation objective and are supported by multiple authors. Tab. 1 presents the consolidated criteria along with a short description and the corresponding references.

Tab. 1: Evaluation criteria for EAFs

Criterion	Description	Reference(s)
Scope	Area of application as stated by the EAF	[Sc06], [Su16], [Wi10]
Goals	Future state of enterprise achieved through applying the EAF as intended	[AG06], [Sc06], [Wi10]
Design principles	Basic normative statements on how to achieve a to-be EA	[AFW11], [Bu17], [Fr09], [Sc06], [Wi10]
Views	Representations of certain aspects of EA from a specific point of view, often in the form of graphical models, e. g., business, process, infrastructure	[AFW11], [Bu17], [Fr09], [UM06], [WF06], [Wi10]
Metamodel	A model that defines the building blocks, their relationships, and notation for modeling the EA views	[AFW11], [Fr09], [LZ06], [WF06]
Method	Method(s) for EA design and evolution	[Fr09], [Bu17], [LZ06], [WF06]
Terminology	Terms and definitions	[Fr09], [WF06]
Reference model	Normative model(s) for re-use as template(s)	[Fr09], [WF06]
Adaptivity	Explicit support of adapting the EAF to technological and economical change, in particular digital transformation	[BY15], [Ga18], [HMS14], [KH17], [Ma17], [MV19], [Zi16]
Tool support	Availability of dedicated software tools	[AG06], [Wi10]

3 Introducing the Frameworks

In the following section we give a brief introduction to the IT4IT model as well as to TOGAF [Th18] and ARIS [Sc92]. The latter have been extensively discussed in the literature and should be familiar to many readers (e.g., [BS12], [DH11], [LZ06]).

3.1 TOGAF

The Open Group Architecture Framework (TOGAF) has been developed on the base of the US Department of Defense Technical Architecture Framework (TAFIM) [De96] as a tool for "assisting in the acceptance, production, use, and maintenance of enterprise architectures" [Th18]. Key element is the TOGAF Architecture Development Method (ADM). The ADM forms a requirement-centric, nine phase cycle, starting from architecture vision to architecture change management, and claims to be framework agnostic [Th18]. However, like in other EAF the definition of different views – to reduce complexity – is included in TOGAF as well. The so-called domains are business, data, application, and technology. With respect to reference architectures, TOGAF includes the Technical Reference Model (TRM) and the Integrated Information Infrastructure Reference Model (III-RM), both being capable to model information systems at a conceptual level as well as systems architectures. TOGAF does not include any own modelling notation, but supports UML, BPMN and TOG's Archimate [TO20].

3.2 ARIS

The ARchitecture of integrated Information Systems (ARIS) can be considered as a process-driven EAF. Starting from a holistic view of business processes ARIS is based on an integration concept and has the capability to create highly complex models. However, this complexity can be broken down using different views and abstraction levels. The views are organization, data, process, function, and output [Sc99]. Relationships between views and levels are essential and thus, a proper EAM tool is necessary to handle complex architecture models. Complexity reduction is further achieved through a lifecycle concept and the various description methods for information systems that are classified based on their proximity to IT. Thus, ARIS calls itself a framework for developing and optimizing integrated information systems, with an emphasis on the business related description level ([Sc92], [Sc99]).

Further, ARIS supports several notation/modelling standards, e.g. Unified Modelling Language (UML) [Ob20], Object Modelling Technique (OMT) [Ru91], and Archimate [Th17a].

3.3 IT4IT

With IT4IT the Open Group claims to provide a vendor neutral, technology agnostic and industry agnostic reference architecture for the business view of IT management. There are several reasons being named, e.g. that other common standards are proprietary and slow to adapt. It is capable to evolve and to enable continuous improvement. IT4IT uses a layered architecture, a meta model and the Archimate notation language version 3.0 [Th17a] as well as UML [Ob20]. Compared to e.g. ITIL the IT4IT reference architecture is

almost process agnostic and focusses on capabilities to run the IT operation model instead. Thus, the standard describes what needs to be done to enable an IT value chain – not how. However, one single process view is given: the IT value chain itself. The simple process model consists of four connected value streams forming a continuous value chain. Figure 1 depicts the four value streams "strategy to portfolio", "requirement to deliver", "request to fulfil" and "detect to correct". These value streams have been extended from the high-level "plan, build, deliver, run" process model and supplemented with supporting activities, e.g. finance, governance, and risk management [Th17b].

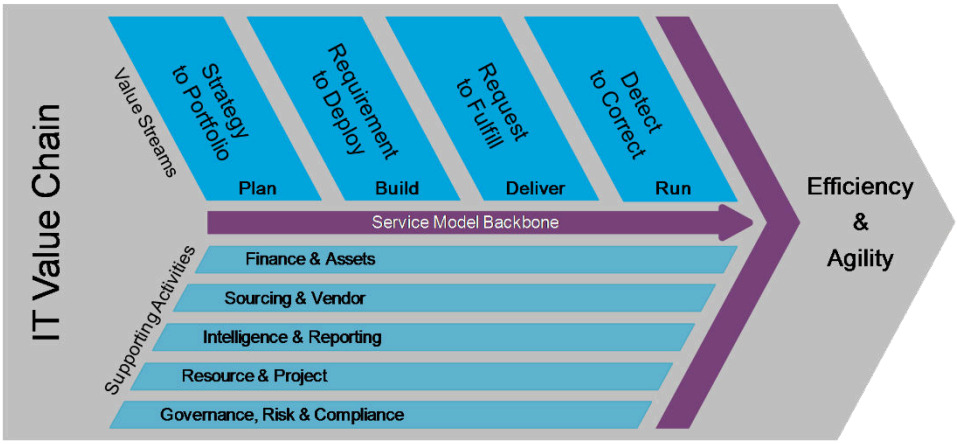

Fig. 1: IT Value chain and Service model ("backbone") of the IT4IT Reference Architecture [Th17b]

Starting from this high-level process representation IT4IT rapidly focusses on a combined functional, informational, service- and capability-based view. Key aspects of the value streams are described as follows: the service model, the essential data objects (information model), goals and capabilities, and functional components (functional model) that support the value stream. Functional components are integrated via well-defined interfaces (integration model) and thus, tie together the whole value chain.

The IT4IT reference architecture defines several levels of abstraction. This approach is similar to those used by eTOM [TM17] or ARIS [ID10]. Level 1 shows a high-level holistic view – the end-to-end overview of the IT value chain containing the four *plan-build-deliver-run* value streams (process model). The information, service and functional model have been defined at high-level as well, including service objects, data objects, functional components, and high-level relationships. Level 2 provides value stream documentation, including objectives, KPIs and capabilities. The focus shifts from high-level towards a more detailed integration model, e.g. relationships are updated with cardinality attributes. The concept of data flow between functional components is introduced at this level, too. Still vendor-independent, level 3 shifts further from general informational reference architecture to a more solution-based architecture. Data object definitions are being updated with more details and essential attributes. The user (solution architect) will be provided with the

capability of scenarios and essential services, the scenario being a "narrative that describes foreseeable interactions of user roles (or 'actors') and a system (or functional component)" [Th17b]. Example given; the architect may describe the implementation of system of records integrations using essential services to maintain the relationship between data objects [Th17b]. Levels 4 and 5 are vendor-specific and thus, controlled by suppliers of IT management products and services (e. g., Atlassian, ServiceNow, HP). The IT4IT model limits itself to some recommendations and example solution architectures.

4 IT4IT compared to classic EAFs

In this section, the results of applying the criteria shown in Tab. 1 to all three frameworks/standards are summarized. The valuation is based on the primary literature on the frameworks. Where interpretations were necessary, they were made based on the experiences of the authors. Comparing the different valuation allows for concluding on the relative position of IT4IT to the two classic EAF at the end of this article.

4.1 Valuation

Tab. 2: Valuation of the three standards

Criterion	**TOGAF**	**ARIS**	**IT4IT**
Scope	TOGAF is targeted at the "*'enterprise'* to be any collection of organizations that have common goals [. . .] encompassing all of its business activities and capabilities, information, and technology" [Th18]	Integrated information system of an enterprise from a business process perspective comprising function, data, organization and process view. The business related description level has priority over implementation issues [Sc99].	Addresses the IT operation model, thus its scope is limited to the IT domain of an enterprise, including any aspect of the business of IT. Since IT is essential to most business domains, IT4IT can be applied in those enterprises – no matter what business process is supported with IT. Enterprises with IT as core business may use IT4IT as basis of an (to be completed) EAF. IT4IT names but does not define enabling capabilities (e.g., financial and HR mgmt.).

Tab. 2: Valuation of the three standards

Criterion	**TOGAF**	**ARIS**	**IT4IT**
Goals	Optimizing business processes towards an integrated organization that is responsive to change and supportive of the business strategy. "Providing a strategic context for the evolution and reach of digital capability in response to the constantly changing needs of the business environment." [Th18]	Designing, analyzing, and optimizing business processes with an enterprise scope. Designing and implementing integrated enterprise systems to automate business processes.	IT organizations shall be enabled to "identify the activities that contribute to business competitiveness" [Th17b]. Introducing the IT value chain, IT4IT aims to align the IT value streams towards "efficiency and agility".
Design principles	Enterprise and architecture principles are defined in TOGAF standard part IV, concept of the enterprise continuum is defined in part V.	No explicit design principles are formulated in ARIS but can be reconstructed from the underlying business process theory: 1) process orientation with its focus on activities for creating customer value and 2) integration as the guiding principle for the design of process oriented enterprise systems. ARIS also incorporates explicit "generally accepted modeling principles" which aim to ensure the quality of individual models [Sc99].	Value-oriented: IT activities are aligned to value streams. Service-centric: IT value is delivered and managed as service/product following the service paradigm. Data driven: data entities are central elements in the architecture. Automation-focused: determination, automation, and integration of the IT toolchain for delivering IT services.
Views	Four *architecture domains*: - Business architecture - Data architecture - Application architecture - Technology architecture	ARIS views: - Function view - Organization view - Data view - Output view - Control / process view	IT4IT views: - Service model - Information model - Functional model - Integration model
Metamodel	Architecture Content Framework (content metamodel), defining e.g. entities and relationships.	Comprehensive metamodel in UML [Sc99].	Metamodel in Archimate & UML [Th17b]

Tab. 2: Valuation of the three standards

Criterion	**TOGAF**	**ARIS**	**IT4IT**
Method	ADM iterative process, starting with preliminary phase, and eight phases (A-H) surrounding the centric requirements management. Top-down evolution from generic architectures to organization specific solutions.	General procedural model for modeling business process oriented information systems as well as specific procedural models for implementing standard software / workflow systems and developing (object oriented) systems [Sc99].	No explicit method defined in the IT4IT model, may be used within the TOGAF ADM [Es18]
Terminology	TOGAF standard part I includes a full list of terms and definitions.	Related terms are defined in the publications by Scheer.	A full glossary with terms and definitions is provided. Some terms are explained in additional white papers, e.g. [BJ16].
Reference model	TOGAF's highly generic ADM can be complemented with architecture patterns [Bu09]. However, reference architectures and patterns are not included.	A full set of reference models is available for industrial enterprises [Sc94]. Although the latest revision dates from 1994 (1997 for German ed.) it still can provide support for today's enterprises.	IT4IT itself is designed as reference model to manage the business of IT.
Adaptivity	Framework or parts of it can be applied to any enterprise and situation, including digital transformation. Full enterprise scope leads to extensive, interdependent model sets which are difficult to oversee and maintain.	Framework or parts of it can be applied to any enterprise and situation, including digital transformation. Full enterprise scope leads to extensive, interdependent model sets which are difficult to oversee and maintain.	Reference architecture is idealized [TF17] and bound to the context IT operation model, specialized for digital transformation. Limited scope and reduced detail level facilitate changes.
Tool support	Many modern EAM tools provide TOGAF support, including ARIS Platform, Abacus, and LeanIX.	Originally introduced as ARIS Toolset in 1993. Later renamed to ARIS Platform and further developed until today.	No explicit support but may be implemented with EAM tools if modelling reference architectures is supported (e.g., ARIS Platform).

4.2 Positioning IT4IT

Through comparing IT4IT with classic EAFs, we intend to extend the understanding of the nature and characteristics of the new approach and its relations to existing concepts. Although IT4IT has structural and topical similarities to the two classic EAFs TOGAF and ARIS, its purpose and context of use are different. Other than classic EAFs, IT4IT includes and makes heavily use of the service perspective. Typical EAFs come to modelling business processes at some point, followed by determining the process' supporting IT artifacts. In contrast, IT4IT defines service entities with associated data entities and groups functional components around them. The Service Model Backbone integrates the service entities and their relationships on a conceptual data level "to ensure end-to-end traceability of a service from concept to instantiation and consumption" [Th17b]. This approach conforms to the concept of a service-oriented architecture (SOA) and follows the principles of cohesion and coupling. In fact, IT4IT's functional components encompass one service or data entity, no more than two. This is best practise object-oriented design: high cohesion and loose coupling. The integration model at level 1 follows the service perspective as well, leading to a component-based service architecture.

This way, IT4IT supports the implementation of a micro services architecture and further paves the way to automating the service lifecycle, especially for software intensive environments. When service delivery heavily depends on software or is completely implemented through software, more and more data is produced. Utilizing this growing amount of heterogeneous and fragmented data for monitoring and automation requires a means for understanding what data exists and how it is related to service delivery. IT4IT addresses this demand with its integrated view on services, functional components, and data entities. Other than common EAFs it also includes KPIs for the evaluation of the architecture management.

In their comparison of EAFs, it was stated by Urbaczewski & Mrdalj that „most if not all frameworks were weak in addressing the maintenance of an information system" [UM06]. Regarding IT4IT, we can assert the opposite: maintenance and operations are one of its strengths. However, this strength may also be considered a risk. The roots of IT4IT are in the IT operation model. Well-orchestrated, agile, and scalable IT services are essential to modern enterprises, and IT4IT gives them a reliable architecture. But setting the focus on IT4IT only and disregarding its connections to classic EAFs, e.g. in the context of financial management, an organization may erroneously replace or even reinvent existing standards. The strength seems only a strength, when IT4IT is combined to a common (and maybe already existing) EAF – providing the reference architecture for the business of IT, while the common EAF delivers a method and the overall picture. It has been shown, that IT4IT and TOGAF can work together. But how about other EAFs?

5 Conclusion

The main characteristic IT4IT has in common with TOGAF, ARIS and also other classic EAFs is its focus on architecture. Furthermore, several structural elements of classic EAFs also do exist in IT4IT (e.g., a metamodel, different views and a well-defined terminology), leading to a structural compatibility.

The main differences are the scope and the intended character of a reference model. While the enterprise-wide scope is part of the nature of an EAF, IT4IT's scope is limited to the IT organization of an enterprise. Only, when the business model of a company is based on providing IT services or IT products to external customers, IT4IT could serve as an enterprise-wide framework. Nevertheless, for non-IT companies, because of the structural compatibility, IT4IT can be integrated with an EAF already in use to further align IT to business with a focus on efficient and agile service delivery. Because of their close relationship, an integration of IT4IT into TOGAF does not encounter methodological problems. An example is described in [Es18]. For an integration in EAFs other than TOGAF things become more difficult. Since, for instance, ARIS' expressiveness is significant higher compared to IT4IT, a model mapping is required. Further research is required for creating and validating such IT4IT mappings. Proof of concept is needed to validate that IT4IT can be used alongside other EAFs than TOGAF.

The reference architecture character results from the normative description of how to manage IT as a business for improving efficiency and agility. Similar to other best practice frameworks originating from industry (e.g., ITIL or COBIT), IT4IT was developed from the professional experience of its creators. The model incorporates expert knowledge on a specific way of managing IT. Applying IT4IT means to follow this direction. In contrast, classic EAFs may include reference models but are not intended to be reference architectures themselves. Rather, they provide a method for designing an individual EA tailored to an individual enterprise. This implies more freedom of design on the one hand but also more effort of design on the other hand.

IT4IT includes no method and its scope is the business of IT. Thus, this reference architecture cannot replace common EAFs. Its position may be described as IT-related extension of a comprehensive EAF, one of its main advantages being the possibility to define a tooling (automation) strategy and creating IT-city planning models as well as roadmaps to evolve towards best practise IT toolchains.

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