Current Challenges and Opportunities in Enterprise Architecture: Insights from 950 + LeanIX Customers

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Abstract. Data-driven architecture is a new paradigm promoted by LeanIX that focuses on making Enterprise Architecture accessible to a wider audience of stakeholders in organizations, to increase data quality and provide transparency when undergoing organizational transformations. This democratization of Enterprise Architecture allows organizations to transform faster and take advantage of trends such as the API Economy, Software-as-a-Service, and Citizen Developers with low-code applications. From this perspective, in this paper, we present the most common challenges that organizations face in their Enterprise Architecture practice due to siloed information and lack of communication between stakeholders. Furthermore, using tools like Excel and PowerPoint to manage the architecture poses challenges due to obsolete data, inability to create meaningful analyses and having multiple sources of truth. In the case of C&A, Helvetia and Marc O'Polo we present how having a modern data-driven Enterprise Architecture has helped these organizations with addressing their challenges and transforming quickly. Finally, we present our ideas on avenues for advancing the field of Enterprise Architecture from a research and practice perspective.

Keywords: Data-driven Enterprise Architecture · Enterprise Architecture challenges · Enterprise Architecture opportunities

1 From Model-Driven Enterprise Architecture for Experts to Data-Driven Enterprise Architecture for All Stakeholders

1.1 The Vision Behind Data-Driven Enterprise Architecture

Enterprise Architecture (EA) is a discipline that aims to help organizations better understand their current IT and process landscape and to provide guidance on how to reach and maintain their desired future state. Traditionally, EA has been a model-driven discipline intended mostly for technical experts who work with modelling languages, such as ArchiMate. However, in the past decade, there has been a paradigm shift from model-driven to data-driven EA, led by tools such as LeanIX.

At the core of the LeanIX philosophy is that EA should extend beyond being solely the domain of technical experts, and instead be accessible and comprehensible for all

members of an organization. We believe that the artifacts produced by EA are not only relevant to the EA team but can also be of immense value to all members of the organization, including subject matter experts. By leveraging their expertise, these stakeholders can contribute to the development of a more comprehensive and holistic EA, which can improve the quality of decisions made and ensure that the organization is well-positioned to address future challenges. Additionally, these stakeholders can also benefit directly from the EA artifacts as they provide valuable insights into the organization's operations, capabilities, and dependencies. For instance, stakeholders such as end-users may offer perspectives on user experience or system usability, which could be vital for shaping EA decisions. Emphasizing the inclusion of non-technical stakeholders as sources of valuable information may ultimately lead to a more comprehensive and effective EA practice.

One of the key collaborators of EA practitioners are the members of the procurement team, particularly when procuring software as a service (SaaS) applications. In our experience, many organizations lack visibility into their SaaS licenses and usage, as it is easy for individuals to purchase SaaS applications with a credit card, without the knowledge or oversight of the IT department. We believe that it is crucial for EA practitioners to be involved in the procurement process, assess license and usage information, and identify opportunities to reduce costs and minimize redundant applications.

Moreover, we have observed a trend among organizations, including more traditional organizations like governmental agencies, to develop their own applications through low-code solutions or by having an in-house software development team. As such, it is becoming increasingly essential for EA practitioners to have a broad understanding of these initiatives, how they fit into the overall architecture of the organization, and their impact. By expanding the scope of EA to encompass adjacent fields, EA practitioners can develop more comprehensive, effective EA practices.

1.2   The Democratization of Enterprise Architecture

Due to the importance of collaboration between EA practitioners and other stakeholders, as also emphasized by Gregor Hohpe [1], effective communication is essential for gathering data from diverse sources and achieving a comprehensive understanding of an organization's operations. Furthermore, we believe that EA practitioners should be able to convey complex technical information in a language that is understandable to non-technical stakeholders. By fostering clear and effective communication between stakeholders, EA practitioners can more effectively align IT systems with broader organizational goals and objectives. To facilitate this democratization of EA, we consider several aspects to be important for organizations.

Simplified Metamodel that can be Easily Adopted. While metamodels provided by frameworks such as ArchiMate and TOGAF are very comprehensive and expressive, a simplified EA metamodel that supports the core aspects of EA[1] leads to easier adoption within organizations. Furthermore, we have noticed this also leads to adoption by a

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[1] The LeanIX metamodel contains 11 concepts that are aligned with TOGAF and ArchiMate, and cover Strategy and Transformation, Business Architecture, Application Architecture, Technology Architecture: https://docs-eam.leanix.net/docs/meta-model.

more extensive range of stakeholders, as seen in some cases where our customers have thousands of stakeholders utilizing EA information on a monthly basis.

Visualizations that are Easy to Understand by all Stakeholders. To support effective communication about EA, visualizations and analyses that can be understood by diverse audiences are key. For example, automatically generated reports that can be easily customized and produced on demand based on data from a central repository can be used by both EA practitioners and business stakeholders to answer questions, such as "What Applications support the organization's Business Capabilities?" and "How much do these Business Capabilities cost?". However, the level of detail needed by more technical stakeholders, such as solution architects, should not be lost. By providing options for drill-downs and diagrams to show the dependencies of architectural elements, more technical stakeholders can (re-)design certain parts of the EA in more detail.

Data Governance and Enterprise-Wide Collaboration Practices. Collaboration is an essential part of data governance for EA, especially for larger organizations. By fostering collaboration, EA teams can ensure that they have access to the necessary data from all relevant sources to make informed decisions. This leads to a more holistic approach to data governance, where everyone plays a role in maintaining data quality and accuracy.

Integration with Specialized Tools and Open APIs. EA practitioners require data from different sources to ensure that they have a holistic overview of the architecture. Thus, integrating data from different sources is critical to their ability to make informed de-cisions and ultimately contribute to the success of the organization. However, it is not sufficient to have data manually maintained in Excel spreadsheets or similar tools, but rather it is necessary to have real-time integrations that enable EA practitioners to per-form accurate and timely analyses.

2   Current Challenges in the Enterprise Architecture Practice

2.1   Trends Impacting the Enterprise Architecture Practice

One of the main challenges that organizations face in their EA practice is the increased pace of organizational transformations. In the past, organizations planned for long cycles (e.g., a year or more) of transformation with only one significant transformational project in scope. However, current insights gathered from our customers show that many organizations now undergo 10 to 20 significant transformations every year. As a result, EA cannot be viewed as a one-time project, but rather as a continuous process (Fig. 1).

There are several major trends that fuel the transition to a continuous transformation of the EA landscape, namely the API Economy, Software-as-a-Service (SaaS), and the Citizen Developer.

API Economy. It refers to the growing trend of businesses utilizing Application Programming Interfaces (APIs) to connect different systems and enable data exchange between them. This results in increased complexity for organizations in terms of
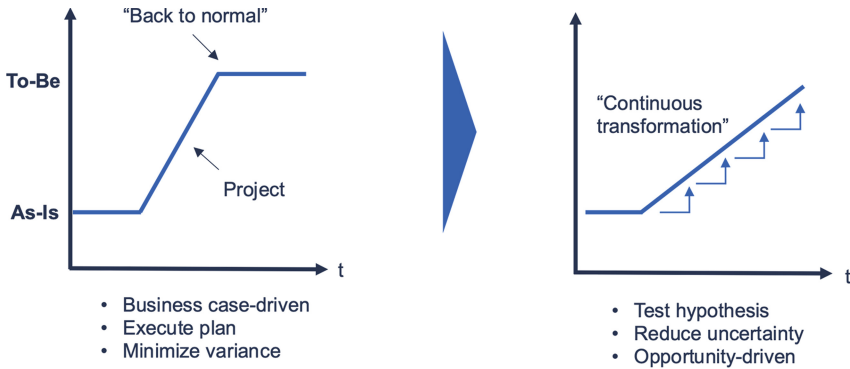
Fig. 1. From long-term single big transformations to continuous transformation of the organizational landscape.

integrating their current application landscape with other applications from their environment.

Software-as-A-Service. The Trend to Transition to the Cloud is One of the Most Influential Factors Affecting the EA Practice. Many Companies View Cloud Solutions as an Easy Way to Modernize Their Landscape and to Eliminate Obsolete Technology that Poses a Lot of Threats. However, Some Industries Have Restrictions that Prevent the Usage of SaaS Applications, Such as the Defense Industry, Due to Regulatory Compliance Factors and Data Security.

Citizen Developer. Another trend that is driving rapid transformation in the EA practice is the increasing adoption of no-code or low-code tools, such as Microsoft Power Apps, Mendix, etc. These tools allow organizations to quickly create applications for specific use cases without needing a full suite of development tools. For instance, a logistics company may create an app that enables warehouse workers to log completed tasks. The data generated from the app can be fed into a central database and analyzed for insights. These types of tools are enabling organizations to rapidly address specific business needs and drive innovation.

2.2   Current Challenges Faced by Organizations

The challenges experienced by companies in implementing an effective EA practice are numerous and varied. Our experience with companies has revealed some common challenges, as follows:

- Many organizations lack a proper EA practice and are relying on information about EA from various stakeholders, represented uniquely using different tools, and stored in multiple repositories. Tools such as Excel spreadsheets, Visio diagrams, and PowerPoint presentations house EA data in different formats, and often those systems are not integrated. This results in siloed information, making it difficult for enterprise architects to easily access EA information required to consistently make informed decisions.

- The process of gathering data for the purpose of producing EA reports is time-consuming, with some organizations taking weeks or months just to do so. These lengthy timeframes make it nearly impossible to produce timely reports on a regular basis (e.g., quarterly). Without EA data that is constantly maintained, the information used to develop reports is often outdated, and worse inaccurate.
- The burden of gathering data often falls on enterprise architects, leaving them with little time to focus on value-adding activities, such as application rationalization, cost-saving initiatives, and innovation.
- Collaboration is also an issue, with enterprise architects often working in isolation and not collaborating effectively with other members of the organization. We have seen instances where enterprise architects have struggled to obtain data from other departments, leading to delays in implementing EA initiatives.
- There is also a lack of alignment between the EA practice and the business, with the latter often making technology-related decisions without consulting the former, especially in the case of purchasing SaaS applications. This can result in unknown risks for the IT department, such as the acquisition of unapproved technology or applications. To cite an example, as part of our work with organizations, we ask them to estimate the number of applications they currently have in their landscape, including SaaS, on-premise, and self-developed applications. Estimating this number can be challenging for many organizations as there is often no centralized repository. This becomes even more difficult for larger organizations that are divided into different entities that operate in silos, resulting in a lack of visibility and transparency that can lead to what is commonly known as Shadow I.T. or Business Managed I.T. This lack of alignment can have significant adverse impacts to an organization, including technology risk, unnecessary costs, and lack of effective tools to support the business operations.

2.3 Maturity Level of the Enterprise Architecture Practice

The maturity level of EA practices varies across organizations. It is noteworthy that many organizations are still quite immature in their approach. In countries like the Netherlands and France, organizations tend to use established EA frameworks such as TOGAF and ArchiMate, as well as reference architectures. However, in other countries, we observe that even large organizations with thousands of employees and hundreds of applications lack an EA practice. Instead, they rely on tools such as Excel, Visio, and PowerPoint, which are not designed for the specific requirements of EA practices. We consider this to the first level of maturity for EA practices, as seen in Fig. 2.

Although many organizations are at the second level of maturity, where they use software tools like LeanIX to manage their EA, integrating data from different systems to create a single source of truth for EA is still a challenge for many. However, for organizations that have a solid foundation for their EA, with data aggregated from different sources, it becomes easier to transform their EA practice to be more business outcome driven and plan the transformation of their landscape accordingly.

While it may seem that having an established EA practice and using software tools for management can indicate the highest level of EA maturity, this is not always the case.
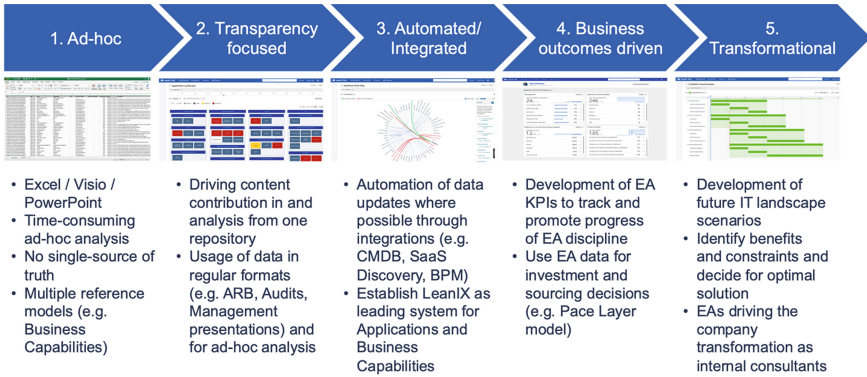
Fig. 2. The maturity levels of the Enterprise Architecture practice.

Without a strong foundation of accessible data, and consistent collaboration with stakeholders throughout the organization, such companies encounter obstacles in transforming their landscape and proving the business value of their EA practice.

3 Success Stories: Solving Enterprise Architecture Challenges with LeanIX

3.1 Defining the Use Cases

When working with an organization to address their EA challenges, it is imperative to first understand their specific problems and needs. To achieve this, we utilize Use Cases that help us relate to their unique issues and provide them with appropriate advice and support. Use cases are often used in the field of EA to better understand the needs and goals of an organization, and to help guide the selection and implementation of technology solutions. They can also be used to communicate these needs and goals to stakeholders within the organization, keeping all parties aligned, and in support of the organization's technology strategy.

One example of a Use Case is Application Portfolio Analysis, which is crucial for organizations starting out in their EA journey. In this case, the focus is on consolidating all applications into a single EA software tool for different types of analysis, such as Functional and Technical Fit, Business Criticality, Cost, Obsolescence Risk, Dependency to other elements in the architecture, etc. Once this is achieved, the next step is Application Rationalization to reduce costs and improve the overall landscape, or to define migration plans to the cloud for greater agility and scalability.

Use Cases are not only useful in understanding problems but also help in suggesting appropriate analysis and visualization techniques that can be shared with different members within the organization. These use cases are also relevant for different stakeholders within the organization, such as enterprise architects, business analysts, solution architects, etc. By understanding these specific needs, we can provide targeted support to help organizations achieve their EA goals.

3.2   IT Modernization at C and A

We conduct regular surveys with our customers to understand the needs and focus areas relating to their EA practice. In a recent survey, we have asked our customers "What should be IT's top priority in 2022?" (Fig. 3). From the 141 responses received, it can be seen that Reducing tech debt / Upgrading their legacy systems is the highest priority. These results are not surprising as many organizations are still using outdated technology and systems. Additionally, the second most common need was migrating to the cloud, which is closely related to legacy system upgrades. Upgrading legacy systems often involves moving to newer cloud-based solutions, which can offer better functionality and scalability compared to on-premise systems. These survey results highlight the importance of modernizing IT systems to keep up with changing technology trends and business needs.
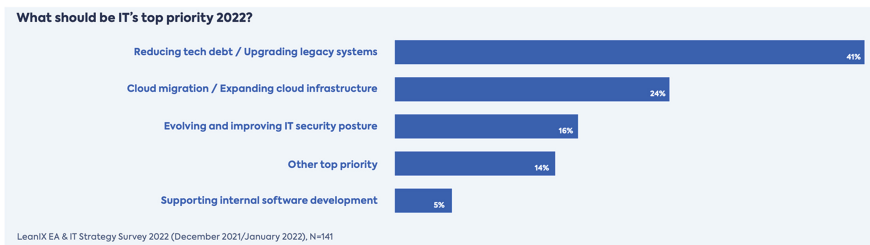
What should be IT's top priority 2022?

Reducing tech debt / Upgrading legacy systems	41%
Cloud migration / Expanding cloud infrastructure	24%
Evolving and improving IT security posture	16%
Other top priority	14%
Supporting internal software development	5%

LeanIX EA & IT Strategy Survey 2022 (December 2021/January 2022), N=141

Fig. 3. Results of the survey on top IT priorities for 2022 [2].

C&A is a global retail organization that faced challenges with their IT landscape, which included multiple stores in several countries with complex legacy systems and databases. They used various tools such as Excel, Visio, and PowerPoint for documenting and managing their IT landscape before they realized that it was unsustainable in the long run. Therefore, C&A decided to transition to an omnichannel strategy to compete with other retailers but realized that their current IT landscape was too complex for this strategy.

Their primary goal was to find vendors that provided applications and technologies that were easily configurable for their specific needs in order to replace their legacy landscape. Furthermore, other key requirements included ensuring transparency and accountability in their IT services, avoidance of a siloed organization, help identify redundancies, and reduce costs.

To achieve these goals, they created an EA board, and required the EA team to report to that board. One of their main challenges was collecting the necessary EA data, as it was scattered across different locations with only a subset of essential stakeholders involved. C&A overcame these obstacles by extending the scope of the EA transformation project to the entire organization and ensuring that every employee had access to the information.

With the help of LeanIX, the EA team at C&A managed to easily create monthly reports for the EA board and defined principles for selecting technology vendors and tools, which included criteria related to the impact on the architecture (e.g.: Homegrown or commercial-of-the-shelf software?). Additionally, another important aspect was to

analyze the flow of data through the EA landscape. This involved a determination of current integrations as well as development of a plan to extend their integration landscape in the future. C&A recognizes that having this information about their complete integration architecture is essential to determine the complexity of replacing an application in the landscape.
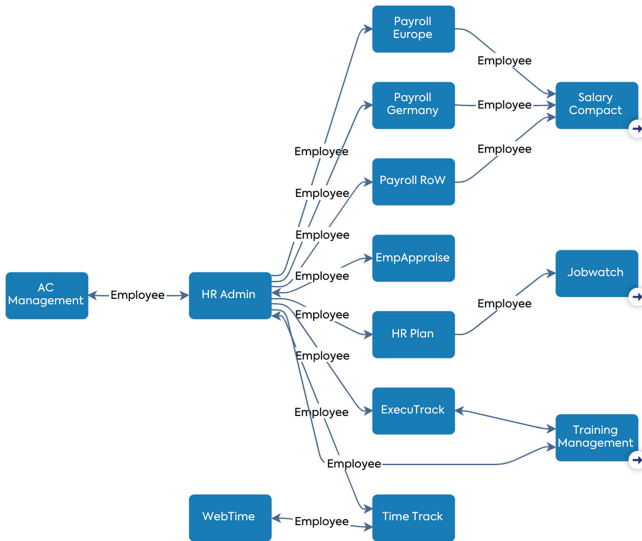

Fig. 4. Data Flow diagram showing how Employee data is exchanged between applications[2].

Figure 4 shows an example of how the flow of data between applications can be visualized and analyzed. Here we see that the HR Admin application is heavily integrated with other applications in the landscape. Therefore, replacing it, while also ensuring no data loss or service disruption, would be a comprehensive and complex task.

This case study highlights the challenges many organizations face when it comes to modernizing their IT landscape. C&A's experience is not unique to the retail sector, and we frequently see similar challenges in other industries. More information about the C&A case is available on the LeanIX website [3].

3.3 Post-Merger Integration at Helvetia

In another one of our customer surveys we have asked organizations how many Merger and Acquisitions (M&A) they perform in a year. The results, which can be seen on the left side of Fig. 5, are quite surprising. Almost 40% of the respondents said that their organizations have at least one M&A and one Carve-out per year. From our experience working with customers, these numbers can be as high as five M&As and/or Carve-outs per year. For these organizations, it is imperative to be very agile in their assimilation of new entities.

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[2] This is example data and not data from C&A.

M&As require transparency into the organization's landscape to ensure a seamless integration of the acquired company's systems and applications (as seen in Fig. 5). This involves rationalizing the organization's existing applications and identifying any duplicates across the two entities. Moreover, it's essential to establish a clear target landscape for the newly integrated company, outlining the desired state of the organization's technology infrastructure. This process ensures that the M&A activities are carried out smoothly and with minimal disruptions.
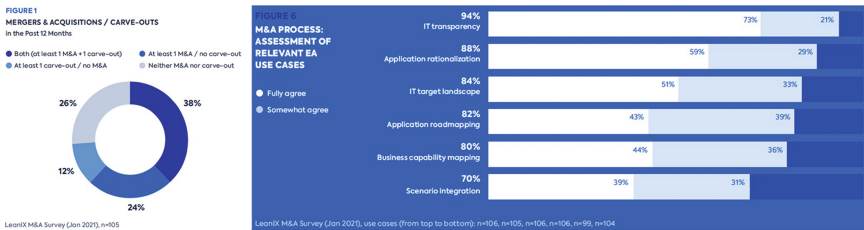

Fig. 5. Number of M&A/Carve-outs per year and aspects that are important for success [4].

Helvetia is a large insurance company based in Switzerland, which merged with Nationale Suise in 2014 to achieve economies of scale and strengthen their position in the market. The management team at Helvetia was keen to explore opportunities within the new landscape and identify areas of synergy. They also needed to assess the current risk profile, especially given the high level of data sensitivity being exchanged throughout the EA landscapes of insurance and banking organizations. Their primary goal was to ensure that their customers did not face any inconvenience during the merger process, and for that, they needed to combine the landscapes of both entities effectively.

However, merging two different landscapes is not an easy task, even if they have the same business processes but use completely different supporting technologies. To tackle this issue, Helvetia used the Atlassian platform, namely Confluence and Jira. They used Confluence to post information about the transformation process within the organization. By embedding LeanIX reports and diagrams, up-to-date information on the transformation was available for the whole organization, which insured the transparency of the process. In addition, they also used Jira to manage tickets regarding the migration process from one application to another. They imported data into LeanIX and created heatmap reports, which provided an overview of the transformation process in relation to different projects, objectives, and the architecture itself.

Before starting this migration, it was essential for Helvetia to analyze all business units from both entities and identify the differences between the applications they used to support the same processes and capabilities. This analysis was critical for the rationalization part of the post-merger integration process, where they would merge the two landscapes. Up-to-date and on-demand analysis and reports were necessary to ensure they had a clear overview of the process.

One of the main reports that Helvetia used was the Application Matrix report, where applications are analyzed in relation to the business capabilities and/or processes they support as well as the business entities that use them. This report allowed them to assess

where duplicates from the two entities existed in the landscape, and was the start of their Application Rationalization process.

⌄ Customer Relationship			
After Sales Service	Customer Service	Opportunity, Order & S...	Retention & Loyalty Pro...
Australia			
Mailsnake	CustEchoe Europe	salesforce Light	Bonus Card Asia/Pacif...
	issueTrack		Bonus Card Use Watch
Brazil			
Mailsnake		salesforce Light	Bonus Card Americas
France			
	Call Center Managem...	salesforce Light	Bonus Card Europe
	issueTrack		Bonus Card Use Watch
> Headquarter			
	Call Center Managem...	salesforce Light	
Italy			
	CustEchoe Europe		Bonus Card Use Watch
Poland			
	issueTrack		Bonus Card Europe
Spain			
Mailsnake	CustEchoe Europe	salesforce Light	
USA			
Mailsnake	issueTrack		Bonus Card Americas
			Bonus Card Europe
			Bonus Card Use Watch

Fig. 6. Example of an Application Matrix showing the applications used by the different business units of an organization[3].

Figure 6 shows an example of the applications that support an organization's Customer Relationship capability, and the differences between which applications are used by its business units. For instance, it is noticeable that there is quite a bit of variation in the applications used by different business units for Customer Service. This provides a good baseline for the Application Rationalization process.

Overall, mergers and acquisitions are complex processes that require careful planning, coordination, and execution. With the help of LeanIX, Helvetia was able to streamline their transformation process and ensure that their customers did not face any inconvenience. More information about the Helvetia case is available on the LeanIX website [5].

3.4   SAP S4/HANA Transformation at Marc O'Polo

Another common Use Case for companies is the implementation of big systems like Enterprise Resource Planning (ERP) system. In Europe, many organizations use SAP, while in the United States, Oracle is the most used ERP system. However, regardless of the specific system, many organizations are faced with the challenge of moving from a legacy ERP system to a new one. It's important to note that in many cases, organizations don't have just one ERP system, but rather multiple systems that are not well integrated with each other (see Fig. 7). This lack of integration can create obstacles for the implementation of a new system and highlights the need for proper application portfolio management and integration strategy.

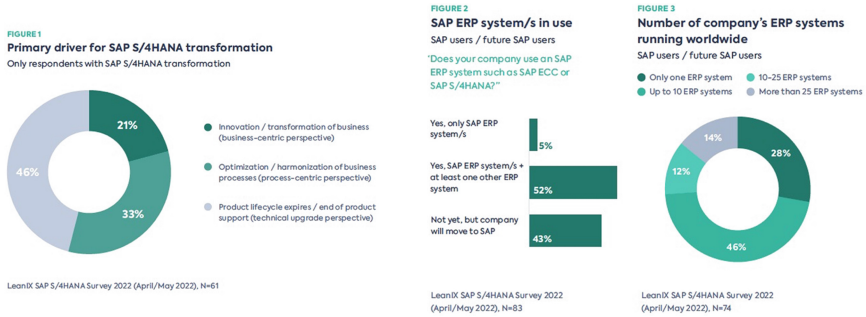[3] This is example data and not data from Helvetia.

Fig. 7. Number of ERP systems in use and the main driver for the SAP S4/HAHA transformation [6].

Marc O'Polo, a global fashion brand and retailer, faced a different problem compared to C&A. They had been using localized ERP systems, which they realized was not an efficient solution. As a result, they decided to move to SAP S4/HANA, which required them to transform their entire architecture. This is a common problem faced by many companies undergoing ERP transformations.

The old and new systems needed to work in tandem for a long time to ensure that there was no loss of service or data, which could cause the organization to a loss of revenue and reputation due to customers being unhappy with the disruption. The two critical parts of the transformation were maintaining employee involvement and motivation and completing the project within two years. The employee involvement and motivation were crucial because this was an intensive project, and the employees had to be retrained and work with two different systems at the same time.

To stick to the two-year deadline, the company had to be able to quickly import data about their EA in LeanIX and onboard 80 employees. The most important aspect that made this complex transformation a success was the collaboration between the business and IT teams, which was made possible by having transparency of information presented in easy to use and understand reports and diagrams.

One of the reports that help plan such complex transformations is the Project Roadmap, where organizations can see the dependencies between projects and also do a drill down to the affected applications and technologies. Figure 8 shows a Project landscape with transformations related to the implementation of the SAP S4/HANA system and the impact on the current application landscape.

One interesting aspect of this transformation was that Green IT was a priority for Marc O'Polo. They were very conscious of their carbon footprint and considered IT within the scope of their sustainability strategy. Green IT not only helps reduce an organization's carbon footprint, but it also has several other benefits such as reduced energy consumption, cost savings, improved reputation, and compliance with regulations. By integrating green IT principles into their EA, organizations can ensure that their IT systems and infrastructure are designed with sustainability in mind. This can involve using energy-efficient hardware, virtualization, cloud computing, and other technologies that help reduce energy consumption and carbon emissions. As sustainability continues to be
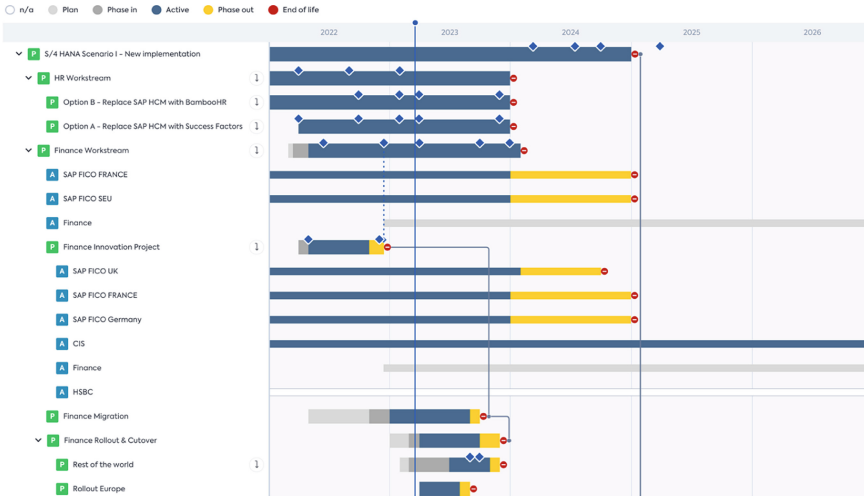
Fig. 8. Project Roadmap with SAP S4/HANA related projects[4].

a critical concern for businesses, incorporating green IT into EA will become increasingly important for organizations to remain competitive and socially responsible. More information about the Marc O'Polo case is available on the LeanIX website [7].

4 Advancing the Field of Enterprise Architecture: Opportunities for Research and Practice

4.1 IT Sustainability as a Key Priority

One emerging topic in the field of EA is sustainability. This is not just an environmental issue, but it is also becoming a business imperative. As a result, there are many opportunities for research and practice in this area.

One of the key findings from a recent survey of 128 respondents is that companies are starting to consider sustainability also from an IT perspective [2]. However, there is still a long way to go. A major issue is that IT is often overlooked when it comes to sustainability. This is partly due to a lack of understanding about what IT can do to help companies become more sustainable.

For example, a survey from Capgemini found that only 40% of companies knew their CO2 footprint [8]. This indicates that many companies are not even aware of the environmental impact of their IT operations. Furthermore, less than 20% of companies had a formal sustainability strategy in place.

In order to achieve sustainability goals within an organization, there are several questions that can be asked to guide the implementation process. For example, "Which capabilities are essential to achieve the sustainability goals within your organization?" and "How do you actually implement these capabilities within your organization from

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[4] This is example data and not data from Marc O'Polo.

the point of view of your architecture?". From the perspective of the architecture, this may involve looking at the current architecture and identifying areas where it can be optimized. This could involve rationalizing applications to remove duplication and reduce resource consumption, developing a migration strategy to move to more sustainable technologies such as cloud-based solutions, avoiding having SaaS licenses for applications that are only used by a few people, or even improving code efficiency for self-developed software.

Given the importance of this topic, there is a clear need for more research and guidelines for practitioners in the area of sustainability and IT. For LeanIX, as an EA software tool vendor, there is also an opportunity to help companies become more aware of their environmental impact and to provide them with the tools and resources they need to become more sustainable [9]. Ultimately, this will not only benefit the environment, but also the long-term success of businesses.

4.2   Better (Automated) Risk and Security Analyses

The field of risk and security is not a new concept, and many organizations are increasingly interested in supporting security frameworks and improving risk and security analyses, particularly with more automated approaches. In a recent survey we performed, 72% of respondents stated that improving their risk assessment capabilities is a priority for them [2]. While previous attempts have been made in this regard [10], there is still significant room for improvement in these areas, highlighting the need for more advanced and automated risk and security analyses.

4.3   Artificial Intelligence and Machine Learning for Enterprise Architecture

Artificial Intelligence (AI) and Machine Learning (ML) are increasingly shaping the field of EA, as architects are required to transform the EA of their organizations to accommodate internal initiatives involving data science practices. For example, enterprise architects need to ensure that the organization has the necessary infrastructure and systems to handle the volume, variety, and velocity of data generated by data science initiatives. Additionally, they need to ensure that these tools and technologies are integrated with the organization's existing systems and applications to enable seamless data flow and processing.

An interesting avenue to explore is how AI and ML can be used to improve the modeling and analysis of EA models. For example, analyzing the current architecture, identifying modeling patterns and making recommendations for specific improvements, or making suggestions while modeling to adhere to certain modeling principles that the organization is using. Additionally, AI and ML can be used to create documentation for EA models and to interrogate models in a conversational manner by non-experts, similar to how the Generative Pre-trained Transformer models from OpenAI can be used for text [11].

One possible avenue is exploring how these technologies can help improve modeling within EA, including identifying new design patterns and suggesting design solutions for specific situations. This is an area that requires further exploration, and discussions

are needed to generate insights and recommendations that can help advance the field of EA.

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