EPiC Series in Computing

Volume 105, 2025, Pages 162–168

Proceedings of EUNIS 2024 annual congress in Athens

Guidelines and good practice on how to establish enterprise architecture management in higher education institutions

Andreas Hartmann[1*] and Markus von der Heyde[2+]
[1] HTWK Leipzig, Leipzig, Germany, [2] SemaLogic UG and vdH-IT, Weimar, Germany
*firstname.lastname@htwk-leipzig.de,
+firstname.lastname@semalogic.de

Abstract

The digital journey of higher education institutions is challenging. This community of practice paper summarises the main reasons for this. As a result, it not only suggests the adoption of enterprise methodologies but also explains how to do so. As many institutions are struggling to establish these methodologies and models, a set of comprehensive guidelines are compiled and motivated from the literature. General advice on how to establish new methodologies (e.g. getting management support) is left aside as it seems to be well-known and often repeated in the community. This paper addresses the specific challenges of implementing and sustaining enterprise architecture, with a primary focus set on Germany, as a driver and fundamental method for digital change in higher education.

Keywords: enterprise architecture management, higher education, good practice

1 Introduction & Motivation

Digital tools often work best in environments that are consistent, repetitive, and well understood. This is partly due to the nature of abstraction required in building these tools, which often necessitate a simplified model of the task at hand. However, the organisational structure and process variability in higher education institutions (HEIs) seem ill-suited for such models due to their exceptions, small batches, high variability, and reliance on human judgement. Despite this, HEIs have increasingly adopted digital tools for research, teaching, and learning. This raises a critical question: Are HEIs effectively navigating their digital transformation, or are they missing essential components for success?

[1] https://orcid.org/0000-0003-1340-5325
[2] https://orcid.org/0000-0002-6026-082X

Central to this discussion is data, the essence of digital ecosystems. The flow of consistent data is crucial to the success of digital workflows. Moreover, communication and data exchange within an institution's various segments hinge on a shared understanding of concepts and a general overview. A survey by von der Heyde (2022) revealed that over 80% of German HEIs lack a systematic overview of their IT in terms of a consistent architectural model. Furthermore, less than 20% of institutions utilise integration frameworks or middleware to facilitate data flow. This survey also found that more than two-thirds of all business functions are implemented without standardised interfaces, persistent data, or data quality assurance measures. The major deficit in transitioning to end-to-end digital processes in HEIs is the lack of interfaces between business functions and inconsistent data usage, as evidenced by the survey data from more than a third of all public universities in Germany.

Enterprise Architecture (EA) is a discipline focused on understanding, building, and maintaining data models and concepts for digitally implementing business capabilities. Gomes et al. (2020) highlight the effectiveness of EA methodologies in digital transformation within HEIs. However, maintaining an overview using EA methods and models is challenging, as noted in a university use case by Budde et al. (2023). However, Syynimaa (2017) summarises from the literature that approximately 70% of organisational change initiatives fail, which would include EA implementations. Questions arise as to why starting with EA is difficult, why applying EA methods can be challenging, and why some initiatives fail after a promising start. The Enterprise Architecture Adoption Method (EAAM) proposed by Syynimaa (2015) has been specifically designed for application in higher education.

In a survey conducted by Lethbridge & Alghamdi (2019) involving 70 enterprise architects from international universities, about two-thirds reported having an organisational model for EA to support ongoing work and maintain an established overview. However, a third of the respondents stated that the definition of EA as 'a discipline for proactively and holistically leading enterprise responses to disruptive forces' did not apply to their institutions.

In conclusion, only few HEIs are yet to fully engage in Enterprise Architecture Management (EAM), e.g. adopt and apply EA models such as the internationally recognized Higher Education Reference Modells (HERM). For those that have begun, challenges are evident. This indicates a clear need for improved guidance to help HEIs navigate the complexities of EAM. This paper aims to provide such guidelines, each backed with references for support. These guidelines have been developed through discussions in a national Special Interest Group (SIG) on EA in Germany, which provided valuable input from various perspectives. However, we believe that most aspects are generic and applicable to other countries starting to implement EA in their higher education landscape.

2 Guidelines

The different areas of recommendations and principles are structured as follows:

- EAM measures success
- EAM promotes collaboration
- EAM is compatible with universities
- EAM is an ongoing task with organisational implications
- EAM needs governance
- Enterprise Architects support projects
- EAM must start small
- EAM is teamwork
- EAM needs competences

Each statement is explained in more detail below and related to the existing literature specific to higher education institutions.

2.1 EAM measures success

EAM supports the entire organisation through change by making success transparent and measurable. EAM's holistic approach means that metrics from different perspectives and levels can be captured across organisational changes and monitored over time. For example, success in quality management, resource efficiency or collaboration can be measured over many years.

The lack of demonstrating the value of EA was one of the main challenges reported by participants in the Lethbridge & Alghamdi (2019) survey. The lack of awareness among leaders also highlighted the well-known need for leadership support for any new method or application of management frameworks in institutions.

The comparison of more than 120 universities was based on the HERM model in the national survey as described in von der Heyde (2022a). Scores from the EDUCAUSE Dx self-assessment were assessed along with digital maturity across all HERM business capabilities to illustrate relevant factors of digital change. As analysed in von der Heyde (2022c), the understanding of the participants differed significantly between the survey respondents.

Budde et al. (2023) proposed to use HERM to measure digital maturity within specific business capabilities, along selected data types and their handling within the organisation, or as a combination of both approaches. An implementation of this idea was demonstrated by who proposed a digital maturity index based on 11 simple closed-ended questions.

2.2 EAM promotes collaboration

Digitalisation leads to a strong networking of information flows. EA provides the management methods for this and presents the interrelationships consistently for the entire organisation. The greater the degree of networking, the greater the impact of EAM. At the same time, the understanding of EAM is continuously extended from a few specialists to the entire organisation. This is the basis for cooperation between several universities to benefit from a common reference model such as HERM. The standardised language makes it easier to identify similar tasks and solve them together.

In transferring Ross & Weills approach into the HE sector von der Heyde (2016) predicted a major influence of the communication along IT-Governance principles towards an EA approach for successful collaboration. This was later supported by an additional analysis of older survey data done by Gilch et al. (2019). According to von der Heyde (2022b) data from a survey of ⅓ of the German higher education landscape questions this positive impact. German university leaders attribute much less impact of the EAM to the success of collaboration than with most other standard frameworks (project management, stakeholder management, governance, IT service management, etc.).

Le Strat et al. (2022) note in this respect: “With increase of maturity working with capabilities will also lead to better adoption of more standardised models as insight to organisational information or data-literacy rises and creates much needed interoperability for sharing and consuming data”.

2.3 EAM is compatible with universities

EAM can be used to provide a coherent view across a complex organisation. For example, it can support the standardisation of different technologies. EAM can also be used to minimise the risks associated with changes and projects. Strategic alignment with EAM supports decision making within the organisation. This makes collaboration within the organisation and with other partners easier and more effective.

EAM is therefore well suited to universities and can be applied in any university. Internationally, there are many references and examples of EAM for universities, government and other public organisations. In addition to established EAM standards such as TOGAF, there is a proven reference

model for universities, the HERM. The combination of TOGAF and HERM provides a good introduction to architecture management.

Several studies have identified a wide use of reference architectures and models in the higher education sector. Sanchez-Puchol's (2018) review of reference and EA models classified 20 existing approaches according to their scope, structure and content, and practical usage. Lethbridge & Alghamdi (2019) conducted a survey on the use of EA in HE among 70 enterprise architects from 19 countries, including 5 from the EU and Switzerland. Gomes et al. (2020) provided detailed methodological advice on how to apply EAM in HEIs. However, their description was based on expert knowledge of EAM methodologies and therefore poses a challenge to anyone starting to explore the topic.

2.4 EAM is an ongoing task with organisational implications

EAM continuously models a holistic enterprise architecture as an ongoing task. It encompasses the entire organisation to enable sustainable improvements. The impact of local changes becomes visible for the entire organisation. Improvement potential arises from the alignment of data, IT and processes, making it easier to motivate, identify and plan changes to the structure and processes of the institution.

Ferrell et al. (2022) note: “In short, the digital transformation of the higher education sector is complex and there is a need for a holistic understanding, something that we believe might be supported by HERM.”

2.5 EAM needs governance

In addition to strategy, infrastructure, applications, and project prioritisation, IT governance also includes architecture. In universities, this has rarely been explicitly regulated by decision-making structures and integrated into a structured flow of information. However, architecture management is an important link between strategy and operations.

In addition, successful architecture management supports governance by providing information for decision making. EAM is most effective when decisions are made in the context of the whole organisation.

One of the five decision areas of IT governance relates to IT architecture (Weill & Ross, 2004), as this was the common name for enterprise architecture at the time. According to additional suggestions by Ross, Weill, & Robertson (2006), enterprise architecture governance is highly relevant to the overall digital maturity of the organisation and its ability to execute a digital strategy. According to von der Heyde & Breiter (2015), both the use of IT governance and the use of EAM frameworks were both below 10% in a national survey of higher education institutions in Germany. This may explain why, in the later survey (von der Heyde, 2022b,c), participants were not yet aware of the impact of EAM on collaboration.

2.6 Enterprise Architects support projects

EAM provides valuable information for the whole organisation. In particular, projects and change initiatives benefit from the holistic view, e.g. by minimising risk. Due to the availability of consistent information from EAM, the enterprise architects working there are often operationally involved in projects. However, they should be prepared to respond promptly to queries from projects and processes and provide the necessary information. Some of the core tasks of the Enterprise Architect are to define and evaluate standards and make them usable for the organisation.

Again, Lethbridge & Alghamdi (2019) report in their survey result of the 70 enterprise architects the strongest agreement on the primary goal of EA in their institutions: Aligning projects with goals.

2.7 EAM must start small

EAM is a model for the whole organisation. However, successful implementation does not take place as an "EA project", but in the context of many other projects. Therefore, the level of detail required, i.e. the level and depth of modelling, varies from project to project. Complete modelling of the university at a high level of detail will inevitably fail due to complexity and timeliness, as reality changes faster than the models can initially be maintained.

An attempt should therefore be made to link EAM to specific projects. For example, in the area of the student life cycle, this could be the design of a digital curriculum; in the area of research, it could be the design of an integrated research proposal management system or the organisation of a multifunctional card for administrative services. Through an iterative approach, each project adds another piece to the puzzle and the EA repository becomes more powerful and meaningful with each project.

Le Strat et al. (2022) note: “Stop modelling the models – start filling them with your organisational data and communicate the outcome to validate the current state of your organisation”.

In von der Heyde & Hartmann (2023), the digital curriculum lifecycle is evaluated in conjunction with the student lifecycle based on HERM to demonstrate how a network of value streams guides the digital transformation of teaching and learning. This approach is also highlighted by von der Heyde et al. (2023) in their application of AI to the study regulation lifecycle. The impact of a common digital format for study regulations is motivated by use cases in different areas of the university.

2.8 EAM is teamwork

EAM is a task performed by several people. There are one or more enterprise architects who focus on the methodology, reference models and answering key questions for the whole organisation. They are supported by local architects in individual departments or projects. In addition, many people from the operational areas are involved to keep the information up to date.

In the survey by Lethbridge & Alghamdi (2019) the institutions which had established an organisational structure also had an EA team with 2 or more people.

2.9 EAM needs competences

Enterprise architects need to work at a high level of abstraction and with networked information. They need to be familiar with common standards, reference models and metrics. At the same time, they need excellent communication skills and a strong understanding of both IT and the business.

Recruiting qualified staff is a challenge for all areas of universities. First and foremost, this means that all architects have to be recruited from within their own ranks and then qualified through further training. A major advantage is that these people are already familiar with the university organisation.

According to Syynimaa (2017), the biggest challenge in the process of EA adoption is the lack of competence. Therefore, the proposed process of "explaining the benefits of enterprise architecture, getting the mandate, organising enterprise architecture training, and implementing enterprise architecture adoption" includes specialised training, which is mainly aimed at reducing institutional resistance to change.

In their survey, Lethbridge & Alghamdi (2019) report on the required skills of enterprise architects in HEIs. In addition to general communication skills and expertise in EAM methodologies, a deep understanding of the nature and mission of HEIs is considered important.

3 Summary

The paper delves into the integration and efficacy of Enterprise Architecture Management (EAM) within higher education institutions (HEIs), presenting a series of fundamental principles that are critical for its successful implementation.

At its core, the paper asserts that EAM is not only compatible with the unique environment of universities but is also essential for their digital transformation. This compatibility is anchored in the principle that EAM must begin on a modest scale, advocating for incremental implementation rather than large-scale, disruptive changes. This approach allows for more manageable adaptation within the complex structures of HEIs.

Moreover, the paper emphasises the enduring nature of EAM, highlighting it as a continuous task with wide-ranging, holistic effects. This ongoing process underscores the importance of collaboration and teamwork, as the successful integration of EAM into HEIs relies heavily on collective efforts across various departments and institutions.

The need for specific competencies and robust governance structures is also a focal point. These elements are vital in ensuring that EAM initiatives are well-guided and effective, and they play a critical role in facilitating the alignment of IT strategies with the broader institutional goals.

Additionally, the paper discusses the symbiotic relationship between architects and project managers within HEIs. This relationship is crucial in ensuring that the architectural vision aligns with project execution, thereby enhancing efficiency and coherence in achieving institutional objectives.

The ability of EAM to measure success is another key benefit explored. This measurement is critical in evaluating the impact of EAM initiatives and in guiding continuous improvement. The paper also highlights how EAM fosters greater collaboration within and between HEIs, leading to shared learning and innovation.

In summary, the paper provides a comprehensive analysis of how EAM can be effectively integrated into the higher education sector. It underscores the importance of starting small, emphasises the ongoing nature of EAM, and highlights the necessity of teamwork, competencies, governance, and collaboration. By doing so, it offers valuable insights into how HEIs can navigate their digital transformation journey more effectively.

4 Acknowledgements and resources

The valuable feedback from the national Special Interest Group on Enterprise Architecture Management at German universities was greatly appreciated in the writing of this paper.

This article was written using ChatGPT 4.0, Deep-L and Google Doc as of Jan 2024. The statements and wording have been carefully checked to ensure that they are objective and understandable. The authors take full responsibility for the content.

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