

Evaluating IT landscape agility

Graduation project
MSc Strategic Product Design

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July 2024

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Master thesis

MSc Strategic Product Design

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EXECUTIVE SUMMARY

During the last decades, many organizations have gone through or attempted to go through digital transformations to create value for their customers, stakeholders and employees. Findings from a thorough literature research pointed out that organizations are forced to implement strategies to embrace the implications of the current digital revolution and improve performance by innovating with new technologies (Thrassou et al., 2021). It became clear that agility in an IT landscape is crucial for the success of digital transformations and survival in volatile market conditions (Châlons & Dufft, 2017). For Deloitte consultants the importance of agility in the IT landscape is clear, however, it is unclear how the agility of an IT landscape can best be evaluated.

The aim of this research was to create a framework for the evaluation of IT landscape agility, on behalf of the Technology Transformation and Acceleration (TT&A) team within Deloitte consulting. The goal, method and content of the evaluation framework was defined based on a combination of insights from seven expert interviews, observations during team and capability meetings, three different focus groups and extensive literature research on the topics of digital transformation, information system agility and information technology agility. Using a design science research methodology, the framework has been iterated multiple times by moving between what is relevant for Deloitte and what is known in the literature sphere. Based on the final framework for evaluation, multiple concepts were developed, of which the quick scan survey was selected by the Deloitte consultants as most desirable. This concept was developed during multiple evaluations and iterations together with employees from the University of Technology Delft.

This process resulted in the IT Agility Scan, a survey that can be used during client engagements, enabling

consultants to efficiently and effectively assess what the agility of an IT landscape. The evaluation considers the complete breadth of an organization, diving into technical dimensions, non-technical dimensions, and system characteristics. Involving different employees and stakeholders across organizational boundaries. Being timed based on project timelines, the IT Agility Scan will allow consultants to not only define the current state, but also track the impact of change. It is expected that applying the IT Agility Scan will improve the ability Deloitte consultants to evaluate clients by providing a standardized method for generating valuable insights in gaps and opportunities for the agility of a client IT landscape. The IT Agility Scan will decrease the time needed gathering and analyzing data during the assessment stage of client engagements.

The IT Agility Scan is accompanied by a recommended implementation strategy, illustrating the onboarding and optimization process. By making TT&A product owner, the position of TT&A within Deloitte is strengthened over time. Involving subject matter experts in the optimization process, ensures and stimulates information sharing between experts, teams and clients. To support the engagement and development process this report provides Deloitte with a recommended strategy for the next five years, presented in a tactical roadmap towards a holistic and automated IT Agility Scan. Lastly this report highlights the limitations of this project and recommendations for further research on the topic of IT landscape agility.

By onboarding the IT Agility Scan, TT&A will be able to become the connecting partner in every digital transformation and strengthen the position of Deloitte within the digital consulting market. Supporting Deloitte and its consultants in making an impact that matters.



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Introducing the project

1. Topic introduction

The goal of this design project is to develop a solution for Deloitte consultants and clients to evaluate the agility of IT landscapes at client companies.

IT Agility

Organizations nowadays must cope with an increased speed of change, such as changes in technologies and changes in user needs. One big development has been the digitalization in the workplace, products and customer interactions. To keep up with the pace of digitalization in the world, many businesses attempt digital transformations to improve value streams, increase agility to meet demands, and hopefully increase performance.

Many organizations nowadays rely on technology to operate, with an increasing use of technologies, such as cloud computing, big data and analytics, and internet of things. Their goals are often to improve aspects like efficiency and transparency. Businesses use technology with the goal to increase their business and organizational agility. Since more organizations are becoming technology, IT- and data-driven, they must consider how agile the IT and technology is on which their business relies. However, IT agility is an ambiguous concept, both in the academic world and in the real world. This report dives deeper into the concept of IT agility and specifically the agility of IT landscapes.

IT landscape agility

Information technologies allow for the sharing of data by different hardware and software components. The IT landscape of an organization can be defined as the combination of the IT infrastructure, including networking, computing and data storage components, the software used by the organization, and the data being gathered, processed and stored. After some initial research by the researcher into the literature and secondary files at the client company, it becomes clear that an IT landscape can also be identified as an information system (IS), which can be described as a system that captures, processes and shares information. If organizations want to achieve business agility, whilst strongly depending on their IT landscape, they should consider how quickly this information system can adapt to fulfil business objectives. On one hand, this means having a fitting strategy in place, where the IT strategy is sufficiently aligned with the business strategy, while on the other hand, this means rethinking how to operate and organize the IT landscape to become agile. To strategize for an agile IT landscape, it is crucial to understand how the landscape is structured and what needs there are within the organization. Based on this, the organization can strategize for an agile IT landscape.

2. The client

Deloitte

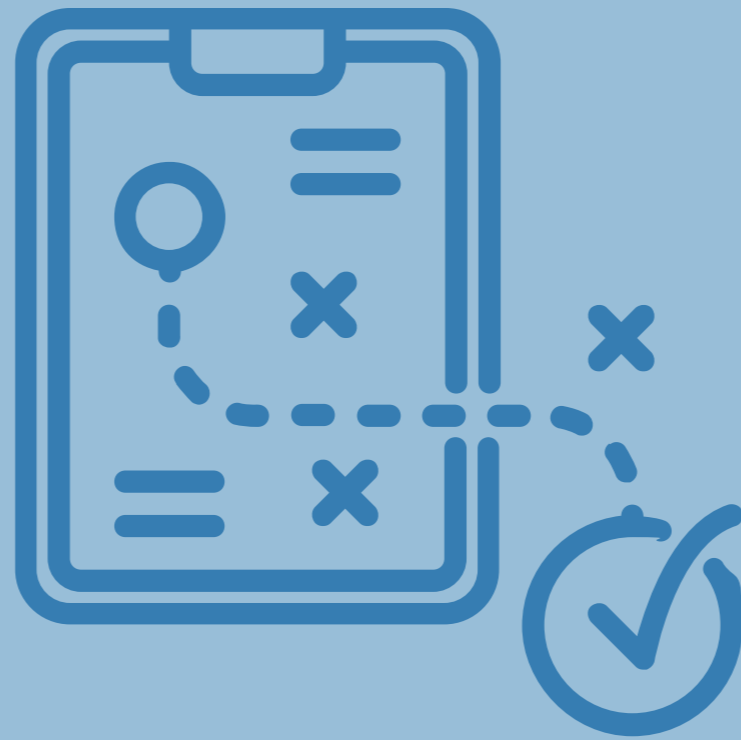
Deloitte is one of the largest service providers in the fields of accounting, consultancy, financial advising, risk advising, and tax advising. With over 244.000 employees worldwide in over 150 countries, and around 7.500 employees in 14 offices throughout the Netherlands. Working in multidisciplinary teams Deloitte can provide a broad vision on challenges faced by clients, providing insights into opportunities for their businesses.

This research is focused on the Technology Transformation and Acceleration (TT&A) team within Deloitte's Technology Strategy and Transformation offering. This offering is focused on advising clients on IT strategies, data management and enterprise architectures, but also on digital transformations, digital platforms, big data and agile IT delivery. The TT&A team advises and guides organizations in digital transformation, with an "integrated and adaptive approach to transforming businesses from the inside". Their goal is to build creative solutions to some of the most difficult challenges by embracing new technologies, shaped by industry insights, while working in an agile way. Deloitte states to value the preservation of the human element. People and technology collaborate to create great ideas or groundbreaking advancements. By combining those two, they can imagine what is possible and deliver real results that will assist companies in running their future. As a consultancy, Deloitte aids from problem definition up to and including execution.

Deloitte is working with a variety of clients who come to Deloitte, for instance, for advice on the implementation of digital solutions. Deloitte assists clients by talking to the different stakeholders and finding out the biggest barriers and opportunities for change. In some cases, Deloitte does not only focus on giving advice, but also guides clients through implementations, by staying involved throughout complete transformations. Deloitte is therefore keen to find out what the success factors and barriers behind digital transformations are and how this influences new technology delivery.

As stated on Deloitte's website: "One of the biggest challenges facing IT and technology leaders is improving business agility and time-to-market. Our Enterprise Technology Agility Advisory teams will support you to engage the business sooner earlier in the development lifecycle to deliver systems faster." Teams seem to understand the impact of IT landscape agility on the agility of businesses, but a shared methodology for assessing the agility of IT landscapes seems to be missing when introduced to the teams and offerings. Understanding how to evaluate the agility can enable consultants and improve the ability of Deloitte to strategize digital transformations. This will benefit clients of Deloitte by tailoring their transformation to their specific needs, considering the risks and barriers that could threaten success, while also leveraging available opportunities.

The Deloitte logo, consisting of the word "Deloitte" in a bold, black, sans-serif font, followed by a small green circle.



PROJECT APPROACH

3. Project approach

Initial project assignment

The scope of this project is the service provided by Deloitte to clients, focused on IT transformations. The primary goal is to improve the advice given to clients during IT transformations, by evaluating the agility of the IT landscape. The intended result of this project is the creation of a framework and a solution that would enable consultants to evaluate IT landscape agility at client companies.

Research questions:

Four research questions were formulated to guide the research phase. These questions determine what needs to be discovered during the research to define how the final solution can enable consultants to evaluate the agility of IT landscapes:

1. What system dimensions determine the agility of an IT landscape?
2. What are the critical system characteristics for achieving IT landscape agility?
3. How do different technologies affect the different dimensions and characteristics?
4. What type of process is most desired by Deloitte to evaluate the IT landscape of their clients?

Project structure

In general, this project will follow a double diamond structure as defined by British Design Council (2019), which is a framework for innovation. This is used to explore a problem more widely by the application of divergent thinking and determine focused action by the application of convergent thinking. There are four different phases in a design project structured according to the double diamond: explore, define, develop, and deliver. These four phases are described in more detail in Appendix B. An overview of the project structure and steps taken from project start to finish are visualized in Figure 2.

Methodology

To add value for both the client and state-of-the-field literature sphere, a Design Science Research methodology (Hevner et al., 2004) is applied during this project. DSR is a method for developing design artifacts and processes, in this case a framework for evaluation, using both the literature sphere and the phenomenon sphere in an iterative process (Figure 1). The goal of the DSR method is to analyze scientific research and existing artifacts and combine insights from this research with insights from real world experiences in an artifact. By going back and forth between literature and the application domain, the artifact can be evaluated and enhanced. The DSR framework is therefore not read from left to right but goes from one cycle to the other in a non-linear order.

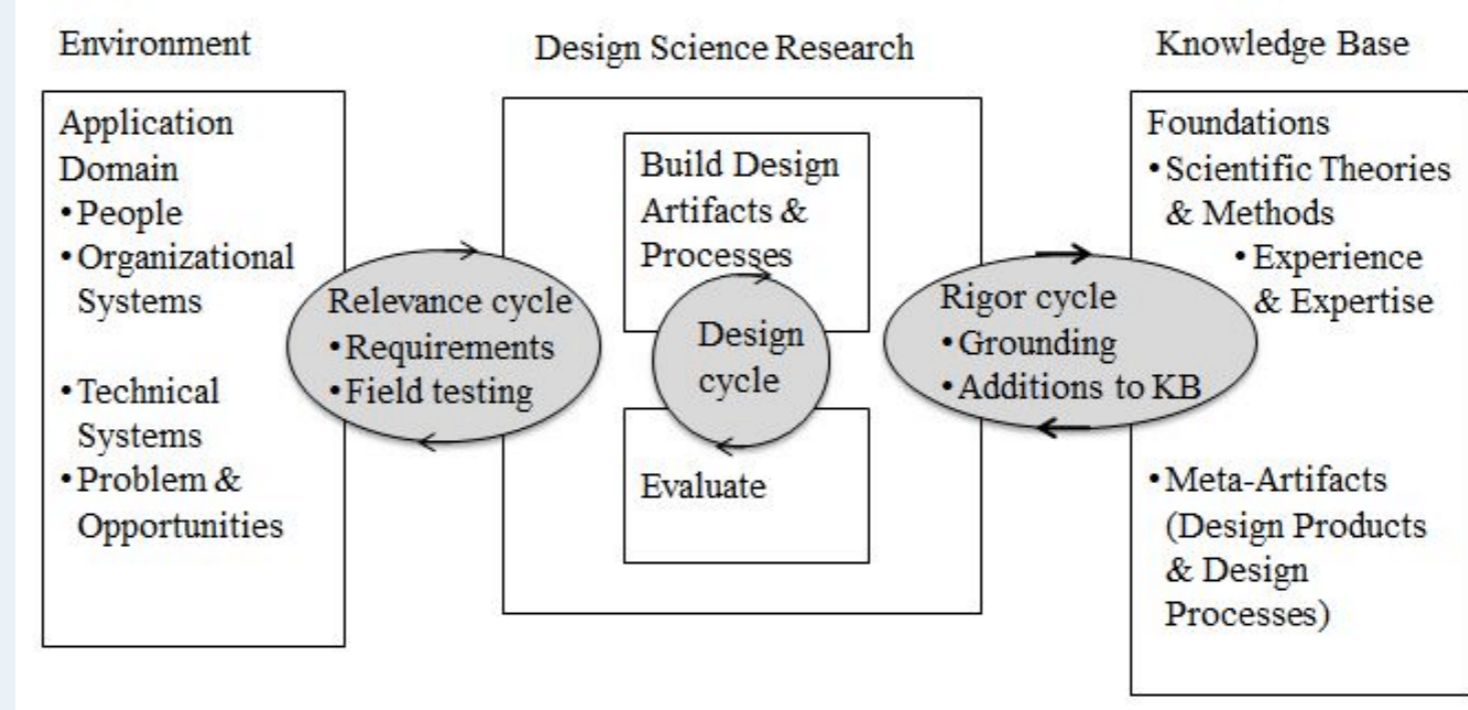


Figure 1. Design Science Research methodology (read outside-in and vice versa) (Hevner et al., 2004)

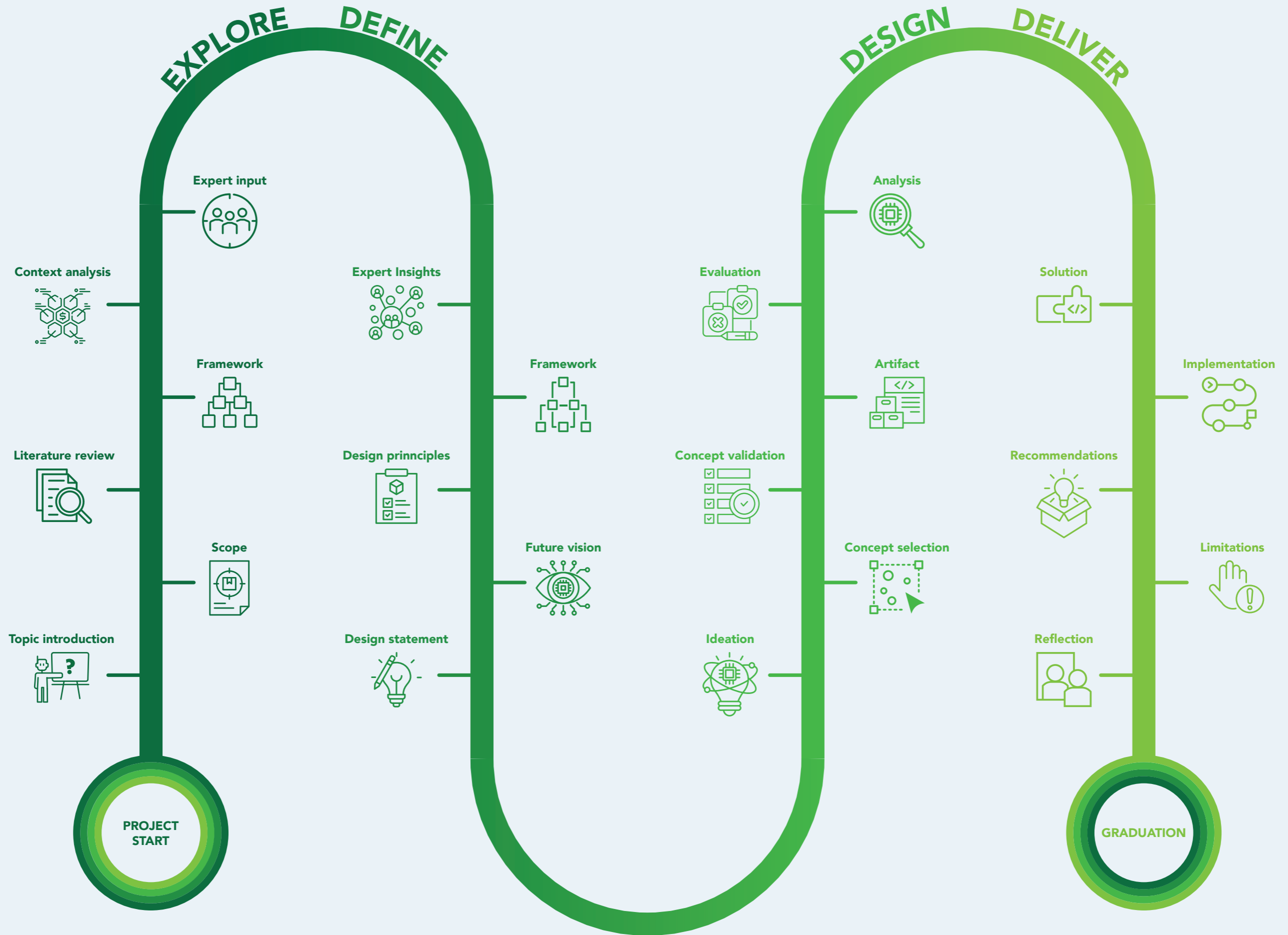


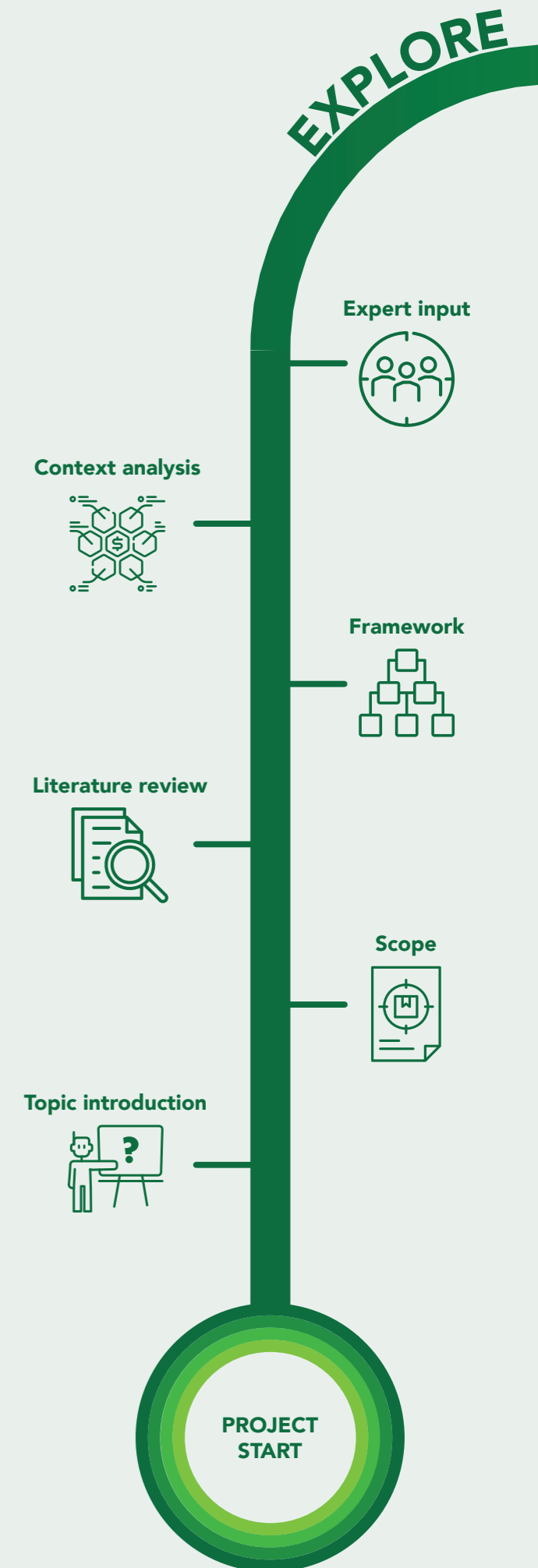
Figure 2. Overview of the project structure based on the Double Diamond



EXPLORE

The explore phase starts with a thorough literature review to answer the research questions formulated at the start of this project. To understand what system dimensions should be considered when evaluating the agility of an IT landscape, what characteristics define an agile IT landscape and what influence different types of technologies have on this agility. This allows for the identification of gaps and inconsistencies in the literature. The method most suitable for identifying gaps and drawing conclusions is a narrative literature review, where the goal in this research is to evaluate existing theories (Baumeister & Leary, 1997).

Besides a literature review, it is important for the designer to emerge in the client company to understand what is relevant during the design phase of the project. This is done by talking to different experts, ranging from business analysts to partners, observing meetings, and analyzing internal documents to determine what is relevant for the users and research scope. This stage of the project belongs to the rigor cycle of the DSR methodology.



4 The need for IT landscape agility

Over the last decades the world has been in the fourth industrial revolution, where the world has changed from an industrial to a digital world (Parviainen et al., 2017). Digitization is described by Kagermann (2015), as the networking of people and things and merging of the physical and digital world enabled by IT. Digitization affects many individuals and organizations are pressured to transform IT assets and adapt value streams and business models to meet new customer demands, which is essential to survive in new market dynamics (Blümel, 2013). Value creation in relation to IT is investigated, to understand what role technology can play within businesses. There are three paths for value creation through which digital solutions can be leveraged to increase business performance: digital products and services, digital operations and digital sales and customer service (Holopainen et al., 2023, Seitz & Burosch, 2018). Creating new value through either one of these paths is done by going through digital transformations, by implementing and adapting information technologies and systems.

4.1 Value creation through IT

4.1.1 Digital products and services

One of the goals for creating value through digital products and services can be increasing sales and competitiveness or disrupting existing markets, by entering new markets or adopting new business models (Holopainen et al., 2023). Customers have different motivations for using digital products and services, as shown in the statistics on the use of music streaming services like Spotify (Figure 3). In the business case of Netflix, it is illustrated how a business can leverage IT by entering a new market and creating new value for its customers.

If we look at the value creation path leveraged by Netflix in the case example through an agility lens, we see that the adaptability was essential for the success. Netflix was able to sense customer needs and responded by implementing new technologies, like algorithms to present a personalized offering based on customer data and a streaming platform. Speed created competitive advantage for Netflix. By being an early adopter of streaming technologies, they realized a shorter time to market than competitors, allowing them to be the first global movie streaming service.

Essential for Netflix was changing their business model to a hybrid business model with offline and online services. A hybrid business model is required for successful digital transformation according to Endres et al. (2019). A hybrid business model can be based on exploitation and exploration (Vial, 2019), where exploitation comes down to creating more value with existing resources and exploration aims at creating value through innovation. The last advantage of Netflix was the scalability of their technologies and business. Without the ability to scale their streaming technologies and algorithms they would not have been able to serve growing demands of new users. The digital transformation of Netflix demonstrates the importance of value creation through digital products and services, and of the agility of an IT landscape. Their ability to continuously adapt and innovate to create new value and realize growth made them one of the most popular streaming platforms in the current digital era.

It stands out that 69% of Spotify users want to access their media on all their devices

Consumer attitudes: media & digital media

Agreement with statements towards media & digital media in the UK

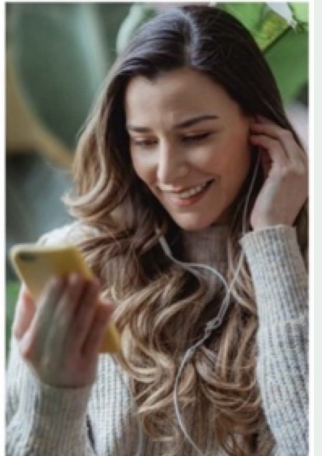
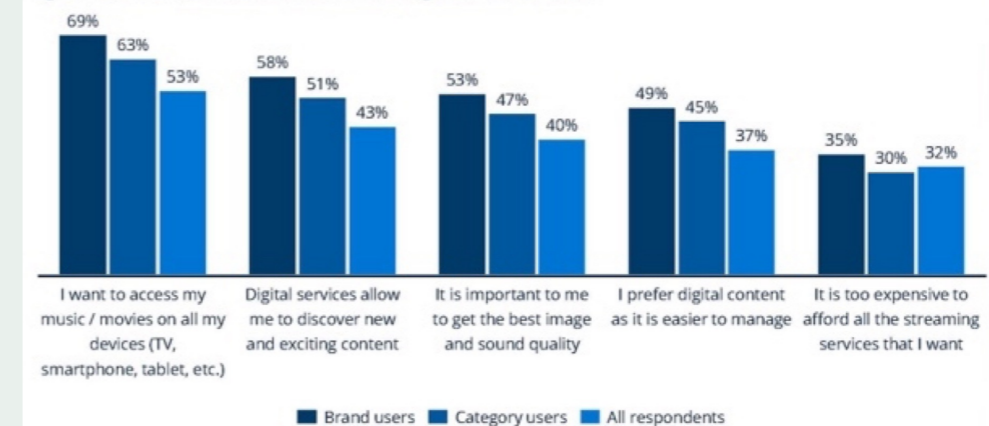


Figure 3. statistics on the use of Spotify (Statista, 2023)

Netflix business case



An example of a company creating new value through digital products and services is Netflix, which started as a movie rental and sales business. Netflix leveraged the value creation path of creating digital products and services through a digital transformation in 2000. During this transformation Netflix started offering a monthly subscription model and developed an algorithm that was able to suggest new movies to customers based on previous rentals and sales. In 2007, Netflix adapted their business model even further by combining rentals with streaming services. After a successful launch, expansion led Netflix to become the first global movie streaming service in 2010. In 2018, Netflix reported a revenue of \$16 billion. This growth was enabled by identifying market opportunities and continuous evolution of their business model with a hybrid business model approach. Since the introduction of streaming services there has been a significant decline in DVD, game, and video rental businesses. With a decline from 3638 businesses in the US in 2013 to only 667 in 2023 (IBISWorld - Industry Market Research, Reports, and Statistics, 2022), showing that the inability to quickly adapt to changing markets can result in business becoming obsolete

4.1.2 Digital customer service / sales processes

Over the last decades e-commerce has grown significantly in many markets. Platforms like Amazon and eBay have seen significant growth and more traditional brands like Albert Heijn and Hema also started selling products online. Global e-commerce sales have doubled in five years, between 2017 and 2022, as can be seen Figure 4 (Statista, 2022). IT plays a big role for sales processes, like online payments and is used to communicate efficiently on online platforms. Allowing businesses to exchange information and data with their operating environment.

Managing data from customers is in many cases done using Customer Relationship Management (CRM) systems, either self-build or as software-as-a-service (SAAS) like Salesforce. CRM can be used to collect all data from customers in one place. Helping businesses to increase efficiency and improve customer experiences by more effective communication and data collection (Akhrin, 2021).

Statistics on CRM from 2021 show that 58% of customers mentioned their customer experience expectations are higher than the year before, 84% expect their inquiries and problems to be solved more quickly and accurately and 72% of customers state that their preferred communication channel varies per context (Talkdesk, 2021). Meaning companies need to adapt systems in place and adopt new technologies. Incorporation of CRM systems in existing IT landscapes means rethinking system and data architectures to facilitate omnichannel communication. Once implemented these CRM systems can enable quick scalability and automation by for example leveraging AI-powered and cloud-based contact center software. Statistics, shown in Figure 5, point out that many companies in the Netherlands have moved from local and remote CRM systems to hosted and cloud-based CRM systems (Statista, 2019).

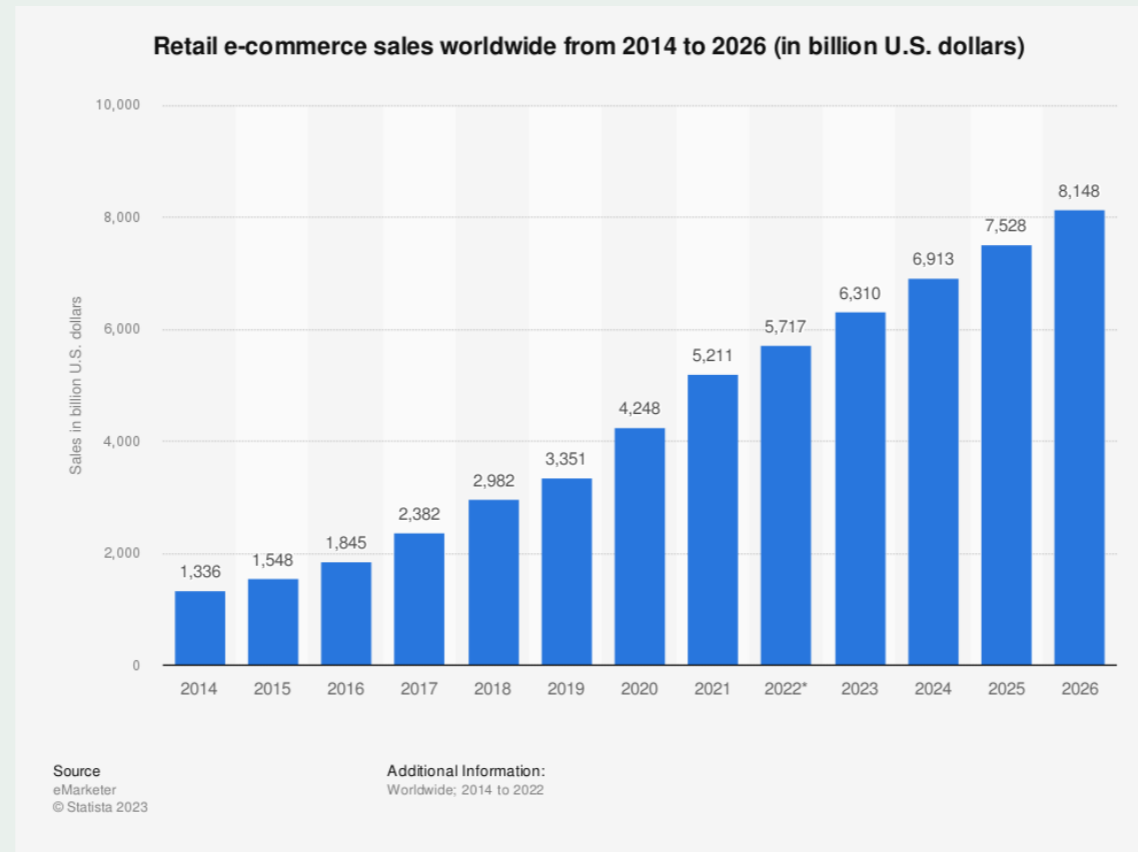


Figure 4 Amount of e-commerce sales (Statista, 2022)

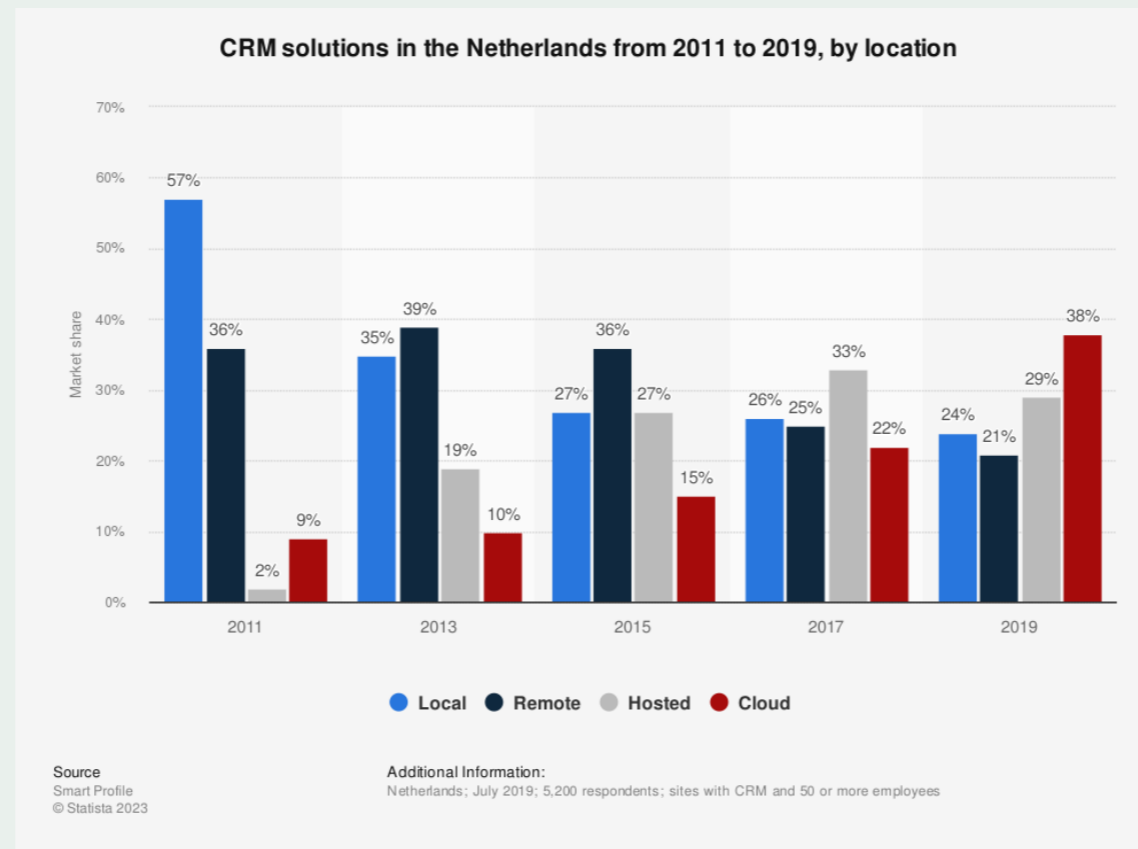


Figure 5 CRM usage in the Netherlands (Statista, 2019)

In the business case on NS, it is described how the NS leverages a CRM system to communicate with their customers and create an omnichannel experience. Creating such an omnichannel experience requires organizations to be agile and quickly adapt their IT landscape by integrating new platforms for communication. Many people may prefer to communicate through online channels such as contact forms, emails or customer support chats. However, recently it became visible that it can pose risks for a business if customer needs are not met. In the current digital landscape, customers of online services are vulnerable for cyber threads such as phishing, which is illustrated in the case of the online bank Bunq.

NS business case



Looking at a real-world example, we could take a company like the Nederlandse Spoorwegen (NS). Customers have a personal card, like an 'OV-chipkaart', or buy a ticket from a ticket machine or on the website. When someone has a question, they either have the option to call the customer service, to start a chat on the NS webpage, on Twitter or on Facebook. Like many other companies, NS has implemented a virtual assistant which is a form of artificial intelligence. This virtual assistant tries to answer the question of the customer. This can help to lower the workload and capacity of real customer service employees. All customer relation channels need to have access to the same information and this information needs to be up to date, requiring real time data sharing. Agility in the IT landscape is required for this as the demands of the system might change, both on the customer end and the operator end.

Recently, customers of the online bank Bunq have been the target of online fraud. With hundreds of complaints on the platform Trustpilot. In 2023 and 2024 there have already been 54 reports of customers with a total damage of around 1,5 million euros (Kassa, 2024). When notifying the bank, customers received an automated response and were not contacted by the bank afterwards. Victims were not able to contact Bunq by phone or go to a physical location of the bank. Additionally, there are less protocols in place on the Bunq platform to mitigate risks of cyber fraud. Bunq claims that they do not support customers through phone calls to minimize cyber phishing, but customers seem to miss the personal aspect of support needed in cases like this.



Bunq business case

This Bunq presents a valuable lesson for online platforms. Automation and digitalization may for some customers be valuable and increase efficiency. However, there are risks associated with these trends that should be considered by organizations. When these risks are not treated in the correct way this can affect business performance and harm the image of an organization. For Bunq we see that cases have been known for more than a year and their inability to be agile and adapt their IT assets brought harm to their customers. Value creation through digital customer services and sales processes can be valuable for organizations, but the needs of the customers should be considered first.

4.1.3 Digital production and operations

There are several motivations for organizations to create value through digitalization of production and operations, like improving internal operations to increase efficiency, automation, adaptability, internal collaboration, transparency, and lowering cost resulting in an increased profit margin (Holopainen et al. 2023). Emergence of new technologies or changes in operating context sometimes require adapting operations to better cater customers. In the case example of Microsoft teams, the transition from working in the office to working from home is illustrated. Where the COVID-19 pandemic accelerated a change in the ways of working for many organizations, which is still visible after the pandemic.

The integration of digital technologies within an organization can be done to support internal operations for employees, like shown by Liberty Mutual Insurance, who launched a digital assistant to improve their employees' workflow management and improve resource allocation (Workgrid, 2016). The digital assistant responds to questions from staff members on action items, approvals, transactions, and technological procedures. Such a support system can increase the digital literacy of personnel and increase speed at which requests are resolved.

Processes and operations are digitalized to increase quantity and quality of data available on operations.

Bunq business case



A recent example of changing circumstances that forced businesses to rethink the way they operate was COVID-19. Businesses quickly had to adapt to remote working by adopting tools like Slack, Zoom and Microsoft Teams to be able to keep communication and collaboration flowing (Robbins et al., 2020). As well as implementing services like two-factor authentication to allow remote access to sensitive data or critical systems. These developments resulted in organizations and people continuing to work remotely even after the pandemic ended (Chadee et al., 2021), and the realization that global collaboration has become easier, additionally causing an increase in offshoring operations to decrease costs (Sytsma, 2022).

are digitalized to increase quantity and quality of data available on operations. For instance, in the 1990s, logistics and procurement companies constructed data warehouses and information networks to better understand and maintain control over inventory, production volumes, and shipping procedures (Stadtler, 2015). This made it possible for businesses to use new types of supply chain management (SCM) and enterprise resource planning (ERP) systems, having significant impact on how industrial operations were organized and how business was conducted in the manufacturing sector (Gunasekaran & Ngai, 2004). These systems are frequently used to automate financial procedures.

Another form of digital value creation through operations is by improving and increasing external stakeholder interactions (Jelassi & Martínez-López, 2020). As reported by PWC (2016) based on the Global Industry 4.0 Survey, the Industry 4.0 aims at digitizing and integrating processes vertically within the complete organization. Aiming at end-to-end integration, from product development up to purchasing, manufacturing logistics and service. Therefore, organizations strive to capture real-time data on operations, process efficiency, quality management and operations planning, which can be supported with technologies like augmented reality and machine learning in an optimized integrated network (Yildizbasi et al., 2020, Mourtzis et al., 2022). (co-)creation and capture.

Regarding horizontal integration, there is a focus on stretching beyond internal operations and integrating data from supplier to customer and other key value chain partners. Companies move from a product-oriented to a platform-oriented approach, with digital interfaces for suppliers, partners, and customers (Dalenogare et al., 2022). By doing so, organizations can link their supplier, partner, and customer to their IT ecosystem, allowing for an increased end-to-end integration, enabling value

In supply chain management (SCM) IT is used for real time insights in end-to-end availability, which improves planning and execution. Organizations use external data sources from partners and vendors and integrate them in their supply chain management systems to increase transparency, allowing them to account for inventory and capacity risks, increasing resilience in their supply chain. Combining SCM systems with big data analytics helps organizations to realize predictive analytics instead of reactive metrics. Other areas where IT plays a role in SCM is robotics for automation, IoT for metrics, digital twins to simulate scenarios and blockchain to record the exchange of goods (Microsoft Corporation, 2022).

If businesses want to benefit from digital production and operations, they need to understand how they use IT to exchange, store and process data. As data allows for the communication between different systems, and companies are continuously adding components that exchange data, so quantities of data are continuously growing. An important aspect, therefore, is how data is managed, by controlling how and where data is collected, processed and validated (SAP, 2022).

More data allows for better analysis, to find patterns in raw data and translate them into information enabling data-driven decisions for optimization of operations and production (Tsai et al., 2015). Utilizing big data for aspects like efficiency, automation and control means that data needs to be managed properly. Database management systems can determine how data is structured within a database e.g., an object-oriented database system, in-memory databases, columnar databases or in-memory columnar databases (Atkinson et al., 1990, Lahiri et al., 2015). It depends on the system requirements what the appropriate management system is. Choosing the right combination of technologies is a consideration between a degree of flexibility and control of risks.

From an operational perspective, agility of the IT landscape is on one hand focused on customer needs, by for example decreasing delivery times. On the other hand, it is focused on the needs of employees for information and processes. Additionally, IT landscape agility is required for the ability to adapt internal systems to requirements of integrated products and services from partners and suppliers.

Key takeaways

1. Three value creation paths:

- **Digital products and services:** leveraging digital solutions to enhance competitiveness, enter new markets, and innovate business models, illustrated by Netflix's transformation from DVD rentals to global streaming.
- **Digital customer service/sales processes:** adoption of e.g. CRM systems and AI-powered solutions to improve customer experiences and streamline communication across multiple channels.
- **Digital production and operations:** Increasing efficiency, collaboration and transparency through the adoption of information technologies in production facilities and offices.

2. Importance of IT landscape agility across paths

- Agility of an IT landscape enables organizations to swiftly respond to customer demands, innovate products and services, and optimize processes, by implementing new solutions and technologies at an accelerated pace. Which is essential for staying competitive in the current digital landscape.

4.2 Digital transformations

Digital transformations have been mentioned in this research as they are utilized for value creation. On high-level digital transformations refer to significant societal and industrial changes brought about by the implementation of digital technologies (Vial, 2019). Digital transformations can be boiled down to the implementation of new digital technologies and change of existing systems in an organization's IT landscape to create new value through digital capabilities. Businesses can modify their strategy, organizational structure, operations, and technology assets to avoid becoming obsolete and mitigate risks posed by new technologies, competitive pressures, legislative changes, or cultural integration and development (Thrassou et al., 2021).

According to Professor Klaus Schwab, Founder and Executive Chairman of the World Economic Forum, the Industry 4.0, has built upon the third industrial revolution as it became a digital revolution (World Economic Forum, 2017). In the industry 4.0 there is a fusion of technologies, blurring borders of the physical, biological, and digital realms. Creating a world where people and organizations are constantly switching between different digital domains and offline reality (Xu et al., 2018). Organizations, people, and devices are becoming more digital and connected, however, many businesses still do not use many cutting-edge digital technologies. Organizations should implement strategies to embrace the implications of digital transformations and improve operational performance by innovating with new technologies (Hess et al., 2016, Chanias et al., 2019).

Following the Path to the Digital Decade concept, by 2030, at least 75% of businesses in the European Union should be using big data, cloud, and AI technology (European Commission, 2023). It was estimated that, 34% of businesses would be using cloud computing in 2021. Only 8% employed artificial intelligence, and 14% used big data in 2020. Figure 6 shows an overview of the

current adaptation of these technologies in comparison to the desired percentage. With the implementation of new technologies, organizations face several challenges. For the adoption of cloud computing the biggest challenges have changed from security and lack of resources in 2022, to managing cloud spending and managing multiple clouds in 2023 (Vailshery, 2023). Organizations will keep implementing new types of digital assets and continue to go through digital transformations to improve their business performance. This is why it is important for the client of this project, to grow their knowledge base on the topic of digital transformation.

What has become apparent is that globalization puts pressure on businesses to adapt. In this context digital transformation is a process that has changed from being an opportunity to implement new technologies and innovate to a prerequisite for being able to manage the needs of a growing world population (Kraus et al., 2021). The fact that not all organizations have been able to implement cutting edge technologies and go through large digital transformations might be because there is simply no need for it or because of the inability to leverage technologies caused by an incompatible IT landscape. Digital transformations can be long, complex and costly processes that might require a great extent of change

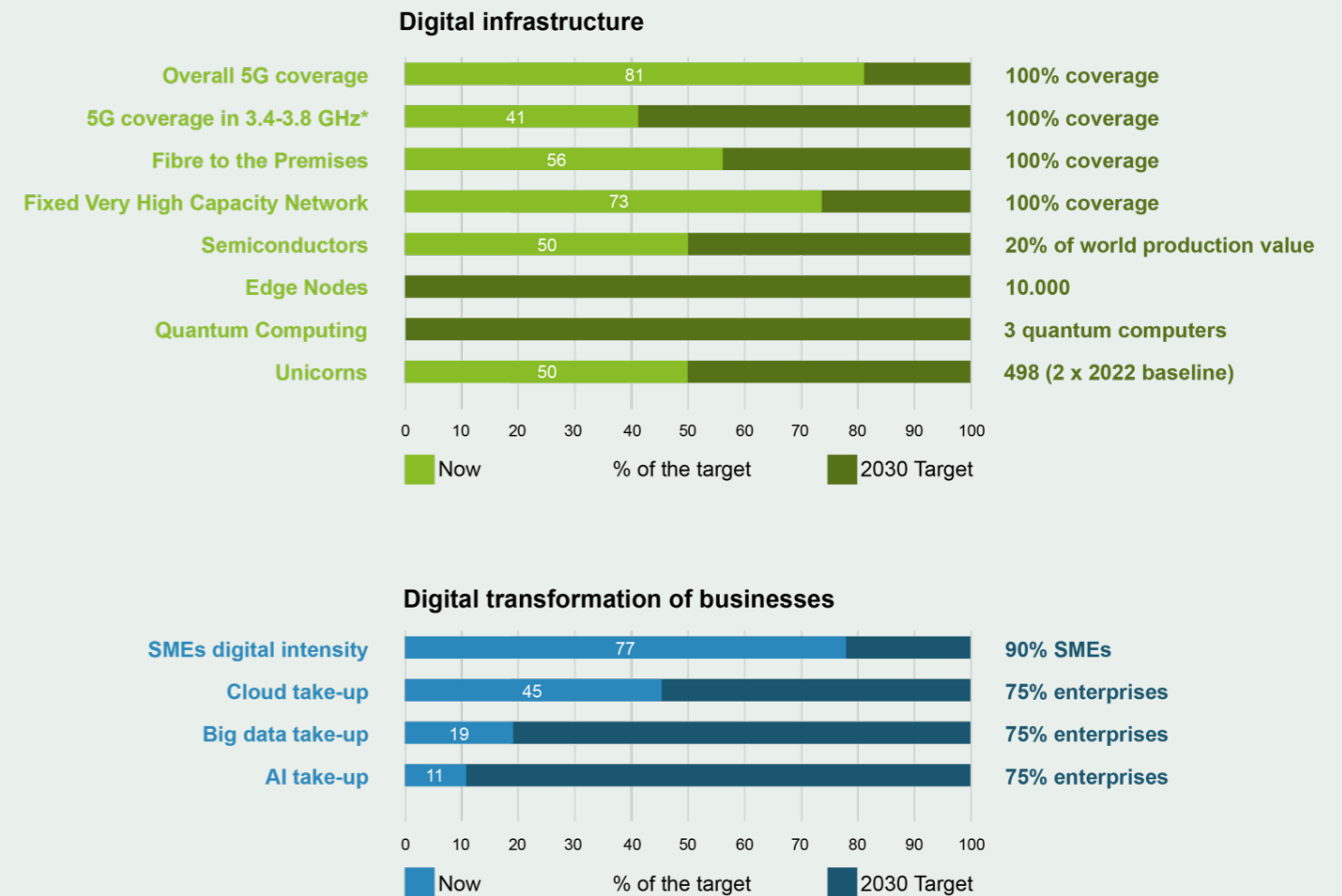


Figure 6 Progress of desired technology adaptation in the European Union

4.3 Agility in digital transformation

There is an emphasis on the fact that digital transformations should consider and align with existing business perspectives and strategies, because they entail shifts in technology, as well as in operations, services, products, competitive environments, and business models (Bouncken et al., 2021, Chanas et al., 2019, Vial, 2019). Changes in these dimensions might be essential for the creation of new value (Svahn et al., 2017). As described by Hess et al. (2016), successful transformation of a business can be achieved by simultaneously exploring and exploiting what it offers to realize agility. Digital transformations rely on the (re) configuration of information technologies within or on the edge of existing landscapes. Adaptation of the technological core of an organization requires speed and adaptivity of technologies, processes, and people, to realize change quickly, minimize costs and limit the impact on critical processes.

Agility of both the IT landscape and the organization can be a great challenge in digital transformations, however, these abilities are critical factors determining the success of digital transformations (Châlons & Dufft, 2017). Agility is not only necessary for success, but also desired by employees. Agility is also desired by employees. A survey among Dutch companies by Intermedius (2019), shown in Figure 7 shows that there is a greater desire for agility among employees in large companies. It might be the case that, in general, larger companies are less agile.

What became clear during the analysis of the existing literature, is that a relatively large body focuses on the agility of people and processes within organizations. There is only a small body of literature on the agility of IT landscapes from a technology perspective. Based on current findings and this gap in literature, this research will focus on providing comprehensive insights on IT landscape agility.

4.4 IT agility

According to Riad et al. (2009) and Dunlop-Hinkler et al. (2011), one important organizational variable is technical agility, which is the firm's capacity to react swiftly to the flow and nature of information as well as rapid technological changes. To respond to internal and external changes, businesses should be technologically flexible to continuously adjust and rearrange existing (in)visible assets and capabilities (Eggers & Park, 2018, Lavie, 2006). Since the rate of technological and digital innovation increases over time, organizations can no longer risk holding on to rigid legacy systems.

During conversations with Deloitte consultants, it became clear that it forms a risk to rely on technologies that are difficult to adapt and take a very long time to transform. It can lead to an increased time-to-market, long down-times of critical systems or the inability to quickly adapt to changing requirements. Out-dated IT systems will become harder to maintain over time as they require more specialized IT employees, increasing the overall cost of maintaining and operating these systems. The ability to sense environmental changes and seize opportunities will allow companies to minimize risks and increase competitiveness. With larger shares of organizations' operations relying on IT landscapes, it becomes more difficult for organizations to adapt their value streams by leveraging technological developments when their IT landscape lacks agility.

The longer the organization postpones transforming the traditional IT landscape to a more product centric IT landscape and operating model, the more complex the landscape becomes and the higher the cost, risk, and chance of success. Literature shows, it is essential for organizations to respond timely to internal and external changes by adapting IT assets, which can be considered as IT agility. However, as Figure 8 shows, IT agility is not only depending on the IT assets but on a large variety of dimensions as suggested by Yousif et al. (2017).

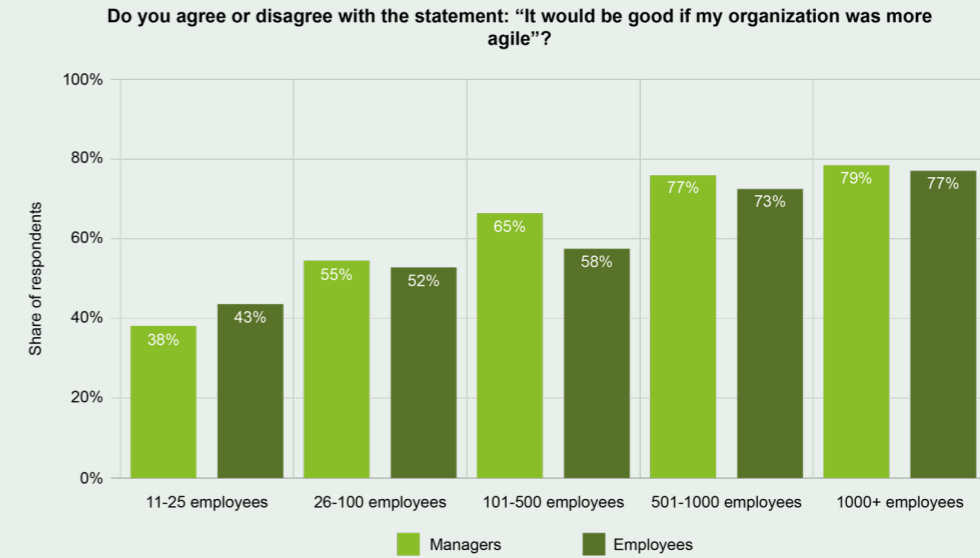


Figure 7 Employee opinions on agility (Intermedius, 2019)

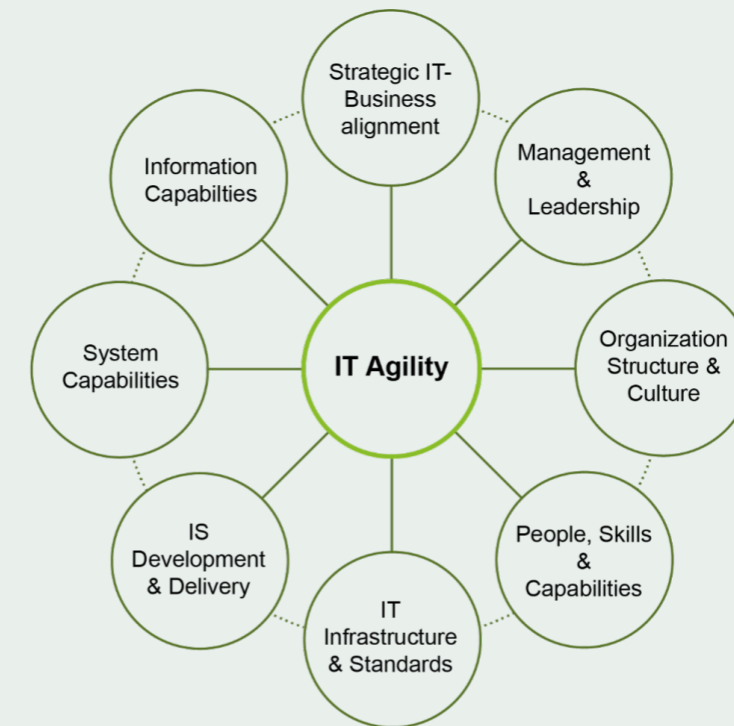


Figure 8 IT agility framework (Yousif et al., 2017)

For the scope of this project, it is decided to focus on the agility of the IT landscape. Since there is a large body of literature that focuses on the organizational aspects of IT agility, but limited literature focusing on the agility of the IT landscape itself. Additionally, it became clear that there is more knowledge within Deloitte on the agility of the IT operating model in comparison to the agility of the IT landscape.

4.5 Need for IT Landscape Agility

According to Bellantuono et al. (2021) monitoring change, including the collection of feedback from people involved in a change process, the identification of gaps and problems and the implementation of corrective actions, is a key activity in change management to avoid failure. Grand and Deneckere (2019) incorporate a step of monitoring change during transformations and suggest surveying individuals who are impacted by change as a means of evaluating change in progress. Butt (2020) also envisions a change monitoring activity and suggests using a lean six-sigma approach. Most of the reviewed digital transformation models (DTMs) do not include many change-monitoring activities, despite change management literature stating that it is critical to understand how and to what extent introduced change is improving the organization's IT capabilities, to implement corrective actions. The absence of activities dedicated to change monitoring is one of the main limits of extant DTMs according to Hess et al. (2016).

Research indicates that measuring and managing is critical for the success of digital transformations (Korachi & Bounabat, 2020). To do so, organizations will need to assess the current state of their capabilities and determine what the desired state would be. It is important to initially evaluate the ability of an organization and their technological systems to quickly adapt. This can determine their ability to digitally transform and continuously evolve. Adopting new technologies is not only implementing them as quickly as possible, but also understanding how new technologies add value for the processes and people. Therefore, it is necessary to understand how quickly and easily an organization can adapt their current IT landscape based on the external and internal change. To be able to evaluate this, there needs to be a clear definition of IT landscape agility, an overview of dimensions of an IT landscape and an overview of characteristics needed for an agile IT landscape.

Key takeaways

3. Digital transformations:

- Digital transformations encompass significant societal and industrial changes driven by the implementation of digital technologies.
- The implementation of new digital technologies and the adaptation of existing systems are crucial for organizations to create new value and remain relevant in a rapidly changing business landscape.

4. Agility in digital transformations:

- Agility is essential for successful digital transformations, allowing rapid adaptation of technology, processes, and people to changing requirements.
- Agility in both the IT landscape and the organization is critical for minimizing costs and limiting impacts on critical processes.

5. IT landscape agility:

- IT landscape agility refers to an organization's capacity to react swiftly to technological changes and innovate its IT capabilities to leverage opportunities.
- Relying on rigid legacy systems poses risks of increased time-to-market, higher maintenance costs, and decreased competitiveness.

6. Evaluating IT Landscape Agility:

- Organizations must evaluate their current IT capabilities and desired states to effectively plan and execute digital transformations while emphasizing agility and iterative processes.
- Monitoring and evaluating IT landscape agility are crucial for identifying gaps, implementing corrective actions, and ensuring successful digital transformations (Korachi & Bounabat, 2020).
- It is advised to survey individuals impacted by change as a method for evaluating the need and success of change (Grand & Deneckere, 2019)

5 Defining IT landscape agility

5.1 Agility

Agility is a widespread concept, Gren & Lenberg (2020) define agility as “the responsiveness to change”, and state that a unified understanding of agility as the responsiveness to change makes it easier to increase the agility of a system. Actors in the system can then ask themselves, “does this change increase our responsiveness to change?”. Gunasekaran (1998) defines agility as the “ability to react to unpredictable changes in a cost-effective way, while prospering from the uncertainty”. What becomes clear from these definitions is that agility is can be consider as the ability to respond to change.

5.2 Technology agility

From an organizational point of view, technology agility is proved to be a precursor to organizational agility and is described as, “an organization’s capacity to respond fast to technological developments” (Dunlop-Hinkler et al., 2011). Technology agility is suggested to influence the operation, customer and partner agility to improve business processes and increase firm performance. This theoretical framework is shown in Figure 9. When businesses want to be agile in the current rapidly evolving digital world, they must benefit from technological developments. This definition of technology agility considers the agility from a technological change perspective.

A similar point of view focusing on technology agility which is expressed by Menon and Suresh (2022), describing how organizations can benefit from technology. Their theory describes technological agility as an organization’s capacity to use technological tools and applications to enhance and streamline processes and procedures, by responding to technological disruptions quickly and cost-effectively. Johnson and Lafley (2010) interpret technological agility from a

business standpoint as the capacity of the business model to adopt new technologies and adapt current technologies for transformative growth. This last definition takes a broader point of view when it comes to the changes putting pressure on a business and focusses on how a business model can be adapted using new technology. These theories consider technology agility from a business point of view, as the ability of businesses and their processes to adapt to new technologies. These theories, however, do not consider the ability of technologies in place to be adapted to external change and changing business processes.

5.3 IT landscape perspective

From an IT standpoint agility can be defined as the flexibility of information technology and its capacity for quick adjustments when called for (Sarker et al., 2009). To understand the agility of the IT landscape, it is necessary to consider individual information technologies in the composition of multiple technological components. An IT landscape generally consists of “an integrated set of components for collecting, storing, and processing data and for providing information, knowledge, and digital products”, which is also the definition of an information system (Zwass, 2023).

Therefore, the IT landscape can be considered as an information system, of which an abstract overview is shown in Figure 10. Dove (1995) described the concept of agility for information systems as minimization of inhibitions and proficiency to change in whatever needed direction to cope with anticipated and unanticipated change. Information system agility can also be defined as the ability of a system to quickly respond to change (Arteta & Giachetti, 2004). From an information system perspective agility is also defined as “the ability of an information system to sense and evaluate change in real time and select and execute a response in real time” by Chaudhary et al. (2017). Van Oosterhout (2010) argues that for an information system to be agile, it needs to sense, respond, and learn. Common factors in these definitions are the ability of the system to sense and respond to change. Where change can be both planned and unplanned. Additionally, it comes clear that agility means that change can happen at high speed. The ability to learn might indicate that a system improves its understanding on how to deal with similar change in the future, or the predictive abilities of a system.

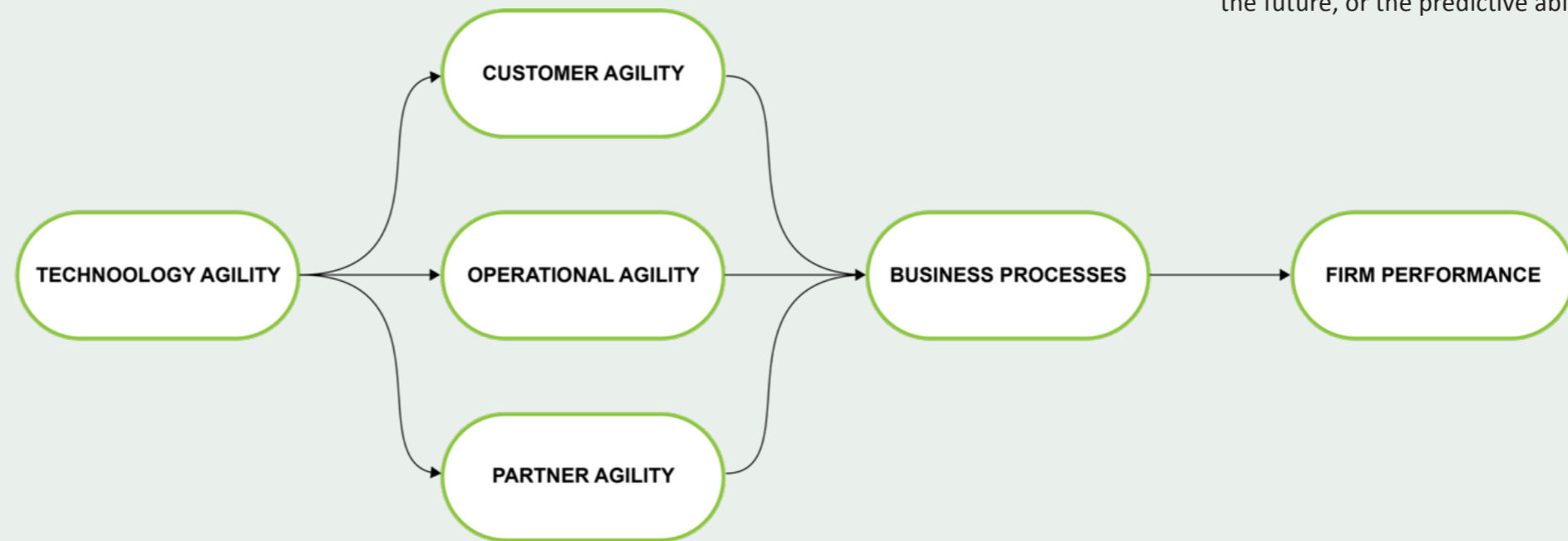


Figure 9 Technology agility framework (Dunlop-Hinkler et al., 2011)

5.4 Definition of IT Landscape agility

Within this research, initially an approach is taken to look at IT agility through an information system approach. Where at first, only the technology within the system is considered as it gives a better understanding of what the IT ecosystem on a technology level needs to consist of to offer agility. People and processes do influence the agility of the information system, however, to make people understand how they should change the IT landscape and processes, it is important to understand what the ecosystem of technologies should consist of and how it should function.

For this research, the IT landscape is considered as the combination of three dimensions: data, applications (software) and infrastructure (hardware and system software). Figure 11. shows a high-level schematic overview of the composition of the IT landscape containing the three before mentioned dimensions considered in this research.

To define agility of IT landscapes, patterns in the definitions of agility have been analyzed. There are three elements we see emerging when comparing the definitions, namely: sensing change, responding to change and speed. Therefore, for this research IT landscape agility will be defined as: The ability of the IT Landscape to continuously sense and respond to internal and external change at high speed.

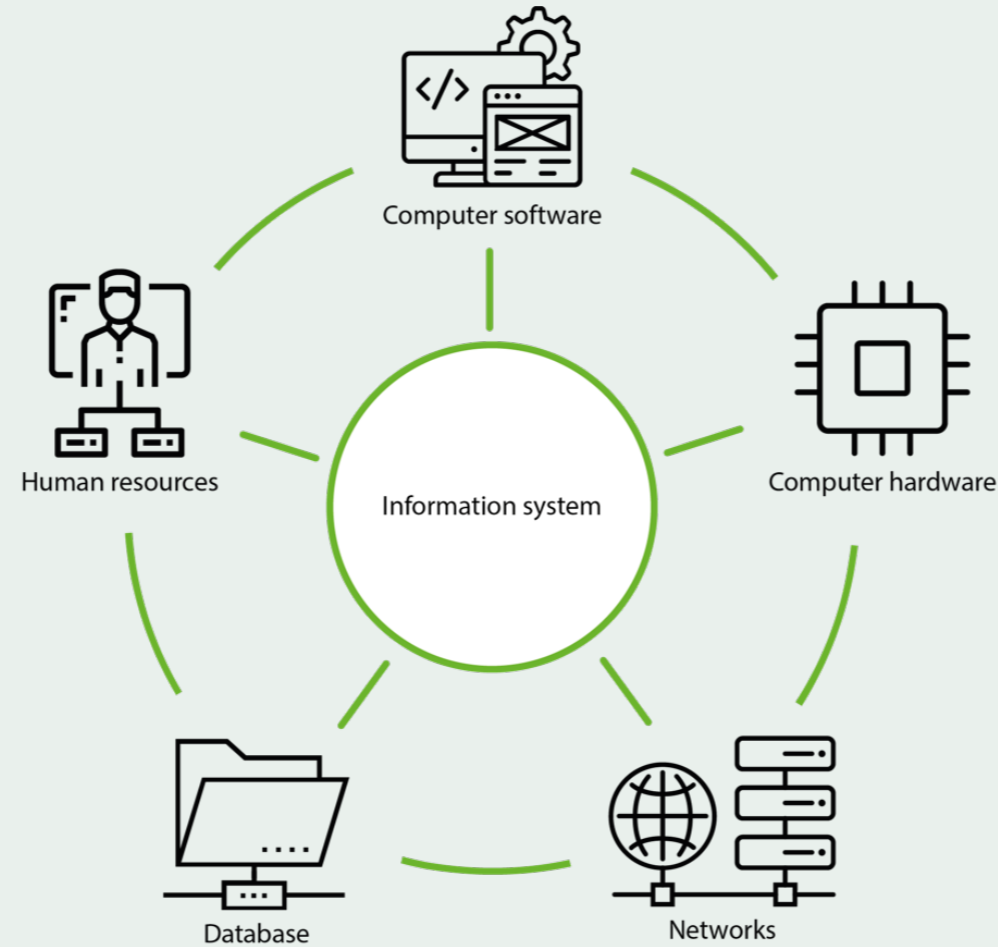


Figure 10 Information system overview

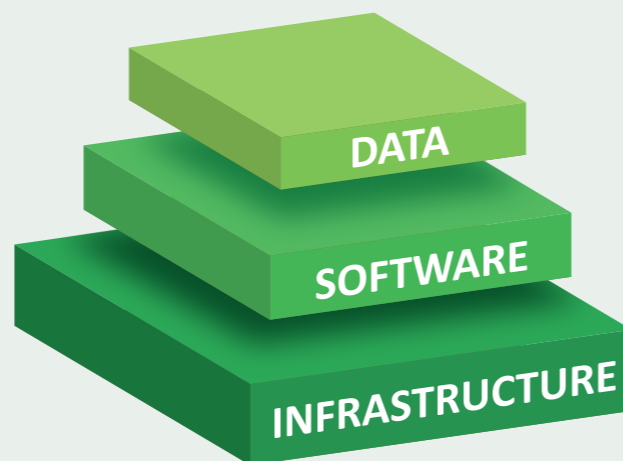


Figure 11 IT landscape

Key takeaways

7. Agility:

- Agility is understood as the responsiveness to change.

8. Technology agility:

- Technology agility is crucial for organizational agility and involves quick responses to technological developments, which can influence business processes and overall performance.
- Various perspectives on technology agility exist, ranging from focusing solely on technological changes to considering broader business implications and adaptations.

9. Agility from an IT Landscape perspective:

- IT landscape agility refers to the flexibility of information technology and its capacity for quick adjustments in response to change.
- Common factors in defining IT landscape agility include sensing change, responding effectively, and doing so at a high pace.

10. Three dimensions of the IT landscape

- In this research the agility of the IT landscape is analyzed based on three dimensions of IT landscapes: Data, software and infrastructure.

11. Definition of IT Landscape Agility:

- IT landscape agility is defined as the ability of the IT landscape to continuously sense and respond to internal and external changes at high speed.

6 Dimensions of an IT landscape

6.1 Data and information

Data is an essential dimension for the agility of the IT landscape. Data is collected, processed, and transferred by various components and utilized for sensing capabilities by providing insights into changing circumstances. For example, raw data is analyzed using business intelligence (BI) tools to identify customer demands, transforming data into actionable information. Methods used for storing, processing and transmitting data are therefore essential for the ability of an organization to quickly sense and respond to internal and external change.

6.1.1 Data architecture

The data architecture forms the basis for information, describing how, where and what data is collected, stored, transformed, distributed, and consumed for a system or sub-system (DalleMule & Davenport, 2017). It sets the principles that govern formats such as databases and file systems, along with the technologies and systems that establish connections between data and business operations relying on it. When data has been processed and integrated with other data, it becomes information (DalleMule & Davenport, 2017). Within organizations, different data architectures can exist on different levels, such as the enterprise data architecture, solution data architecture, application data architecture and technical architecture. The principles to which these architectures adhere can differ from one another. These principles might influence the agility of the IT landscape, as they determine how data is stored, processed and transmitted within the system. Figure 12. shows an example of an open data architecture, with a goal of preventing vendor lock-in (being dependent on a vendor, providing a service) (Gaurav, 2024).

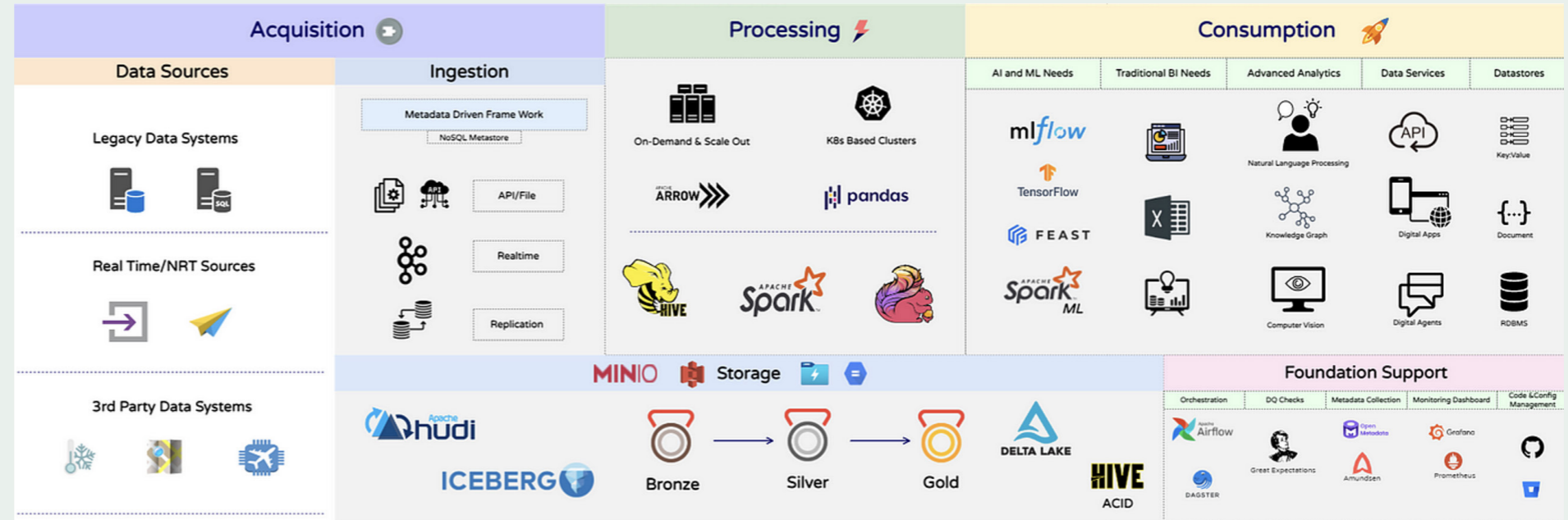


Figure 12 Open data architecture (Gaurav, 2024)

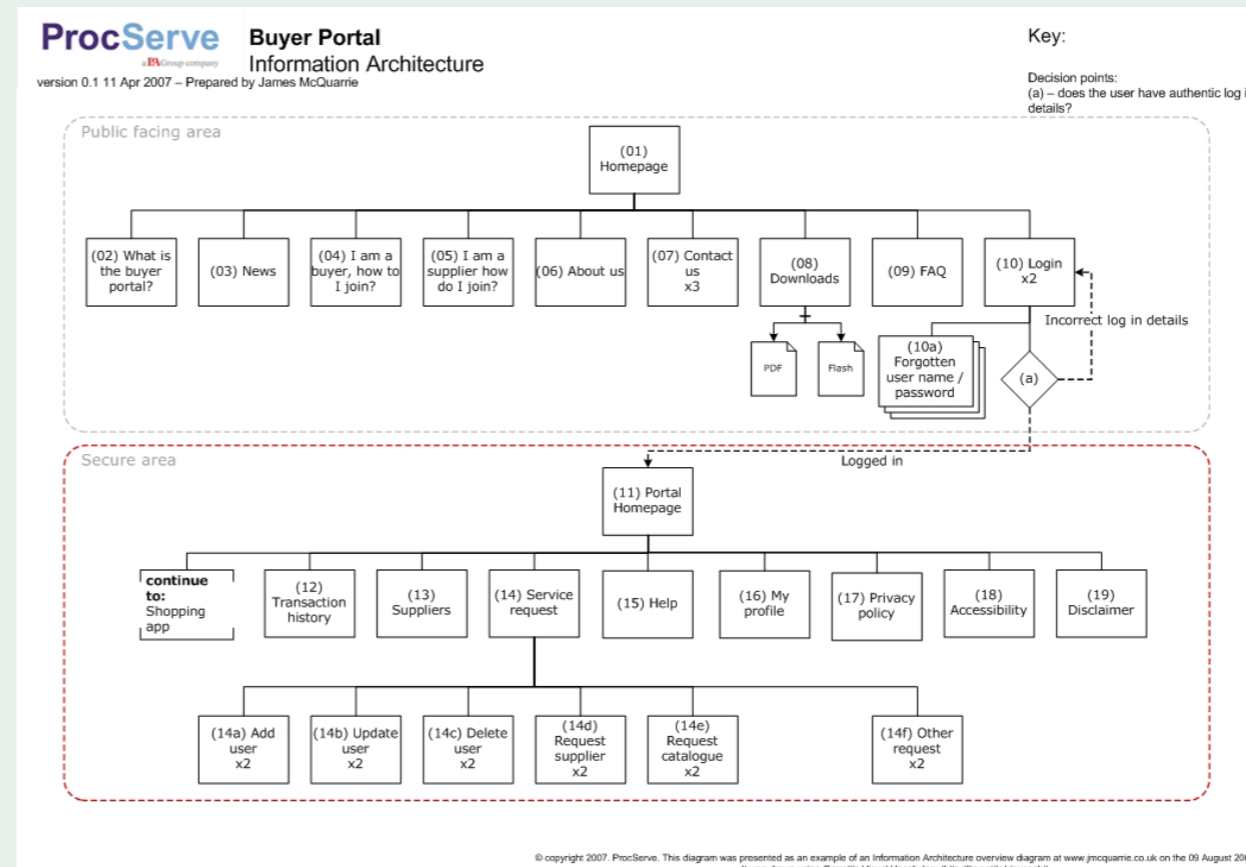


Figure 13 Information architecture (McQuarrie, 2007)

6.1.2 Information architecture

The practices and guidelines responsible for transforming raw data into valuable insights are governed by information architecture. Pervasive information architecture refers to a framework designed to organize, store, retrieve, display, manipulate, and share information. It ensures constant access to information across various aspects of a wide-ranging environment (Hartson & Pyla, 2019). An information architecture is often determined and used by UX and UI designers for web pages, apps and more.

Figure 13 shows an example of an information architecture for a buyer portal. To achieve agility in the IT landscape it is essential to understand what the influence of information and data architectures are on the agility and vice versa. Methods like master data management and information engineering are known approaches that organizations use to create single sources of truth and are suitable for effectively standardizing data, however, they can make it more difficult to customize data and transform it into strategically applicable data (DalleMule & Davenport, 2017). It is therefore necessary to understand what is more effective for increasing the agility of the IT landscape, considering the operating context and processes, for one organization standardizing data might be more effective and for another it might be more effective to have highly customizable data.

6.1.3 Integration & interoperability

Integration of new (third-party) components is part of business development and value creation. When components can share and interpret data amongst each other, the system will be able to achieve adequate coupling, increasing the interoperability and integration as described by Nissen & Von Rennenkampff (2017). Therefore, within the data and information architecture, there needs to be high homogeneity, formed by

standards and controls. Integrating data from different sources quickly allows for high adaptability. However, disparate disciplines using incompatible data standards and nomenclatures creates barriers to realization and exploitation of this potential as it lowers the interoperability of systems (Migliorini et al., 2019).

6.1.4 Data management

Data is an asset, and it needs to be managed like any other asset to ensure availability, traceability, quality, integrity, and compatibility of data (Kapitany, 2021). There is the possibility of putting a data management system in place to improve these characteristics of data to increase the agility. Additionally, for risk management it is a necessity to have a secure data governance in place. A part of data governance is determining who can access what data, who has ownership and ensuring data quality. To ensure agility within the IT landscape it is important that there is a high level of interoperability of data (Sengupta & Masini, 2008). Meaning, every system can process the same data, in such a way data can be shared throughout the system and is available in the right place at the right time.

6.1.5 Data availability and quality

As mentioned above, the agility of the IT landscape is influenced by data availability, which determines whether data is available to all actors and stakeholders at real-time or not. If data is not available at real-time, but is only updated at weekly intervals for example, this can lower the ability to sense changes and respond to them quickly. Additionally, data quality should be ensured because inconsistent, redundant, or incomplete data is less reliable. A data architecture principle to ensure consistency and quality is the single source of truth, meaning there is one set of data that is correct, preventing the existence of multiple locations

storing different versions of the same data. Making use of smart contracts on blockchain is a method for creating a single source of truth between multiple actors (Holl, 2018).

6.1.6 Data technologies and processes

There are different methods and technologies for storing and processing data. Traditionally data is stored in data warehouses, with structured, semi-structured or unstructured data. Nowadays, some organizations are transitioning towards new technologies for storing and processing data, such as data lakes, meshes and marts. In traditional data warehouses, data is generally stored in files and folders, data lakes contrast from this as data is stored in the original format. This makes data lakes more agile as it can be configured and reconfigured more easily. Additionally, it allows for efficient storage and makes data compatible with standard data-discovery tools (McKinsey & Company, 2016). Figure 14 shows an example of how such a data lake would function.

Large organizations with outdated traditional warehouses may struggle with the existence of data silos, resulting in high cost and inefficiency. Getting rid of data silos and automating data management can increase speed and efficiency, positively influencing the agility of data within an organization (Oliveira et al., 2016).

Newer types of repositories, where data is treated as a product, can be the basis for data architectures such as data meshes or data fabrics. Figure 15 shows a visualization of traditional data consumption, which can lead to complexity in data architectures and redundancy, slowing down development and increasing difficulty of maintenance. Figure 16. shows a data product approach like utilized by data meshes.

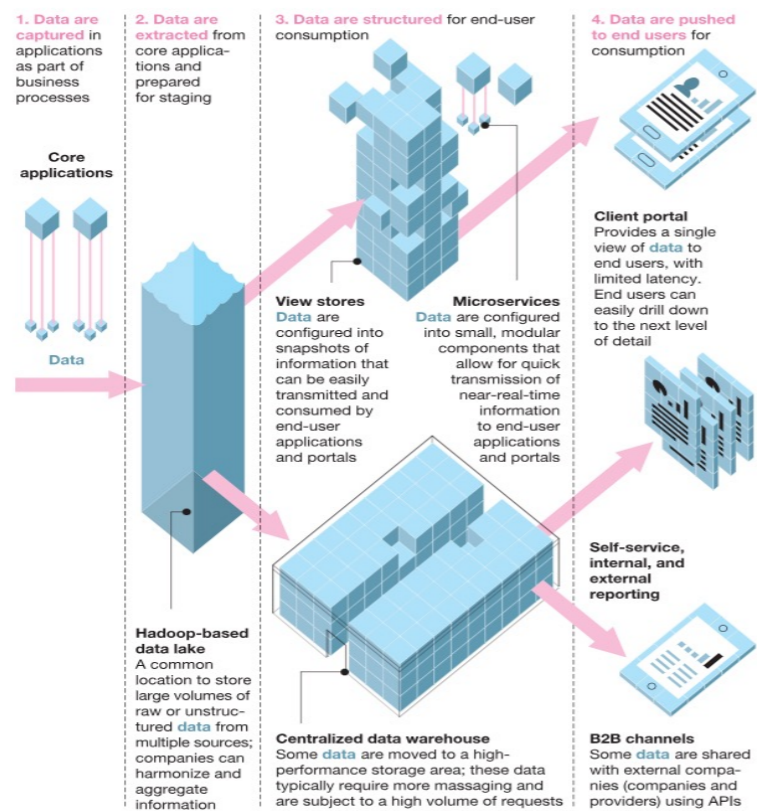


Figure 14 Data Lake process (McKinsey & Company, 2016)

Data product approach

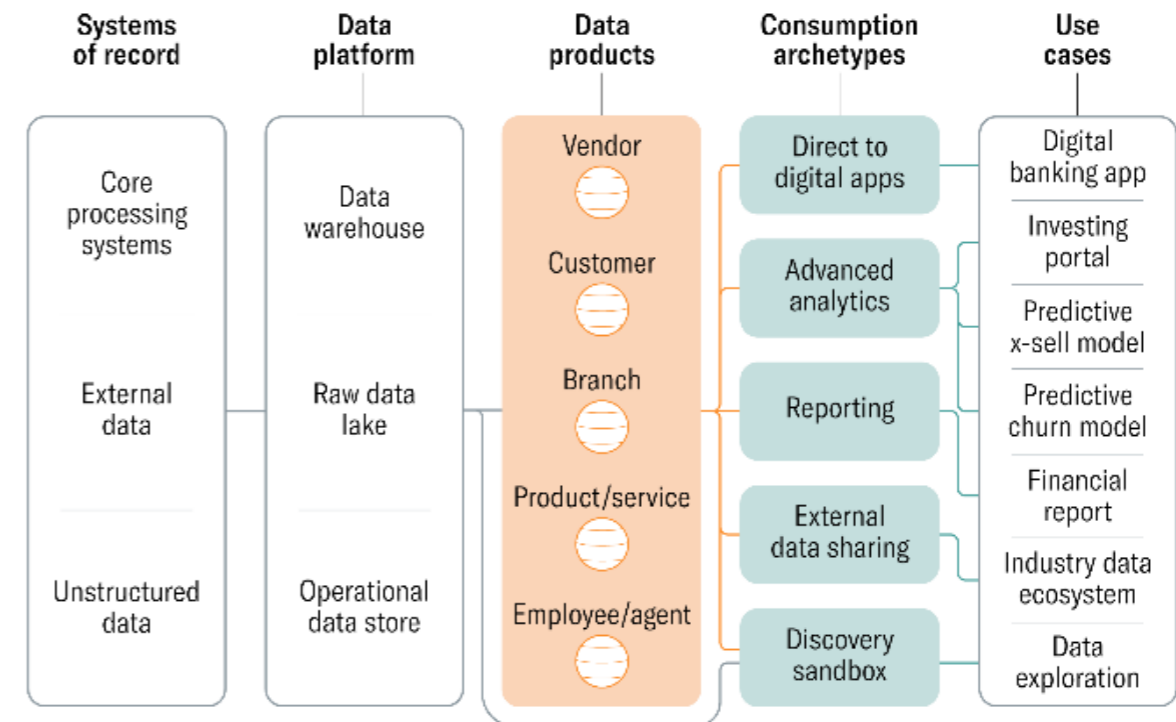


Figure 16 Data product approach (Harvard Business Review, 2022)

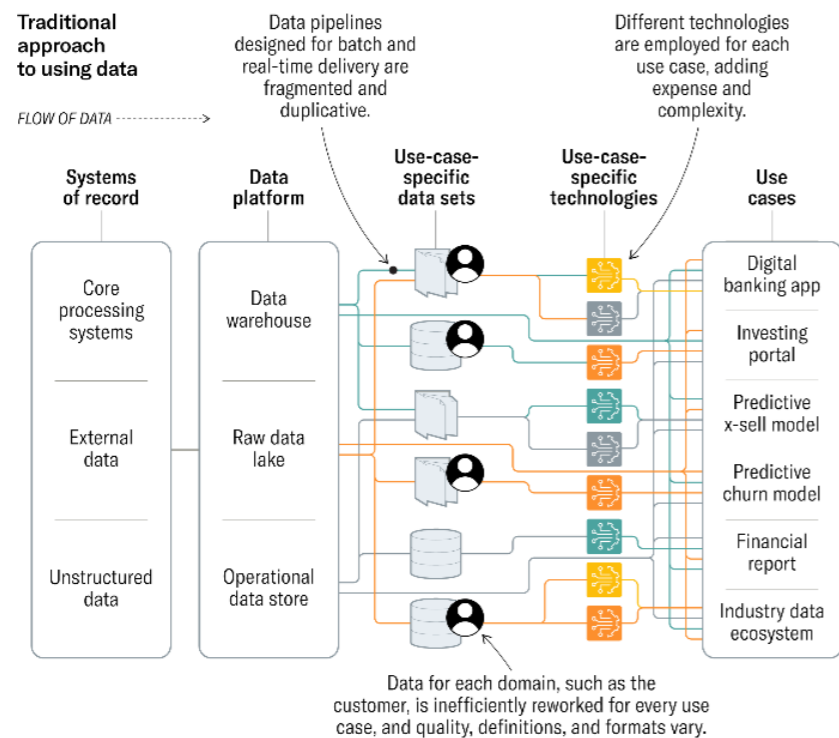


Figure 15 Traditional data consumption architecture (Harvard Business Review, 2022)

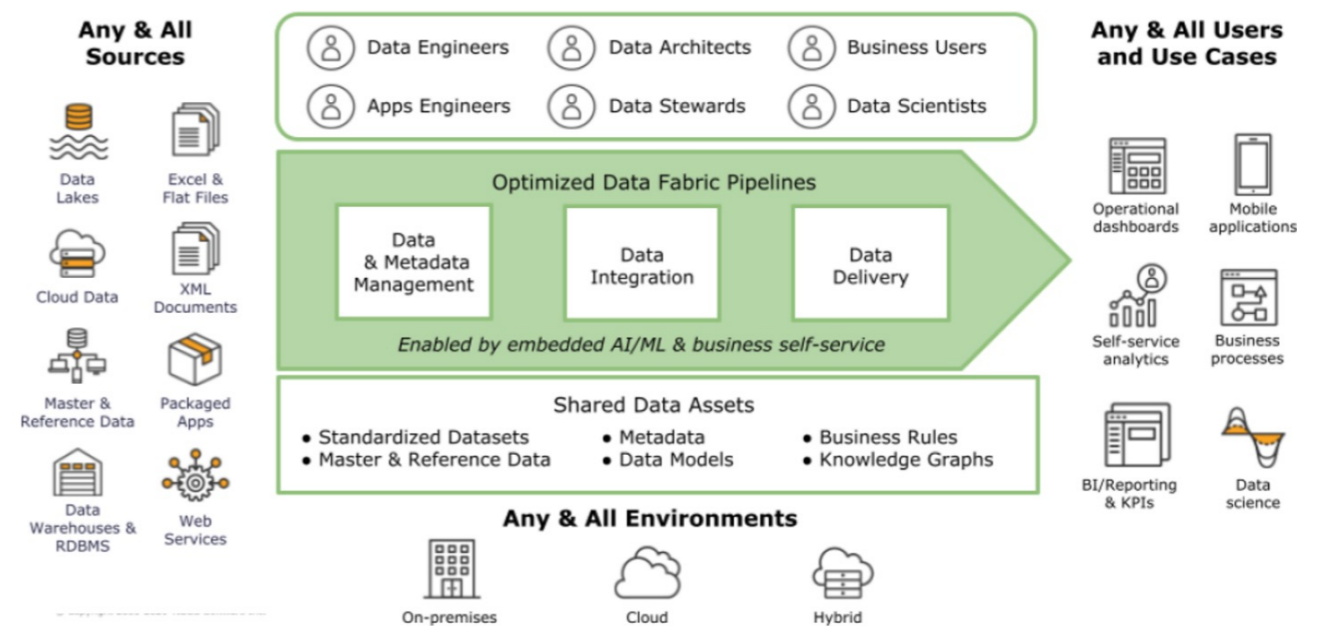


Figure 17 Data fabric architecture (Ascention, 2021)

By using standardized data products and consumption archetypes, the amount of work required to manage data is reduced, the architecture is simplified and time to create value is decreased (Desai, 2022). A data mesh is a decentralized architecture where data is organized by different domains.

Next to the concept of data mesh, there is the concept called data fabric. A data fabric is a machine-enabled data integration architecture that unifies, integrates, and governs diverse data environments. Data fabrics increase data security and accessibility by standardizing, linking, and automating data management techniques and processes. They also allow end-to-end integration of data pipelines and on-premises, cloud, hybrid multi-cloud, and edge device platforms (AltexSoft, 2022). Figure 16 shows a basic setup of how a data fabric architecture would be structured.

6.1.7 Conclusion on data

Data is crucial for organizations to communicate, operate, and generate insights on operations and users through analytics and reporting. Information architectures determine how, where, when and to whom information is displayed. Data architectures determine how data is structured, processed, stored and transmitted throughout a system. For the agility of IT landscapes, these can determine how well data enables quick sensing and responding capabilities.

It becomes clear that traditional data warehouses are generally more complex and rigid, making it more difficult to ensure adaptivity, high speed delivery, interoperability, and integration. Architectural archetypes such as a data meshes, and fabrics can solve these issues by integrating multiple data sources,

platforms, and users. Standardization and automation allow for higher integration, interoperability, and the ability to generate insights more easily, making not only operations but also the IT landscape more agile. However, high levels of standardization may form a risk for agility as it lowers the ability to customize data and information. Based on the introduction into these technologies we can consider that technologies like data lakes and fabrics, treating data as products, can increase agility compared to a traditional warehouse approach. Which technologies and approaches lead to the most agile IT landscape differ per organization and its data needs and use.

Key takeaways

12. Data agility:

- Data serves as the foundation for agility in the IT landscape. Agility relies on how quickly data can be collected, processed, and utilized to sense and respond to changing circumstances.

13. Integration & interoperability:

- Integration of new components and ensuring interoperability enhances adaptability within the IT landscape. However, achieving high homogeneity through standards and controls is essential to overcome barriers posed by incompatible data standards and nomenclatures.

14. Datamanagement:

- Managing data as an asset ensures its availability, traceability, quality, integrity, and compatibility. Effective data governance, including secure access, ownership determination, and data quality assurance, is crucial for managing risks.

15. Data availability and quality:

- Real-time data availability and ensuring data quality are essential for agility. Principles such as the single source of truth and technologies like blockchain for smart contracts contribute to maintaining data consistency and reliability.

16. Technologies and processes:

- Transitioning from traditional data warehouses to newer storage approaches like data lakes and implementing architectures such as data meshes or data fabrics, simplifies data management and increases efficiency, ultimately enhancing agility.

17. Contextual consideration:

- The choice of technologies and approaches for achieving an agile IT landscape depends on the organization's context and needs. Considering specific situations and requirements is crucial for selecting the most suitable solutions.

6.2 Software

Software is essential in the digital landscape and can be described as “a set of instructions, data or programs used to operate computers and execute specific tasks” (Rosencrance, 2021). Application software is defined as “software designed to carry out a certain general utility task” (Jazayeri, 2003). Within organizations there exist many types of applications, for example word processing software such as Microsoft Word, web browsers such as Google Chrome, business intelligence applications such as SAP Business Objects, and so on. Figure 18 shows an exemplary ecosystem of applications for both internal and external operations.

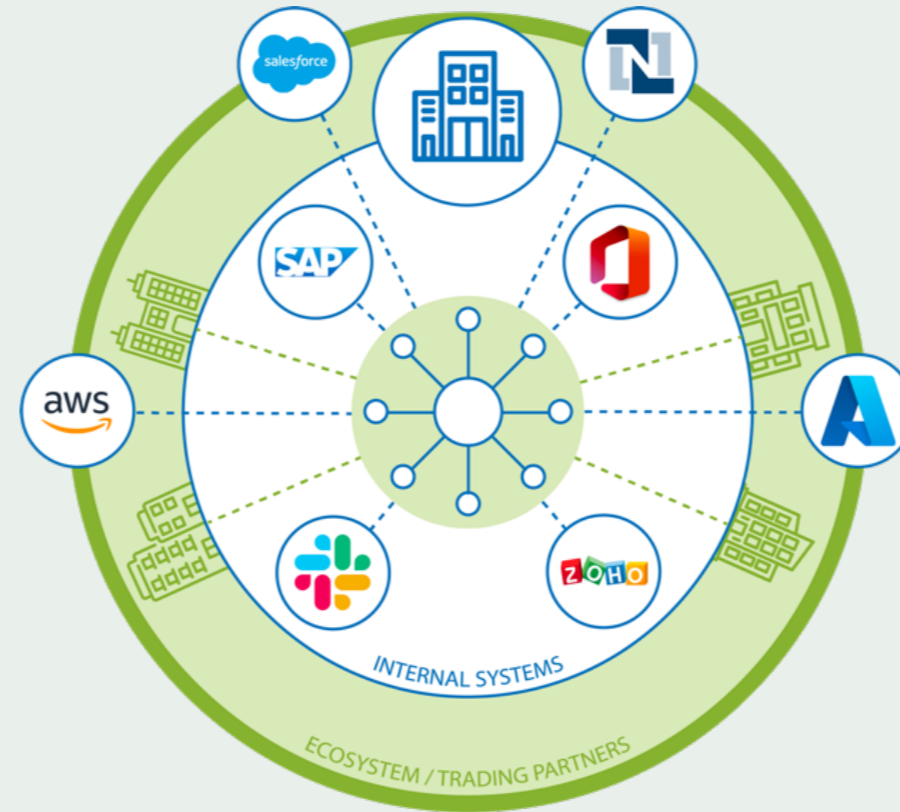


Figure 18 Exemplary ecosystem of applications

6.2.1 Software development

Applications can be developed in-house by software engineers, or externally and bought or used as a service. This last type of software is called Software-as-a-Service (SaaS). The increasing attractiveness of SaaS technologies is supported by features that facilitate fast adoption processes like small initial financial investments for obtaining, as it is provided on a subscription-based model (Venkatachalam et al., 2014).

Additionally, the implementation of SaaS platforms is notably quick and uncomplicated (Siu, 2020). These features distinguish the adoption of SaaS technologies from traditional self-built technologies, since the perceived risk shifts from potential financial loss to potential obstacles in harnessing SaaS benefits and realizing associated advantages. For the sake of agility, it could therefore be advisable to implement quick solutions like SaaS instead of going through lengthy processes of building software in-house (Mero et al., 2022).

If we compare in-house software to software as a service, we can see some differences that might have a high impact on the agility of the IT landscape and organization. Figure 19 shows a comparison of both types of software. As we can see in the comparison by Nata (2022), the implementation time of in-house developed software is considered as long, and the scalability is limited. Additionally, the cost of development is higher and specific IT expertise is necessary. These factors can limit the agility of the software and the IT landscape. However, having unlimited customization and the freedom to build every feature and functionality needed, could enable agility as it improves the ability to respond to new needs.

It is therefore essential for clients to determine over what axis a higher agility is needed, balancing between speed, scalability, customizability and cost. One of the biggest risks considered for SaaS is a vendor lock-in, where the migration of applications and data to different providers becomes too expensive and time-consuming (Opara-Martins et al., 2014). There are several reasons for a lock-in, such as incompatibility with software from competitive vendors, lack of interoperability due to closed architectures or exclusive standards, and sole right licensing of software.

Comparison areas	SaaS	In-house
Initial cost	Less expensive	More expensive
Implementation	Short to long	Long
Scalability	Rapidly scale up and down	Requires additional configurations
Staffing	Limited need for staff	Requires IT expertise
Features and functionality	Based on provider and best practice based	Unlimited and can be adjusted to business processes
Updates and security patches	Handled by vendor	Requires IT expertise
Database management	Handled by vendor	Requires IT expertise
Customization	Limited	Expansive
Business continuity	Handled by vendor based on SLA	Own responsibility

Figure 19 Comparison of SaaS and in-house developed software

6.2.2 Platforms

In general, applications used within organizations used to be built for specific platforms, which are often referred to as the operating system on computers, such as Windows and Macintosh. However, it is essentially a combination of hardware and software that operates as the platform (Rodero-Merino et al., 2012).

It is the software that allocates different resources such as the CPU and GPU to run the applications on. Operating with different types of platforms can raise compatibility issues, which can be mitigated using virtualization. SaaS products can also overcome these issues by operating on PaaS (platform as a service) and even on top of IaaS (infrastructure as a service). Essentially PaaS is a cloud-based technology which is used for creating, executing, and overseeing applications, all without the expenses, intricacies, and rigidity typically associated with constructing and up-keeping such a platform on-site. These types of platforms can overcome compatibility and interoperability issues of software, but might also bring security issues and share some limitations with SaaS, such as dependency on vendors and limited customization options.

Key takeaways

18. Software

- Software is integral to the digital landscape, encompassing instructions, data, or programs used to operate computers and execute specific tasks (Rosencrance, 2021). Application software, designed for specific utility tasks, comprises various types within organizations, such as word processing (e.g., Microsoft Word), web browsers (e.g., Google Chrome), and business intelligence tools (e.g., SAP Business Objects) (Jazayeri, 2003).

19. Software-as-a-Service (SaaS) Adoption:

- SaaS, providing software on a subscription basis, facilitates fast adoption with low initial financial investments and quick implementation (Venkatachalam et al., 2014; Siu, 2020).
- The agility of SaaS solutions contrasts with traditional in-house software development, favoring quicker solutions over lengthy development processes (Mero et al., 2022).

20. Comparing In-house Software to SaaS:

- In-house software development offers unlimited customization but entails longer implementation times, limited scalability, higher development costs, and the need for specific IT expertise (Nata, 2022).
- Organizations must balance agility requirements with speed, scalability, customizability, and cost considerations when choosing between in-house development and SaaS solutions.

6.3 Infrastructure

As became clear in the previous chapter, many processes within an organization rely on specific software applications. These applications need a certain foundation, which is referred to as the IT infrastructure. Infrastructure serves as the fundamental support for a system or organization. When it comes to computing, the IT infrastructure encompasses both tangible and intangible resources essential for enabling flow, storage, processing, and analysis of data. McKay and Brockway (1989) were some of the first to describe an IT architecture and defined it as “the enabling foundation of shared information technology capabilities upon which business depends”.

An IT infrastructure can be centralized in a data center or distributed across multiple data centers managed internally by the organization or externally by third-party entities like colocation facilities or cloud providers (Longbottom & Bigelow, 2020). To evaluate the agility of the complete landscape, it is important to understand what the influence of the IT infrastructure is. Capabilities that form the infrastructure are essentially build up from three elements: storing, computing, and networking. These elements can, for example, include some of the technologies mentioned in Figure 20.

The ability of an IT landscape to adjust rapidly and cost-effectively to system changing demands, that come with changes in business practices or strategies, is determined by infrastructure flexibility. The ideal flexible infrastructure would be one that is built to adapt in tandem with emerging technology and supports the ongoing redesign of businesses and related operations (Salmela et al., 2015). If for instance the demand on an IT landscape increases due to an increase in traffic, it is dependent on the ability of the infrastructure to increase capacity. An organization may need more bandwidth in their networking capability, more storage capacity on servers, or increased processing capacity in

its computing capability. It might also be the case that customers have demands for a new service which will require a new platform which is incompatible with current infrastructure capabilities. The agility of the infrastructure will determine how quickly the organization is able to provide new services to customers and adapt to changing demands. Figure 21 shows a stack, illustrating how applications can run on platforms on top of an infrastructure. This illustrates that the functioning of the complete system is dependent on the IT infrastructure. When multiple applications share infrastructure resources, this means that the impact of infrastructure down-time on the IT landscape will be larger than down-time of one of the applications.

The measurement of the agility of the IT infrastructure from a technical perspective can for instance be done based on the IT connectivity, application functionality, IT compatibility and the data transparency according to Byrd and Turner (2000). Where others suggest measuring it on a basis of business impacts and benefits such as the speed of business process changes (Broadbent et al., 1999) or improved organizational responsiveness (Bhatt et al., 2010). It becomes apparent that there are two models that are of high influence on the agility of the IT infrastructure, namely the hosting and service model. The influence of both categories will be explained in the following sections. Additionally, the IT architecture determines how the data, applications and infrastructure are connected and therefore influences the agility of IT landscape (Weill et al., 2002).

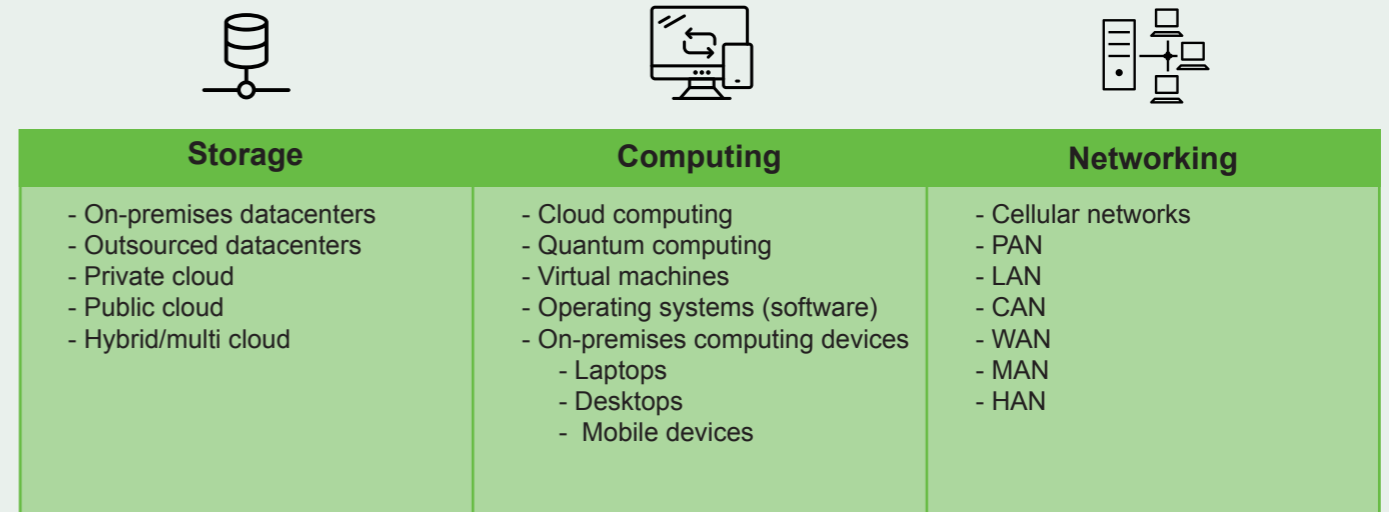


Figure 20 IT infrastructure technology overview

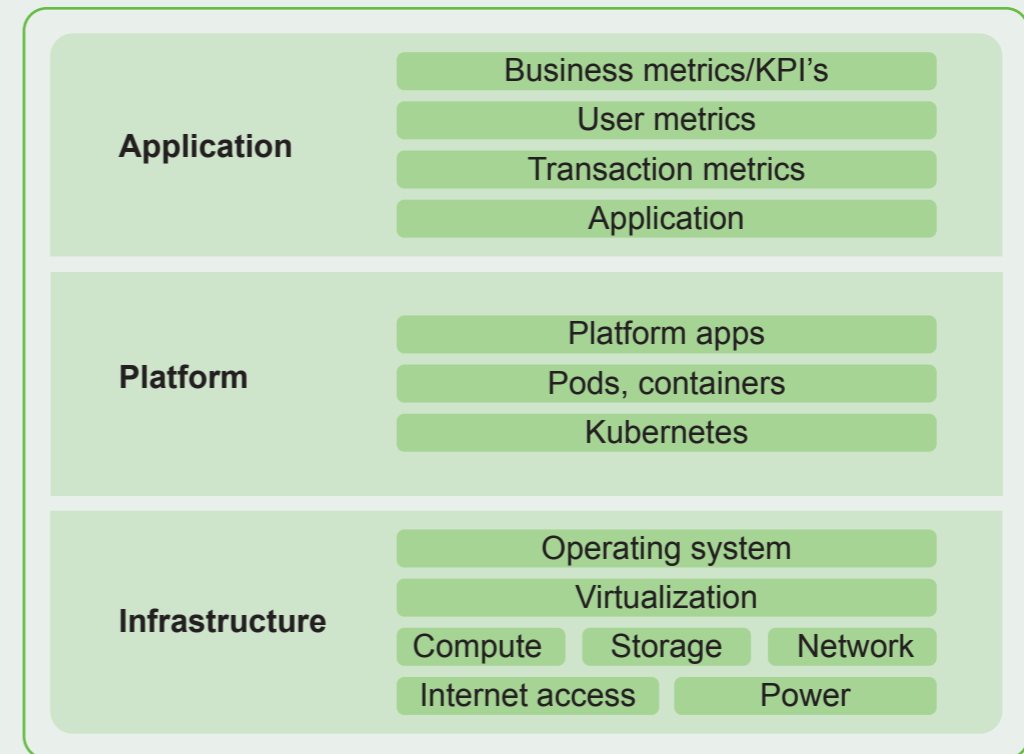


Figure 21 Software stack example

6.3.1 Infrastructure hosting model

One of the aspects of the infrastructure is the hosting model, where a distinction can be made between physical datacenters, server hosting, virtual machines, and cloud. In physical datacenters, bare metal servers run on-premises, hosting operating systems and services such as databases and applications. The constraints of this type of hosting model are that delivery of hardware and software in general must be deployed manually. Adding or integrating new components to the existing infrastructure depending for a large degree on the manual configuration along the complete chain involved in the infrastructure, making the addition and integration complex, time consuming and expensive (Johansson & Rusu, 2019) lowering the agility of the IT landscape.

Organizations can increase their infrastructure agility by automation of processes concerning their infrastructure. Scalability, both vertically and horizontally is one of the barriers for agility in a physical datacenter landscape. A demand for higher capacity means building new server units or adding additional CPU, RAM, or storage to existing servers. It takes time to integrate and, once build, scaling down is not always an option because of investments made. This can slow down the speed of development. There is a high reliability on the availability of the right personnel and resources to place the servers and budget, creating a risk of latencies in development and deployment. If an unplanned downtime occurs to one of the physical servers, the chances of long recovery times are high and an impediment of agility (Johansson & Rusu, 2019).

Another type of infrastructure hosting model, providing users of the IT landscape with remote access to server resources such as memory, CPU, Disk, and more used to run applications and store data without having to buy, (re)configure and maintain the server hardware is server hosting (Inap, 2020). For server hosting there are

physical datacenters, filled with bare metal or dedicated servers. These servers are used for various services provided by the hosting provider, such as: databases/storage (database software on a server), dedicated servers (renting a complete server), VPS (sharing a server with multiple users), application hosting, and network infrastructure (private networks).

Virtualization is done with virtual machines or containers. Virtual machines are very similar to physical computers, except they are virtual. Meaning that it is a virtualization of a computer running on another computer. One of the advantages of virtual machines, is the fact that the applications running on the virtual machines are blocked off from accessing the physical machine acting as a host (García-Valls et al., 2018). The virtual machine itself is not running on the host directly, but through a hypervisor communicating between the virtual machine and the physical hardware. The hypervisor coordinates the use of processors, memory and storage by the virtual machine and prohibits the virtual machines from interfering with one another. This technology can offer multiple advantages, such as, scalability, portability, flexibility, security and improved resource utilization.

Containers use a different method for virtualization. Multiple services or applications operate on one host operating system. The concept of containers is packaging software code in such a way that it can switch between servers running a Linux OS, such as Ubuntu, Debian, fedora, and more. One of the benefits of containers is that the software can be connected to build a distributed application in the cloud. This allows for an acceleration in building large scale applications and increases scalability (García-Valls et al., 2018).

Organizations have been adopting cloud computing over the last decennium, but there has been a strong

increase over the few last years. The Google Cloud Brand Pulse Survey, Q4 2022 (Franklin, 2023) shows that 41,4% of IT leaders are increasing their use of cloud-based technologies and services and that 33,4% is planning to migrate their legacy software to the cloud. Additionally, it shows that 32,8% of IT leaders is planning on migrating their on-premises workloads to cloud-based resources.

Cloud computing makes use of dynamic resource scheduling to balance loads between different resources and can be seen as a “type of computing technique where IT services are provided by massive low-cost computing units connected by IP networks” Qian et al. (2009). Qian et al. (2009) describe the history of cloud computing and the basic technological components that help to build an understanding of cloud capabilities. Cloud computing can be seen as one of the more suitable solutions to support the maximum amount of end users and increase the elasticity of infrastructures while using minimal resources. Cloud computing is the use of large-scale computing resources by making use of a shared resource pool. This shared resource pool can be divided into both physical and virtual resources, such as physical servers and virtualized networks (Susnjara & Smalley, 2024).

There are different types of cloud: Private cloud, public cloud, and hybrid cloud (Susnjara & Smalley, 2024). Private cloud is built and operated by enterprises themselves. Whereas public cloud is shared with multiple users and is build and operated by a company and used by external sources. A hybrid cloud means that the resources are shared between private cloud and public cloud through a secured network. Having data in the cloud can raise security and risk questions. Some organizations, for example, are not allowed to store data on servers on other continents for security reasons. As data is stored in an external location

through IaaS, the service provider is responsible and accountable for a part of data security. Risks must be assessed, there is a reliance on the service provider in preventing data breaches and cyber-attacks (Oladoyinbo et al., 2023). These risks can be mitigated by making use of multiple service providers.

6.3.2 Service model

Johansson & Rusu (2019) described, based on their case study on the IT department of a large Swedish enterprise, how the reliance on in-house development, maintenance and support of the IT infrastructure led to limited scalability and formed a barrier for the agility of the IT landscape. The development of the IT department relied on an infrastructure with many different licenses and components which were interconnected and triggered by change. In their example, they describe how setting up one new server, needs the involvement of all the different teams working on the IT infrastructure. This can significantly slow processes down and limit the ability to scale up and down, in comparison to outsourcing the infrastructure to a vendor, which can be called Infrastructure-as-a-Service.

Besides the service model of outsourcing the development and management of physical servers, there are service models for a multitude of cloud-based technologies. Simply put, there are three service types. Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). This means that the infrastructure, platform, or software is not bought or build by the user itself, but the user is paying for the service of the hosted server, platform and or application. Figure 22 shows different types of service models and the components that are managed internally and externally in each service model.

Per service provider it depends what level of customization is provided. By utilizing one of the mentioned service models, organizations only get as much as they use, this can reduce cost and energy consumption. Organizations can satisfy more of their business requirements and user needs on demand, because of scalability on demand. Additionally, it can increase the efficiency of managing resources, by utilizing the ability to dynamically schedule resources. Besides scalability, migration to cloud-based

technologies allows for better accessibility both locally and globally. The global COVID-19 pandemic in 2020 accelerated cloud-first strategies and a shift towards outsourcing IT, leading cloud technologies to account for 67% of total contract value in 2020 (Bhatnagar et al., 2022).

Motivations for organizations to outsource change over the years, during the pandemic it was mainly about reducing cost and increasing flexibility. After the pandemic more about automation, standardization, efficiency of processes, driving business value and accelerating their digital agenda (Deloitte, 2021). However, moving to cloud-based technologies also comes with risks. For example, the dependence on the service provider, especially when using a single cloud environment called vendor lock-in. Where the organization becomes dependent on their service provider because their data is locked-in to one cloud provider, there is a risk of inability to move to data or applications in or out of cloud environments and the risk of data breaches and cyber-attacks.

This can be mitigated by using a multi-cloud strategy, but it is important to consider the interoperability of the different cloud-environments (Opara-Martins et al., 2016). The more practical interoperability challenges of cloud migrations are identified to be a lack of integrations point for the existing management tools, proprietary data formats that cause compatibility issues with the existing software and the inability to switch between service providers or take data in-house. In general, it is also known that cloud environments might cause privacy and security concerns for organizations but also for their customers. Additionally, there is a reliance on the continuity of service, describing the dependence on internet, power, service disruption and system bugs (Qian et al. 2009).

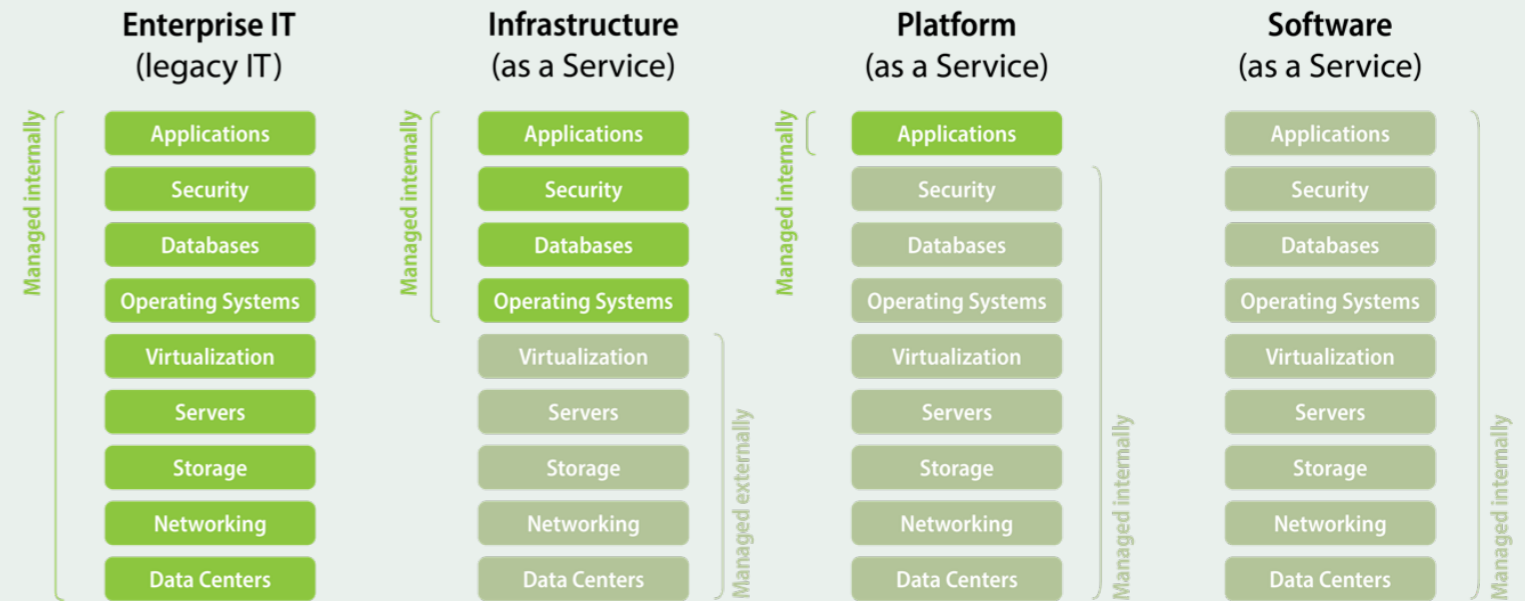


Figure 22 Software stack example

Key takeaways

21. IT Infrastructures

- IT infrastructure provides foundational support for system operations, encompassing tangible and intangible resources for data flow, storage, processing, and analysis (Longbottom & Bigelow, 2020).

22. Infrastructure agility

- Infrastructure agility is crucial for rapid adaptation to changing demands, enabling organizations to increase capacity, respond to new service demands, and maintain operational continuity (Salmela et al., 2015).
- The agility of IT infrastructure is measured based on technical factors like IT connectivity, application functionality, and business impacts such as speed of process changes and organizational responsiveness (Byrd and Turner, 2000; Broadbent et al., 1999; Bhatt et al., 2010).

23. Infrastructure delivery models

- Infrastructure delivery models range from physical datacenters on site to infrastructure-as-a-service (e.g. Cloud), each offering different levels of scalability, automation, and resource allocation (Inap, 2020; Johansson & Rusu, 2019).

24. Cloud Computing

- Cloud computing leverages dynamic resource scheduling and shared resource pools to provide scalable, cost-effective IT services, driving increased adoption and migration to cloud-based technologies (Qian et al., 2009; Franklin, 2023; Bhatnagar et al., 2022).

6.4 Architecture

There can be various sorts of architectures within an organization. In general, the enterprise architecture (EA), software or solution architecture (SA) and the technical or IT architecture are considered in an IT context. The Enterprise architecture (EA) is a detailed blueprint defining an organization's structure. It considers applications and IT systems used within various departments within the company, encompassing core and contributory applications, integration platforms like Enterprise Service Bus and API management, as well as web, portal, and mobile applications. Furthermore, it encompasses data analytics tools, data warehousing, data lakes, operational and development tools such as DevOps tooling, monitoring, backup, and archiving, security measures, and collaborative applications like email, chat, and file systems (Binders, 2023). The idea behind the Enterprise Architecture is that it visually presents the organization in a logical framework.

The solution or software architecture is a set of rules and guidelines that describe how a system and application-system organized, constructed and functions based on business objectives. The solution architecture is often considered from a business perspective and created based on the value it adds to business processes and users. The Ladder of Business Intelligence (LOBI) framework describes 10 different steps for successful implementation of IT, which is based on three pillars: People, process, and technology (Cates et al., 2005). The framework is a methodology that aims to inductively facilitate creation of an IT plan and design of solution architecture for businesses. The architecture is analyzed based on the dimensions mentioned in Figure 23.

Technical or IT Architectures provide an intricate depiction of the diverse technology elements essential for fulfilling business goals, encompassing the principles guiding them and the relevant data (Widjaja, n.d.). Essentially, the IT architecture delineates the

software and hardware structure, with less emphasis on overarching business and corporate strategies, but rather concentrates on how this solution can be supported by the platform. During the development of IT architectures, architects can encounter many challenges. According to the research of Dragičević and Bošnjak (2019), in the industry 4.0 the main challenges in developing a solution architecture have been:

- Balancing agility and architecture
- Scaling
- Interdependence of components
- Interdependence of requirements
- Organization, communication, and coordination
- Application of microservice architecture

When it comes to IT landscape agility, it is essential to understand how the rules and standards applied to the IT systems influence its ability to change at high speed. Simplification of IT architectures by reducing the number of different and redundant systems is one way to go about increasing uniformity of IT architectures and agility. Van Oosterhout et al. (2006) suggest increasing uniformity by expanding and increasing the availability of low-cost high bandwidth network connections to bundle expertise in centers of competency.

However, what becomes clear during this research, is that many organizations increase the size of their IT landscape over the years as their focus is on supporting functionalities rather than on increasing agility. When the organization suddenly requires more agility, the IT landscape and technical architecture need to be reconsidered. Van Oosterhout et al. (2006) quote a CIO of a multinational in the energy sector to illustrate what this can mean for an IT system:

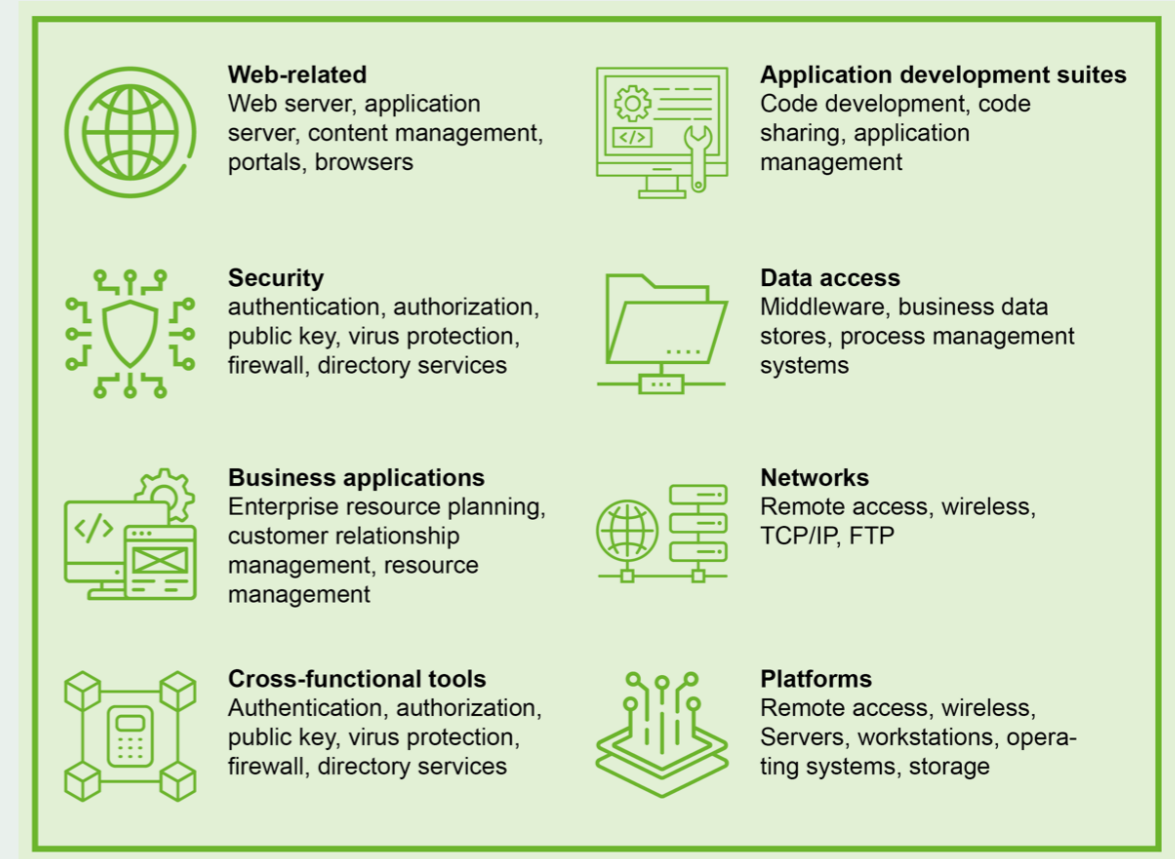


Figure 23 Architecture dimensions (Cates et al., 2005)

“Energy companies used to have integrated systems that have grown over the years to support most of their business functions. Quite suddenly, these systems now must be split up vertically, as new regulations require Chinese walls to be put up between the Retail, Production and metering function’. While the split up is being realized, at the same time, mergers in the energy sector call for horizontal integration.” - CIO in the energy sector

6.3.2 Architecture archetypes

There are different archetypes of architectures utilizing different solutions and structures. The first archetype is the monolithic archetype, which is a more traditional type of architecture. The structure of the monolithic architecture can be considered as one large block. A monolithic architecture refers to a unified, extensive computing network characterized by a single code base that integrates all business components. Implementing changes to such an application necessitates updating the entire stack, involving accessing the code base, and constructing and deploying an updated version of the service-side interface. Consequently, updates are constrained and time-consuming (Harris, 2023).

Another IT architecture archetype is the service-oriented architecture (SOA). A service-oriented architecture is a model for arranging IT components as services, distributed across a network and under control of different ownership domains. Services are interfaces and its underlying applications and platforms, arranged in such a way that each service provides a different business solution (Laskey & Laskey, 2009). The ESB middleware is used as a mediator in between components, allowing for the transfer of data from one system to another, which is often needed with legacy systems wherein different standards and protocols exist (Van Oosterhout et al. 2006). Figure 24 shows an example of a SOA using an enterprise service bus. The ESB create a level of elasticity allowing for higher levels of interoperability and agility than traditional architectures, as it is responsible for the built-in logic supporting interaction and integration, based on functionalities like availability and scalability, (de) coupling, information conversion, security, and routing (Aziz et al., 2020).

Recently, there has been an increase in usage of the microservices architecture (Van Telling, 2023). These are used to decouple systems and decrease the

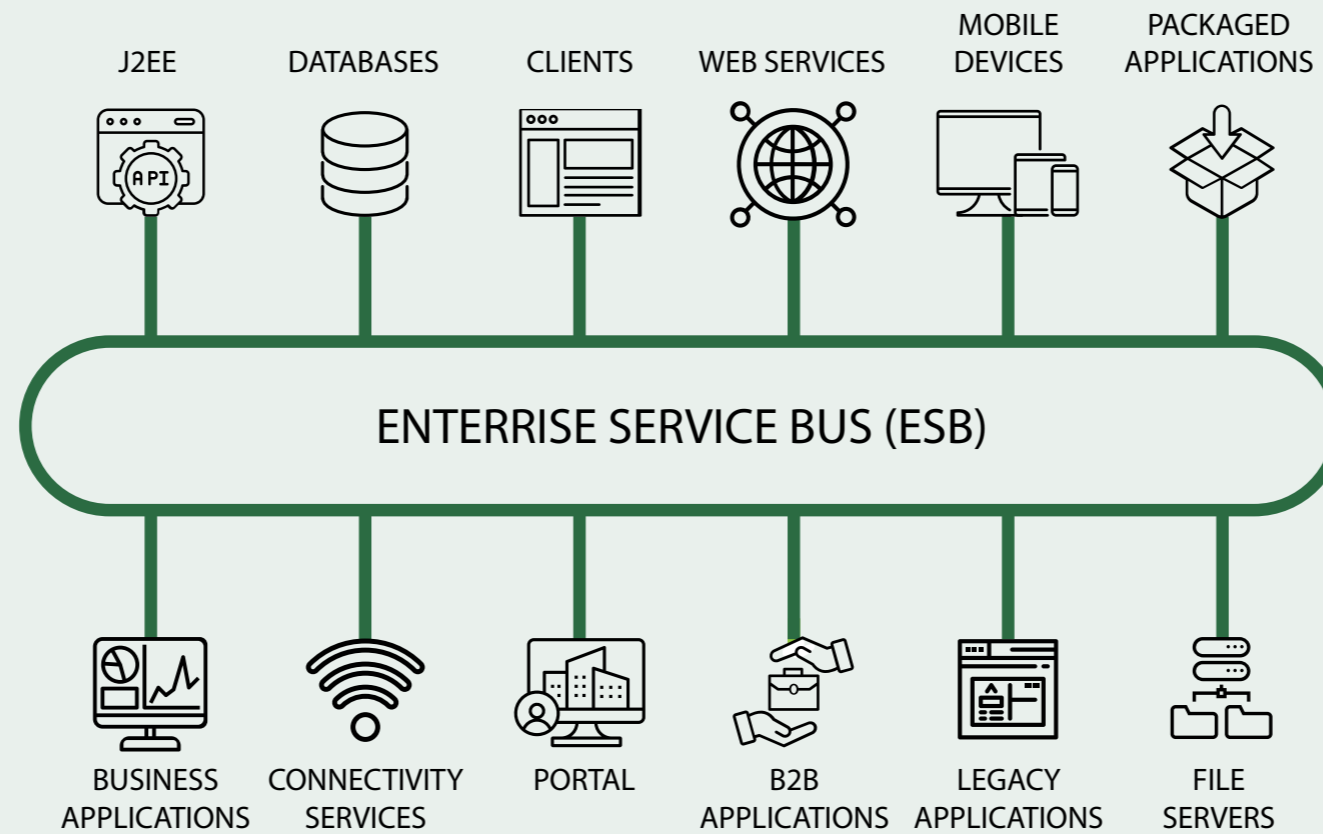


Figure 24 Example of a SOA architecture using an ESB

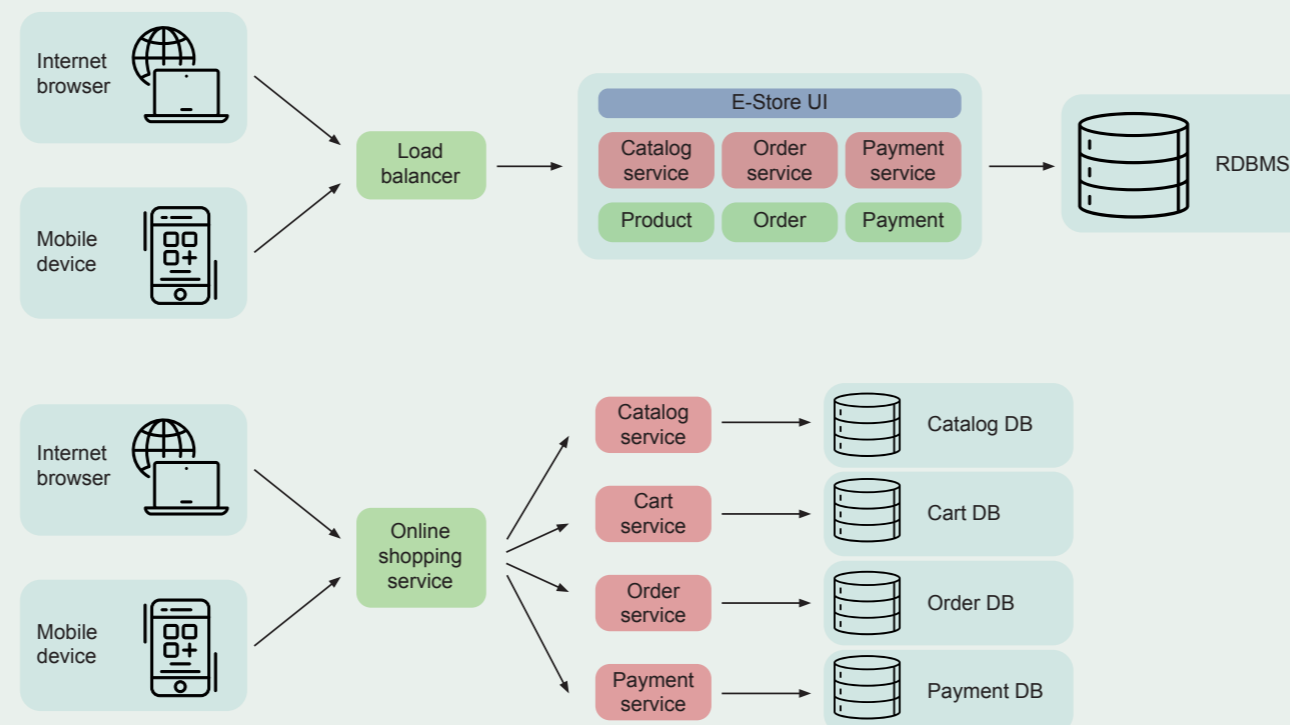


Figure 25 Monolithic architecture vs. microservice architecture

dependencies between components. Figure 25 shows the comparison between a monolithic architecture and a microservice architecture. Microservice architectures enhance the capacity to develop, debug, update, and leverage third-party code (Van Telling, 2023). Microservice designs can improve operations by reducing downtime, optimizing resources, and lowering infrastructure costs.

If large monolithic legacy applications are split up in different microservices using APIs and clients to share data, this will help in building a more resilient and modular system. When for instance one of the microservices is not working properly, it does not necessarily mean that the whole system is down. Whereas a large legacy system, with large applications integrated on one platform, could be completely down if one of the applications isn't working. Since there are often interdependencies entangled within these legacy systems. With the modernization of these architectures and a transition towards a microservice architecture, changes can be made to the IT operating model as well, as it requires new teams to be formed around the microservices. Instead of occasional scheduled deployments, deployment can be done continuously (Harris, 2023).

It is important to understand the needed level of agility to understand what type of architecture fits best with the enterprise and the solution and base the technical architecture on this. The architecture of the applications influences the ability of developers to make changes and respond to changing circumstances. It is logical, that a system split up in smaller components would be more adaptable than one large component providing multiple functions, allowing the microservice architecture to be more agile than the monolithic or service-oriented architecture. For small systems with a limited number of concurrent users and little need

for change because of a stable environment, the monolithic architecture might be more reliable and cost efficient. When a system is operating in a more volatile environment, with a need for high horizontal and vertical scalability, a microservice architecture can be more cost efficient and performs better (Blinowski et al., 2022). It can be concluded that organizations need to consider per application system, what the requirements are and what agility is needed.

Key takeaways

25. Types of Architectures:

- Enterprise architecture (EA), solution architecture (SA), and IT architecture are fundamental blueprints guiding the organization, design, and implementation of IT systems, each emphasizing different aspects of business objectives, technology elements, and organizational structures (Binders, 2023; Cates et al., 2005; Widjaja, n.d.).

26. Architecture Archetypes

- Architectural archetypes like monolithic, service-oriented, and microservices architectures offer varying levels of adaptability, scalability, and complexity, influencing the agility and responsiveness of IT systems (Harris, 2023; Laskey & Laskey, 2009; Van Tellinggen, 2023).

27. Choosing the Right Architecture

- The choice of architecture should align with the organization's agility needs, balancing factors like system complexity, adaptability, and cost-effectiveness to ensure optimal IT performance and responsiveness (Dragičević and Bošnjak, 2019; Van Oosterhout et al., 2006).

7 Characteristics for IT landscape agility

To evaluate how agile an IT landscape is, it is essential to understand what system characteristics determine how quickly an IT landscape can sense and respond to planned and unplanned changes from within the organization and outside of the organization. Dove (1999, 2005) prescribes from a technical perspective what characteristics a system needs to be an agile information system and defined a set of abstract design principles, presented in Table 1. The term system is defined as a group of interacting modules serving the same purpose and modules are defined as software or hardware components.

Desouza (2006) describes that an agile information system is characterized by the ability to modify the system with minimal cost in terms of time, money and effort, the ability of flexible information processing and the ability to adjust to changing needs of end-users. This view shares characteristics with that of Dove (1999, 2005), where modularity, plug compatibility and unit reusability facilitate the ability to modify systems with low effort. Non-hierarchical interactions, dynamic late binding relationships, and distributed control and information facilitate flexible information processing. Additionally scalable size and unit redundancy create the ability to adjust to changing needs of end-users in terms of capacity and fault tolerance.

Contrasting to the view of Desouza (2006) is that Dove (2005) includes self-adapting and dynamic capabilities that allow the system to adapt on itself, increasing speed and efficiency of change. Desouza (2006) additionally adds cost of change, which is for many businesses a key indicator for the feasibility. The more expensive it is to change a component; the more likely it is there will be resistance. Constructs of time, money and effort, as well as cost of change by Desouza (2006), help in quantifying the ability to change. This allows for benchmarking agility of systems or sub-systems.

Arteta & Giachetti (2004) view technology agility as the agility of a system to respond to change, whether it be anticipated or unanticipated, and propose that agility of technology is based on the complexity of an information system as determination for the ease of change. Boiling down the concept of technology to system complexity and ease of change is a high-level approach to determining agility.

Another theory comes from Nissen & Von Rennenkampff (2017), who developed a framework (see Figure 22) for the agility of IT application landscapes. For this theory agility is divided into two high level agilities: functional agility and capacitive agility. Within this framework, functional agility is determined by complexity and high consistency, like the approach of Arteta & Giachetti (2004). Complexity is evaluated based on dependencies and homogeneity. Dependencies are determined by connectivity and coupling between components. The homogeneity is evaluated based on the homogeneity of technologies and homogeneity of interfaces. The other construct of functional agility is evaluated based on consistency, which in turn is evaluated using the modularity and redundancy of the components. Where modularity is considered as a combination of professional modularity and technical modularity and redundancy is determined by the functional redundancy and data redundancy.

Encapsulated unit modularity	"System of interacting unit not intimately integrated. Internal workings unknown externally."
Plug compatibility	"System units share common interaction and interface standards and are easily inserted or removed."
Facilitated unit reusability	"Standardized unit replication information, unit modification tool, unit capability catalogs."
Non-hierarchical interaction	"Empowered self-directed units that communicate, negotiate, and interact directly among themselves."
Dynamic late binding relationships	"Relationships are transient when possible; fixed binding is postponed until immediately necessary. "
Distributed control and information	"Units respond to objectives; decisions made at point of knowledge; data retained locally but accessible globally."
Self-organizing relationships	"Dynamic unit alliances and scheduling; open binding; and other self-adapting behaviors."
Scalable size	"Unrestricted unit populations that permit large increases and decreases in total unit population."
Unit redundancy	"Duplicate unit types or capabilities to provide capacity fluctuation options and fault tolerance."

Table 1 Design principles for agile IS (Dove, 2005)

The need for modularity is supported by Mikalef et al. (2021) suggesting it helps systems sense emerging threats and opportunities more, quickly incorporate outside technologies and expertise, improve lateral collaboration between components and increase the ease to reconfigure different components within an IT landscape. Nissen & Von Rennenkampff (2017) have a similar view on low functional redundancy compared to the design principles defined by Dove (2005), where duplicate unit types are advocated to be an indication of high information system agility. As low functional redundancy describes the fact that components should contain only a small number of functions, to make it easier to duplicate and re-use them, to for instance increase capacity. The framework of Nissen & Von Rennenkampff (2017) does not cover the self-adapting and dynamic capabilities deemed necessary by Dove (2005). It does, however, aim at increasing the interoperability which is seen as an integral element of agility for the IT landscape.

Based on initial talks with experts, it becomes apparent that the framework of Nissen & Von Rennenkampff (2017) is a suitable starting point for a framework for the evaluation of the agility of IT landscapes as it considers the different dimensions of the IT landscape, shown in Figure 26. The framework is created using the same DSR methodology used in this research and has been tested on multiple cases. The goal of this framework was to evaluate the IT landscape based on quantitative input, which is independent of company or landscape size. This makes it suitable for benchmarking between different organizations. The system characteristics discussed above are further investigated in the following paragraphs.

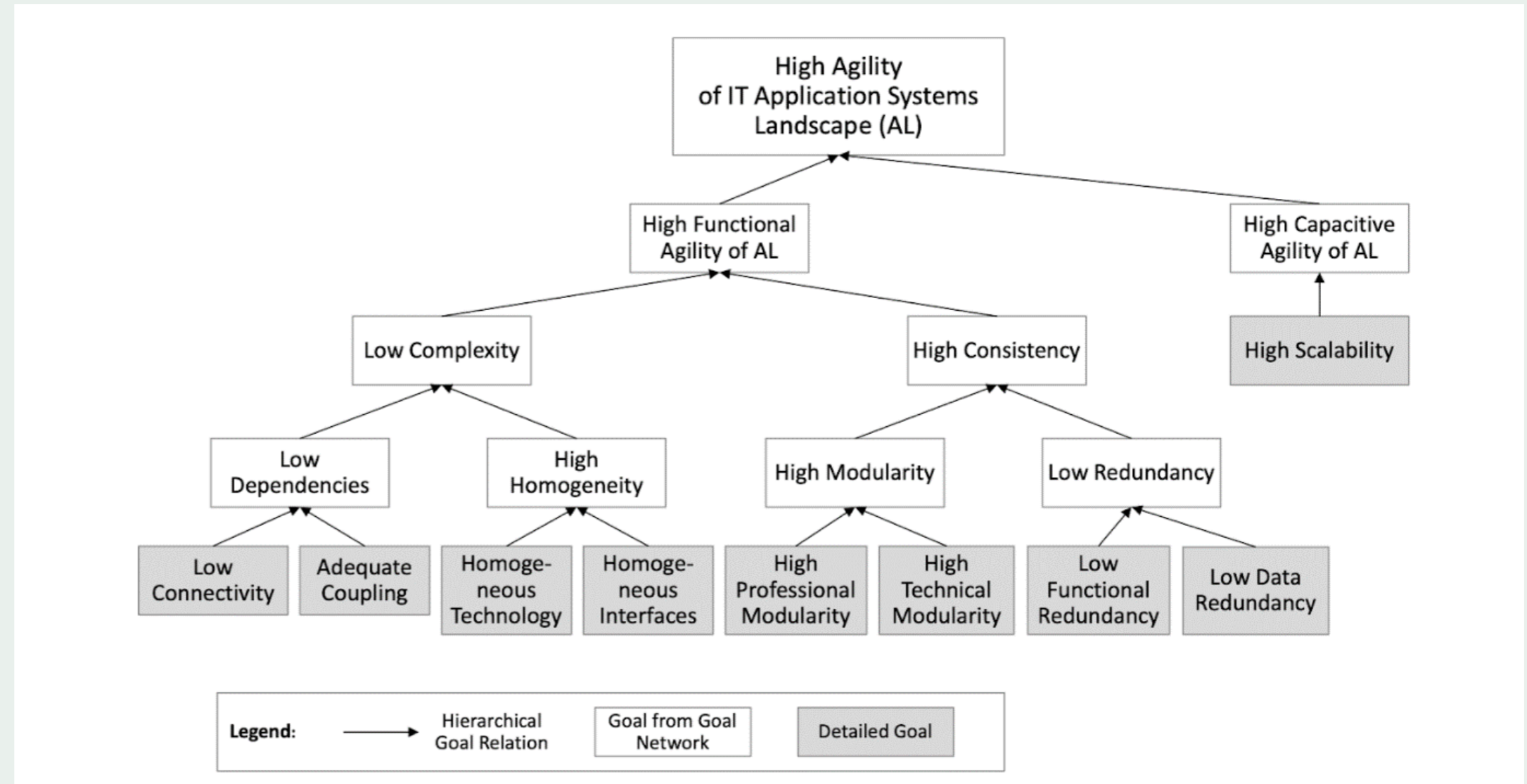


Figure 26 Framework for IT Application Systems Landscape (Nissen & Von Rennenkampff, 2017)

7.1 Dependencies

Within the IT domain, dependencies are defined as the connections among different resources and services (Hanemann et al., 2005). Components are reliant on one another to function and changes in one component may change the functioning of the dependent component. On an enterprise level, dependencies can exist between components in the IT landscape and specialized employees. Within the IT landscape, dependencies can exist between components within the landscape, such as between applications and data, between different applications or between applications and infrastructure components.

Figure 27 shows an abstract overview of dependencies and an interdependency between components. In source code, software dependencies impede IT agility by covering business requirements, resulting in difficulties to adjust systems to evolving business demands (Tarenskeen et al., 2018). There are many types of dependencies, which can either be one way or both ways, making the actors interdependent. Reducing dependencies between systems and system components can increase the modularity of the system, improving the ability to add, remove, or change components without impacting other components (Reitz, 2018), thus increasing the agility of the IT landscape. Reducing the number of dependencies can have a positive effect on the speed of change as it requires less communication and handovers between teams developing, operating, and maintaining these dependent components.

Dependencies generally make the process of implementing change more difficult, it can slow systems down and can pose reliability risks. One of the risks is e.g. that down-time in one component results in down-time of dependent components, posing a threat for business continuity. Complete entanglement of components with many dependencies, can result in a complete outage of multiple applications and

processes, which is often the case with large legacy applications. Therefore, it is key to identify and manage dependencies. Desouza & Redmiles (2008) found that among development teams, there is a positive correlation between active dependency management and performance. It allowed teams to identify problems in their development process early on, accelerating delivery. Nissen & Von Rennenkampff (2017) suggest evaluating the degree of dependencies (connectivity) by determining the ratio of existing connections and the possible total amount of connections between application systems in an IT landscape. Analyzing the dependencies within the landscape or enterprise can also be done through visual graphs of the dependencies, mapping out where the dependencies are located and what the reasoning for this dependency is, or they can be described in a cross-reference report (R. Winter & Schelp, 2008). However, when this is not done from the start, it can be a tedious and time-consuming task.

It is one of the strengths of a service-oriented architecture (SOA) according to Sant'Anna et al. (2007), as the IT landscape strengthens business environments by leveraging a "flexible infrastructure and processing environment by provisioning independent, reusable automated business processes (as services) and providing a robust foundation for leveraging these services". Microservice architectures share this principle, distributing functionalities across independent services within an application. The purpose of a microservice architecture is that the services are operationally independent with an isolated function (Dragoni et al., 2017). When a high number of dependencies is the cause of low agility, untangling large applications can be time consuming and expensive organizations might choose to build separate independent services on the edge of the IT landscape.

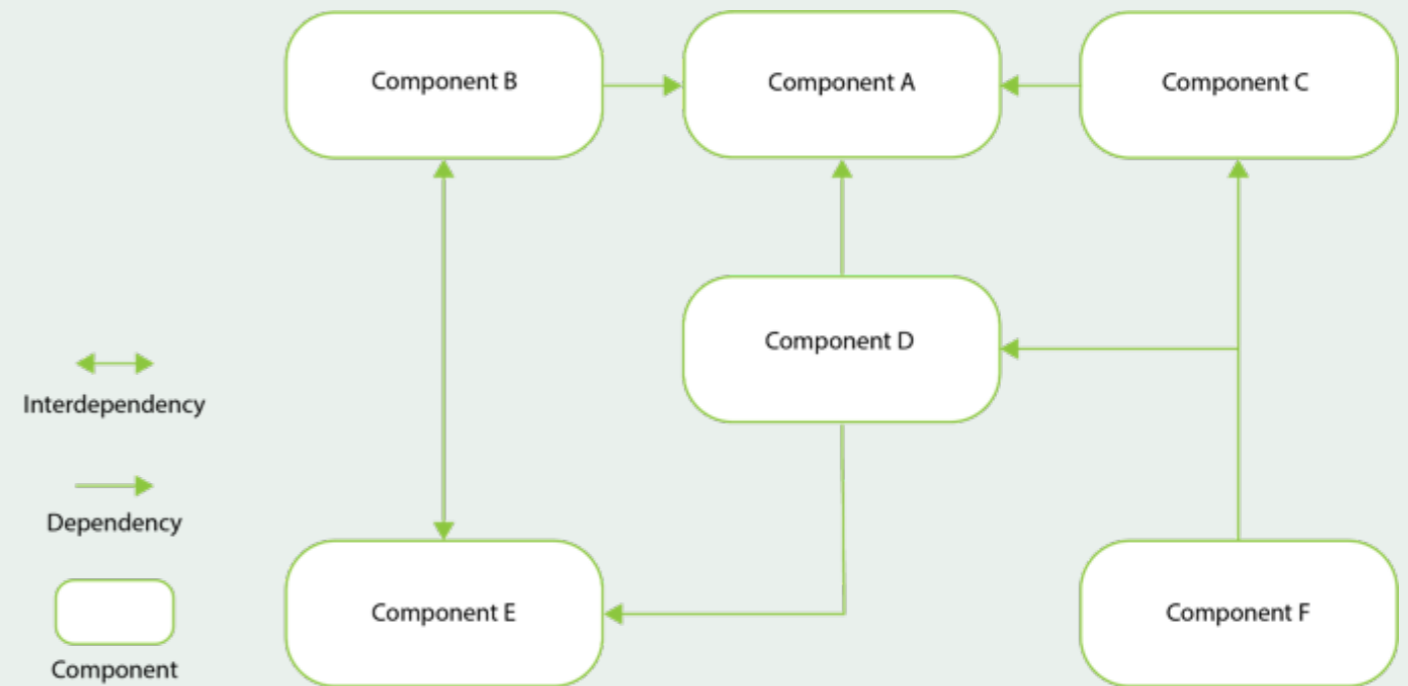


Figure 27 Dependencies and interdependency between components

7.2 Coupling

Coupling is related to dependencies and refers to degree of interdependence between different modules or components within software systems. Tight coupling signifies a tighter integration and reliance between components, whereas loose coupling suggests a more modular and autonomous system (Hasselbring & Steinacker, 2017) improving the agility of IT landscapes.

Loose coupling is desired for three reasons (Offutt et al., 1993): (1) A lower number of interconnected modules, means lower chance that an error or mistake in one module, will cause the failure of other modules. (2) A smaller number of interconnections between modules, means a lower chance that change in one module will result in failure of the other module. (3)

A lower number of interconnections results in shorter development time as it requires less time to understand the connections and the other modules' workings. Overall, it increases the re-usability of modules, increases the development speed and testability, makes systems easier to maintain and reduces the complexity of the landscape (Karhikeyan & Geetha, 2012). Nissen & Von Rennenkampff (2017) describe that the coupling ratio could be measured by defining the ratio between the number of interfaces and the overall number of application systems.

Coupling is mainly created in the source code of applications. Figure 28 shows an abstract visualization of what the different types of coupling between components would look like. Decoupled components are completely independent without information flow, in contrast to highly interdependent components within tightly coupled systems. With tight coupling there is a high information flow, but also a high need for coordination (Amrit & Van Hillegersberg, 2010). So, the type of coupling suitable for the solution is, again, depending on the necessary functionalities and context of the solution.

Karhikeyan & Geetha (2012) list several classifications for coupling in procedural: content coupling, common coupling, external coupling, stamp coupling, data coupling, control coupling and message coupling. Additionally, the authors also describe how the nature of a coupling can arise from different types of dependencies such as, direct, indirect, state, IO, and delayed message dependencies. Appendix C contains a table with descriptions of the different coupling types that can exist within application systems.

Since coupling determines how dependent applications are on data, other applications, and infrastructure, service-oriented-architectures are a solutions to solve a high degree of coupling in the IT landscape. Applications in a SOA should be self-descriptive, independent from platforms and programming languages and discoverable. The initiative to adopt SOA often originates from a need to increase infrastructure efficiency and they generally result in loose coupling and high flexibility of the architecture (Theorin et al., 2017). Although the SOA is meant to deliver high distribution within the architecture, there is generally still a central service orchestrator, like an Enterprise Service Bus (ESB). The ESB is used as a message router enabling the communication between services. This means that different services are still somewhat dependent on one component, creating a single point of failure.

An event-driven architecture (EDA) solves this problem, as each service reacts to events on its own rather than responding to a request from a central orchestrator. The software component publishing the event only must know that an event took place. Leaving out the need for the central body to know who must respond to this event and how the service should respond. Because there is no direct dependent link between the event creator and the service processing the event, the EDA is characterized by extremely loose coupling (Michelson, 2006).

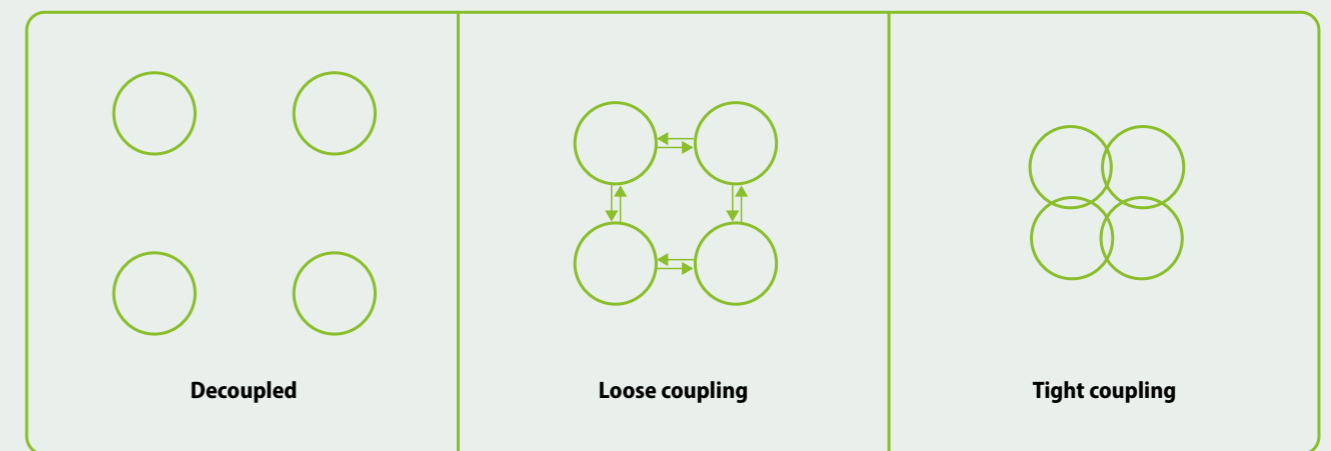


Figure 28 Abstract visualization of coupling types

7.3 Homogeneous technologies

Homogeneous technologies are a group of tools or technologies that have a commonality of features, compatibility, or standards that enable them to be interoperable (Nissen & Von Rennenkampff, 2017). Multiple technologies are frequently utilized within a system and built to be compatible. Homogeneous technologies frequently display similar behavior, data formats, or protocols, which facilitates and improves integration and communication across them. Organizations can streamline their operations, improve compatibility, and foster interoperability between various software systems or components by implementing homogenous technologies (Amorim & Sousa, 2014). Figure 29 illustrates what homogeneous and heterogeneous technology systems could look like; each color represents a different technology.

The portability and compatibility of application systems are facilitated by the consistent implementation of a small number of prominent technologies. The simplicity of function reuse makes modifications quicker, easier and cost efficient, stimulating IT landscape agility (Nissen & Von Renenkampff, 2017). Increased portability means that applications and functions can easily be re-used across several platforms and environments, requiring minimal adaption, and leading to less complications. Integration of homogeneous technologies are improved by shared characteristics, compatibility, and standards among them, incompatibility issues are less common as with heterogeneous technologies. Considerable customization for integration and a larger variety of skillsets within the organization are therefore often not necessary (Buckl et al., 2008).

Complexity of the IT landscape can be controlled by having introduced corporate standards for the use of new technologies and architectural solutions. As a result, integrating and maintaining technologies takes less time and effort, which enables enterprises to

react more swiftly to changing business requirements and market demands. On an architectural level, homogeneous structures are desirable as it allows organizations to reduce their cost of maintaining applications and infrastructure, software, and hardware licenses, and enables them to treat similar issues consistently (Bucher et al., 2006).

A heterogeneity analysis of the landscape helps in identifying architectural elements and patterns that need re-evaluation and restructuring to increase the overall homogeneity of the landscape and thus the agility. On the other hand, one might argue that the presence of heterogeneous technologies might increase resilience. Relying on one type of cloud from one provider e.g. could mean that an outage with this service provider results in an outage of a complete system. Whereas multiple types of clouds could overcome these issues.

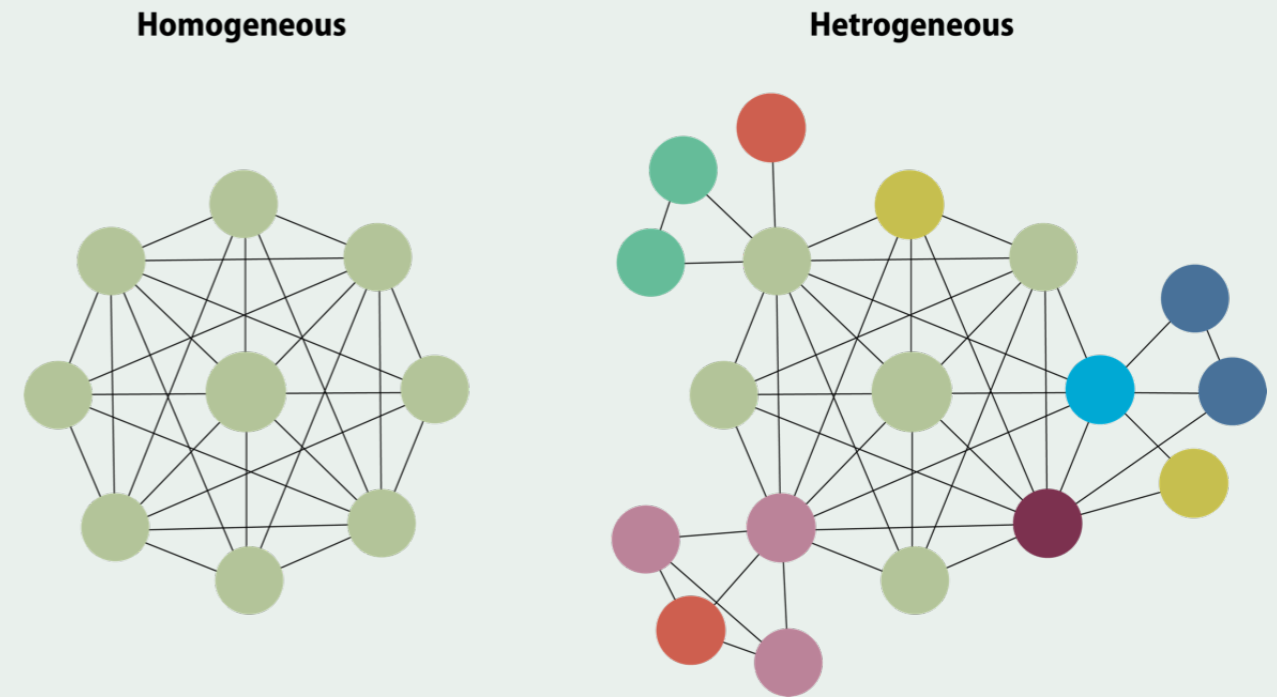


Figure 29 Homogeneous IT landscape (right) versus heterogeneous IT landscape (left)

7.4 Homogeneous Interfaces

The point of contact between components within IT systems is referred to as the interface. Interfaces in large systems can produce numerous problems both in development and evolution of these systems (Perry & Evangelist, 1985). Heterogeneity in interfaces like APIs can block the portability and interoperability of applications and makes the development of applications more difficult because of a need for interpreting the semantics of data and processes (Sanaei et al., 2014). A method for decreasing these types of heterogeneity can be using standardized models for programming and data, and by structuring information in a standardized format (Hasselbring, 2000). Increasing the homogeneity of interfaces, can speed up the development and improve the shareability of data as it eases and accelerates integration. Different types of interfaces exist, such as user interfaces for customers or business teams with command line interfaces, graphical user interfaces or file interfaces. Homogeneity in these interfaces can increase the homogeneity of data and interaction processes. With higher demand for customizability, developers need to find a balance between customizability and homogeneity.

Additionally, there are different types of interfaces between software and hardware components, determining how applications interact with each other and the infrastructure. High interoperability and integration enable developers to connect new systems to existing systems more easily, which is stimulated by homogeneous interfaces (Süß, 1998). Figure 26 illustrates the effect of homogeneous interfaces on the ability to communicate with other components. Application Programming Interfaces (APIs) have the goal to hide much of the business logic and details and only share information requested or pushed to the receiver. Using APIs helps developers in decoupling large and complex systems build for multiples functionalities, by splitting functionalities in different services. Within

large enterprises, there can be several applications with different business logic layers and system requirements, leading to large varieties of interfaces and requirements. The goal may not be to reduce the number of different interfaces to a single type, but rather to make the interfaces as homogeneous as possible by managing the interfaces correctly and setting standards.

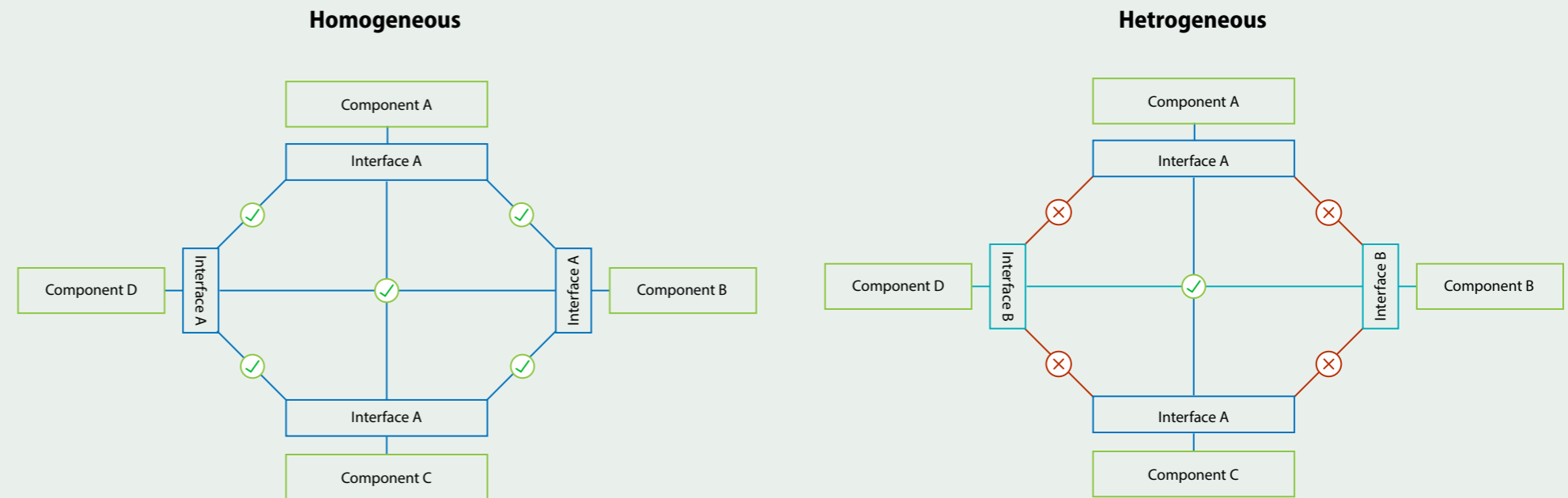


Figure 30 Homogeneous interfaces (left) versus heterogeneous interfaces (right)

7.5 Professional modularity

Another factor in the framework of Nissen & Von Rennenkampff (2017) is professional modularity, referring to the organization of software and hardware components. When there is high professional modularity, each component aligns with a distinct business function and its operations. A method for realizing professional modularity is by splitting up the business processes into modular components and splitting up the landscape components accordingly, which is defined as functional decomposition (Wieringa et al., 2003). To support the professional modularity, teams can be organized around the decomposed components.

The goal is to create business components that can be developed, deployed, and operated independently. The IT systems should be broken down into pieces that are encapsulated, loosely coupled, and have high cohesion. If the services cannot independently be adapted, professional modularity is not achieved (Jardim-Gonçalves et al., 2007). Figure 31 shows an example of professional modularity and the lack thereof. Professional modularity will enable development teams to realize business intent as there is a clear distinction between what IT component serves each business function and will improve collaboration between business teams and IT teams. This will have a positive effect on the agility of the IT landscape as needed change is communicated more efficiently. Having well defined interfaces will allow easier communication and data sharing between different components and increases integration and interoperability. Splitting up larger systems into smaller components also allows for higher customization as business functions can request changes for specific components and it makes support more manageable.

Wieringa et al. (2003) describes multiple decomposition archetypes that can be applied to align business processes with IT by realizing professional modularity. The communication-oriented decomposition is

characterized by defining a component for each of the communication streams with external parties. This can be divided into three different decomposition guidelines.

The first is device-oriented decomposition which means dividing components based on the device facing the external actor. The second one is actor-oriented decomposition, which means that the components are built for serving a specific actor. The third communication-oriented decomposition is the event-oriented decomposition, where the components each serve a specific event triggered by a user of a product or service.

Another type of decomposition that is mentioned to align business with IT and create professional modularity is behavior-oriented decomposition, this aims at splitting components based on the process they handle. This can be done if each business responsibility contains a clearly defined independent process that can be mapped to one application component. The last decomposition method is the subject-oriented decomposition, used to split up components based on parts of the context it operates on.

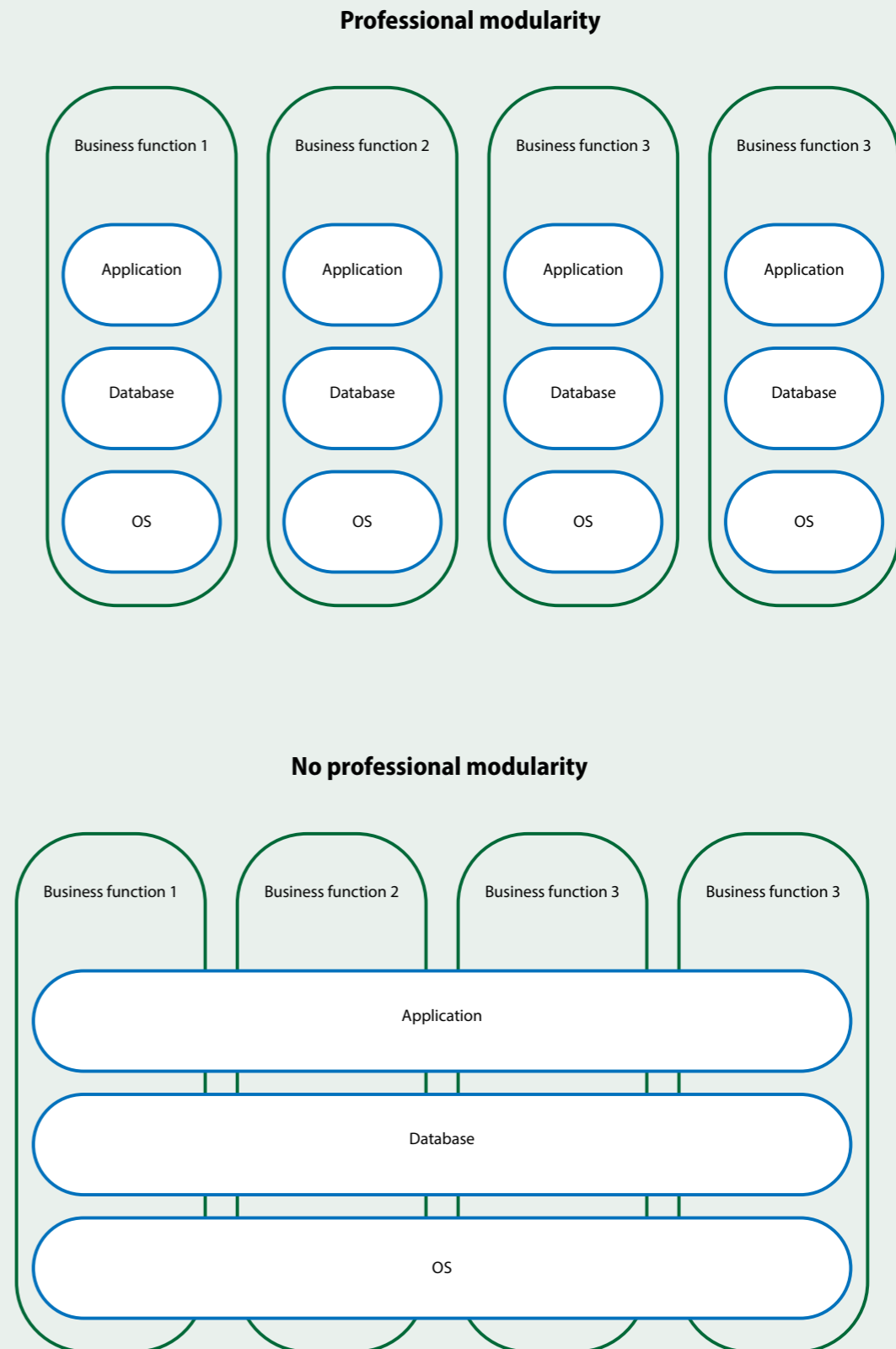


Figure 31 Professional modularity (top) vs no professional modularity (bottom).

7.6 Technical modularity

Technical modularity aims at minimizing the number of functions executed per component. If a system is decomposed into components on a technological level, based on functionalities, it increases the modularity of the system (Li et al., 2014). The concept of technical modularity is illustrated in Figure 32. If we would take the example of Wieringa et. Al. (2003), where a traveling agency has a booking system, the system would be split up in one component checking whether the requested destination is available, one component reserving the selected destination, one component accepting the payment, one component in charge of reimburses, and so on.

If technical modularity is achieved, the components can more easily be replicated and re-used for new products and services. If these components, often referred to as services, are not clearly split up based on functionality, it could create more dependencies and decrease modularity components. A modular system allows for faster changes because individual components can be modified or decommissioned more easily and quickly, reducing the need to make changes throughout the entire system due to decreased dependencies. The technical modularity is supported by loose coupling and the use of homogeneous interfaces and increases the ability to separately develop, deploy, operate, maintain, and scale services (Tiwana & Konsynski, 2010). SOA, EDA and microservice architectures make use of technological modularity by splitting up large monoliths in different services, or by building a new system based on different system functions.

Modularity can be viewed as a factor for decomposability of components within a software or system architecture. Decomposability enables utilities to transform their IT applications from being “built to last” to being “built for change,” providing the adaptive flexibility required in a constantly changing business environment

(Haire, 2023). Decomposability can be seen as a combination of modularity, autonomy, and discoverability. Where the autonomy refers to the independence of components, indicating they are fully self-contained. Modularity refers to the bundling of a specified set of services into a component that is dedicated to one purpose. Discoverability refers to the ability for other teams to find the components (visibility), increasing the ability to re-use it for similar functions.

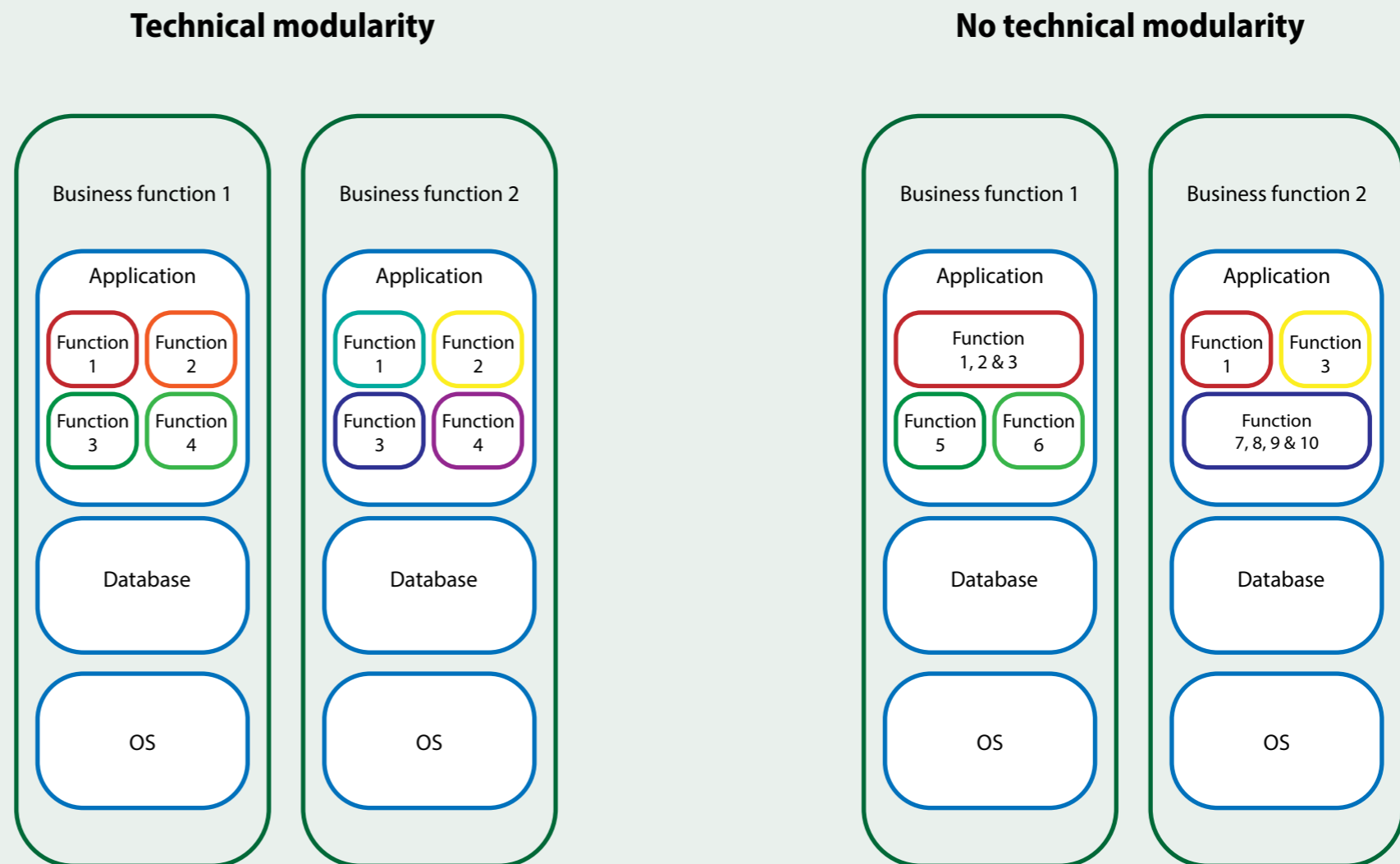


Figure 32 Technical modularity vs. no technical modularity

7.6 Functional redundancy

According to Nissen and Von Renenkampff (2017), functional redundancy describes the multitude of business functions performed by different components. This can either be caused by the fact that different IT departments, do not know that from each other they have built components performing similar tasks. Or it is done to provide a backup system to mitigate risks of outages, ensure continuity of operations, increase performance, and enhance the reliability of the system. This last form of redundancy is mainly important for critical systems, where downtimes pose a risk for business continuity. Functional redundancy is illustrated in Figure 33.

Functional redundancy can be put in place on purpose as it provides certain benefits, however when it comes to the agility of the IT landscape it is important to consider the fact that it can increase the complexity of the landscape, as it means organizing, monitoring and maintaining an additional system (Desouza, 2007). It can also slow down the decision-making process as there are more people involved in the development and operations of the redundant systems performing similar functions, which slows down the speed of change and thus negatively impacts the agility of the landscape. Developing, monitoring, and maintaining additional components also requires additional resources, in hardware, software and human resources. The aim should be creating the optimal reuse of functions performed by components.

Redundancy requires a trade-off, as agility can also mean that a system needs to be resilient and secure, which can be supported by redundancy. When it comes to storage and network capabilities, sometimes redundancy is desired, as it gives the ability to handle larger demands on systems when needed without requiring additional time to scale up. It does however cost an organization money, time, and effort to maintain this redundancy. In an ideal situation, functional

redundancy would come in the form of a dynamic capability that allows for adaptability on demand.

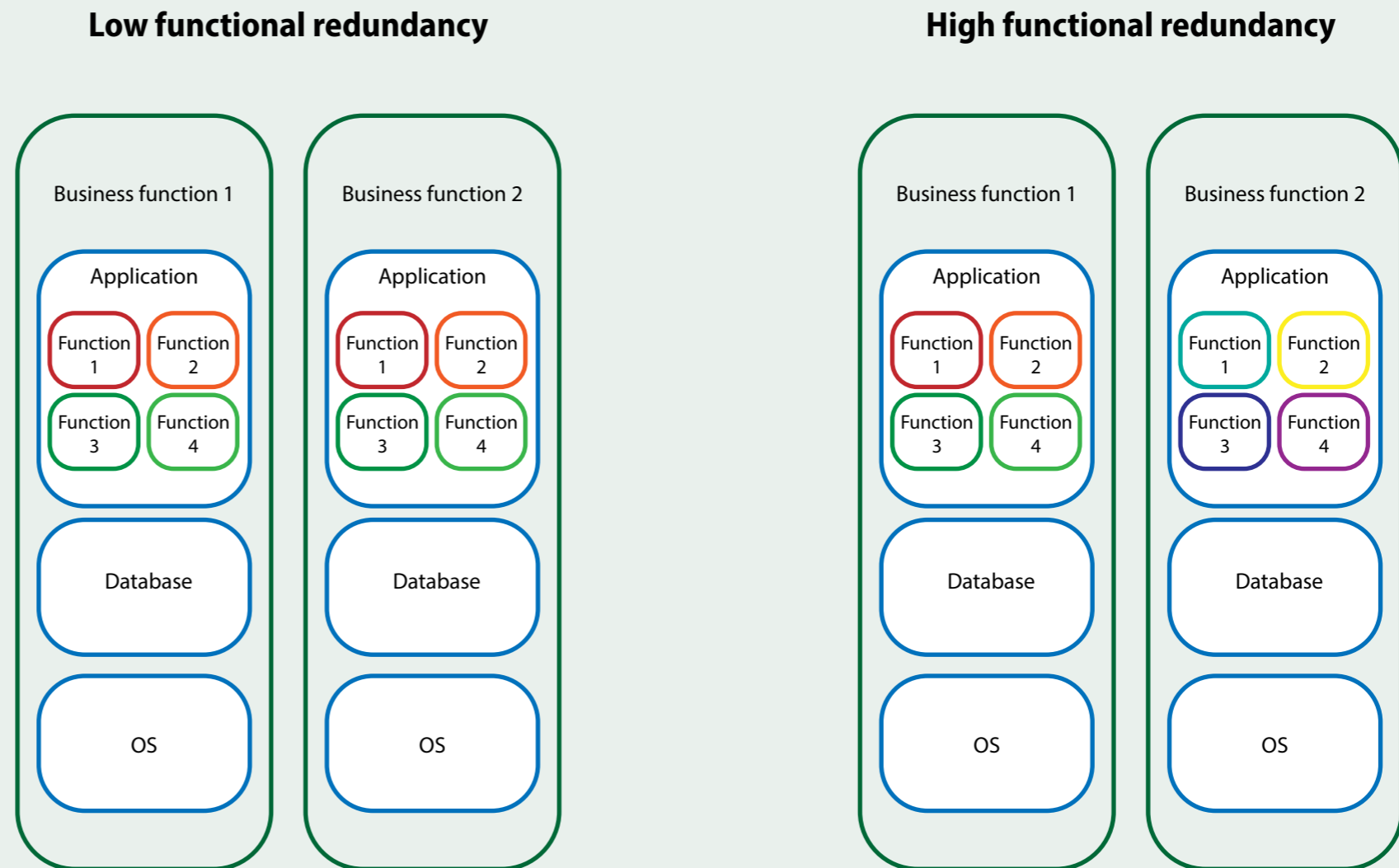


Figure 33 Low functional redundancy vs high functional redundancy

7.7 Data redundancy

In information systems data is inserted or modified by different users and system components, generally stored in databases, and processed by different software components. With data collection and storage in multiple locations, there is a higher chance of duplicate data, referred to as data redundancy. Data redundancy can occur within a single database or within multiple databases, such as illustrated in Figure 34.

Just as with functional redundancy, reliability is one of the motivations to have a duplicate set of data in case of loss or failure. However, storing large amounts of duplicate data does increase the overhead cost of storage and energy consumption (Huang et al., 2015). For the agility of the IT landscape, data redundancy can be an issue as the landscape often contains multiple data sources interacting with multiple applications that are developed with heterogeneous technologies.

For an organization, to increase the agility of the IT landscape and organization it is important to have real-time access to high quality data and make it visible for the right actors within the organization at the right moment (Anand & Ganesh, 2006). Some of the reasons data redundancy exists are heterogeneous technologies, heterogeneous data types, heterogeneous locations, and heterogeneous ownership.

Poorly managed data architectures lead to problems like longer preparation times for consistent data, increased efforts for data management, high efforts for reconciliation, redundant data silos, multiple sources of truth, and missing data foundations for new technologies (Jensen, 2021). These problems can result in a lower agility of the IT landscape as it hampers the ability and speed of change. It is therefore important to define common interfaces and reduce parallel data streams that cause data redundancy. Interoperability and agility are increased by an

improved enterprise integration, with automated data entry and executing business rules for data to improve data standardization, resulting in less data redundancy and maintenance efforts (Fazlollahi et al., 2012).

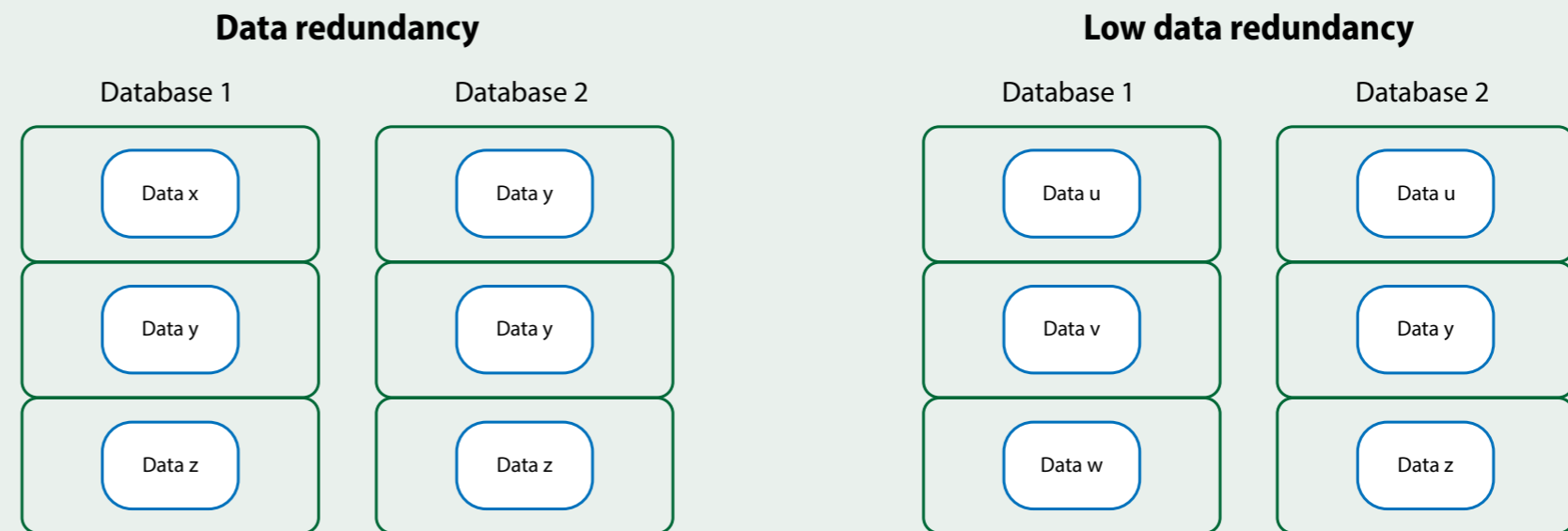


Figure 34 Data redundancy vs. no data redundancy

7.8 Scalability

As user demands on IT systems change, there can be a shift in the capacity needed or functionalities of systems. The ability of the system to process increasing or decreasing capacity by for example adding new computational, storage and networking resources with new hardware or software is called scalability (Gartner, 2023). For example, more users and increased activity mean there needs to be more bandwidth available on the network. Or when an organization needs to store more data on users, there needs to be an increase in storage space available.

When large amounts of data need to be processed, this could for instance also mean that there is a need for more computing power. The implication for landscape agility is that the system needs to be scalable over different dimensions. For planned changes, this increase in scale can also be planned, however, for unplanned changes the capacity would need to be scaled on demand. We can define two different types of scalability, vertical and horizontal scalability (Razzaq, 2020). Horizontal scalability is done by putting additional units in place, for example setting up an extra server next to the existing one to increase storage space. Whereas vertical scalability is the ability to increase the capacity of the existing units in place. Figure 35. Illustrates the difference between vertical and horizontal scalability. For example, by adding new SSDs to existing servers to increase storage space.

Cloud-based technologies are generally associated with high scalability and can reduce the cost and efficiency of scaling as service users pay for what they use. The installation, operation and maintenance are delivered by the service provider, cloud is considered as infrastructure-as-a-service (IaaS). To increase system speed, landscapes can incorporate load balancers, distributing requests between different applications and hardware units to minimize delays in traffic. Scalability

is part of the landscape agility as it is the ability of the landscape to scale both up and down for adaptation to changing requirements. Vertical and horizontal scalability are described to rely on three things, namely the ability to increase speed and capacity, improving efficiency and shifting and reducing workloads (Fayad et al., 2005).

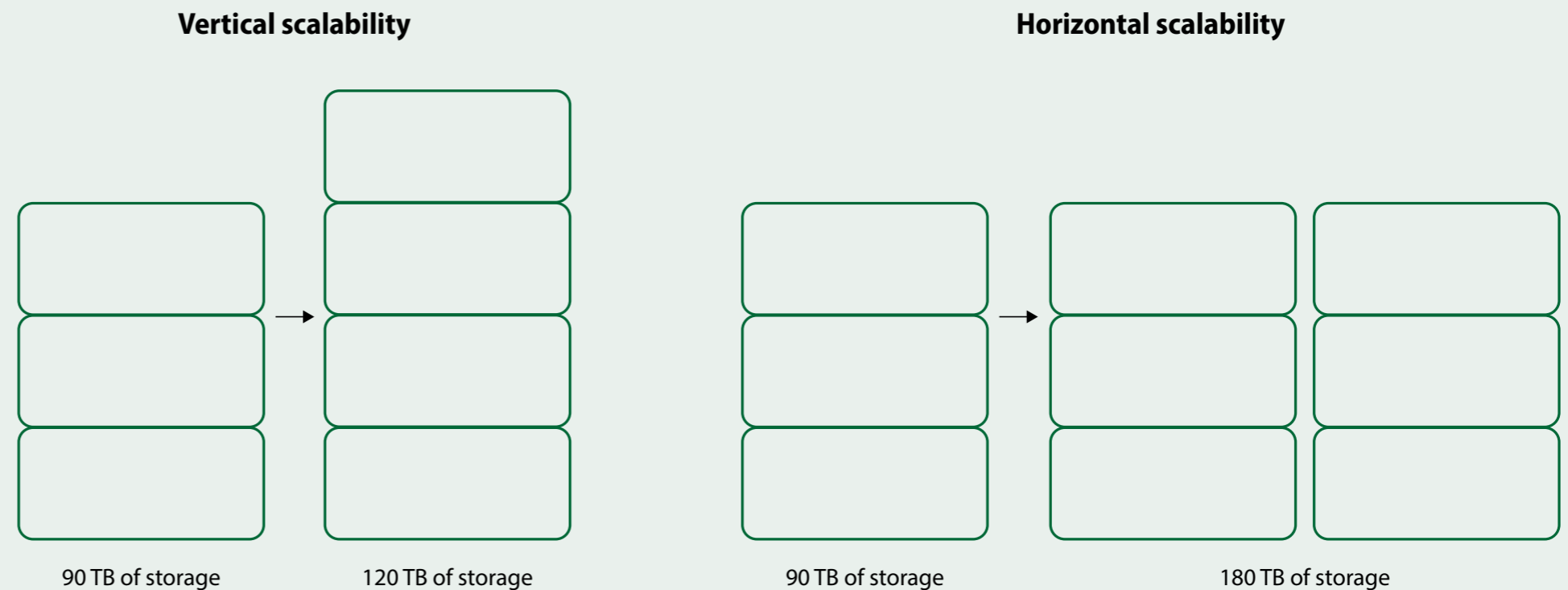


Figure 35 Vertical and horizontal scalability

7.9 Interoperability

A concept mentioned a few times in this report, which is relevant to the agility of information systems, is interoperability. Interoperability can be defined as “the ability of a system or a product to work with other systems or products without special effort from the user” by Konstantas et al. (2005). Internet of Things (IoT) is a widely spread concept, describing how everything that can be connected to the internet, will be connected (Atzori et al., 2017). In digital innovation, this means that different information systems will be connected to share data, operating as ecosystems. To benefit from digital innovation and the connectedness of information systems, two or more systems need to have the ability to exchange and understand information being shared (IEEE, 2002). Figure 36. Shows an example of the difference between high and low interoperability.

This is one of the reasons interoperability has become more important for IT systems over the years. Businesses, engaged in digital innovation, frequently face significant obstacles. Occurring when new features need to be integrated in underlying digital business ecosystems, which is the group of digitally connected actors necessary to co-create and co-capture value in a specific value space, or when building ecosystems (Hodapp & Hanelt, 2022). From an information systems (IS) viewpoint interoperability across digital business ecosystems has significant consequences for innovation, competitiveness, and the value generation of the ecosystem (Agarwal & Tiwana, 2015, Markus et al., 2006). The improved flow of information from and to components leads to an improved ability to analyze processes and user data.

Interoperability influences the level of integration in an enterprise IT landscape and there are two levels at which it does so: semantic interoperability and syntactic interoperability (Park & Ram, 2004). Enterprise IT landscapes often form a heterogeneous

environment, containing different types of applications, sharing different types of data between systems with multiple and sometimes conflicting formats. To share data between heterogeneous systems operating in different contexts, semantic (meaning and use of data) interoperability among heterogeneous information sources has become more important.

To be able to connect different applications, syntactic interoperability may be required, allowing different applications with multiple programming languages, interfaces, and platforms to cooperate. Semantic interoperability aims to create homogeneous linguistic and semiotic solutions at a data level and syntactic interoperability aims to provide technical solutions to create higher homogeneity at an application level.

Literature suggests that improving both semantic and syntactic interoperability increases the agility of IT landscapes, by allowing for easier reconfiguration when responding to change (Izza et al., 2008). In the age of digital innovation, fostering interoperability requires sophisticated standardization initiatives, design expertise regarding standards and platforms, as well as cooperative involvement of stakeholders (Hodapp & Hanelt, 2022). To be able to build interoperable systems that allow for higher adaptability, there is a need for standard data exchange formats and application program interfaces that allow for more loose integration of functions.

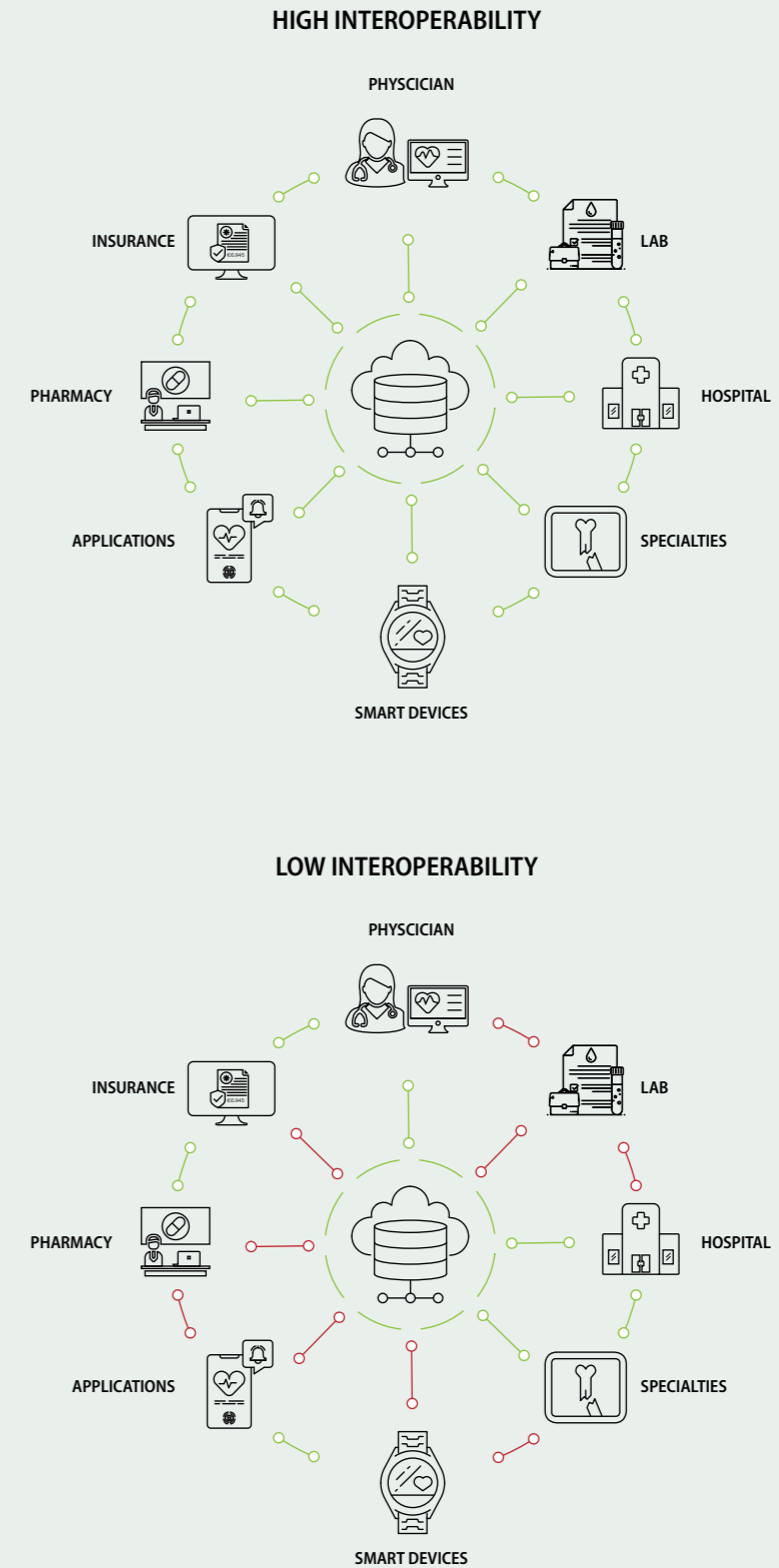


Figure 35 High interoperability vs. low interoperability

7.10 Integration

As mentioned above, the concept of interoperability is related to that of integration. According to some scholars, interoperable systems can function independently and are therefore considered as being 'loosely coupled', whereas highly integrated systems are often referred to as 'tightly coupled' (Panetto & Cecil, 2013). Which indicates that tightly integrated systems exist of components that are interdependent, resulting in loss of functionality when the stream of data or functioning is interrupted.

In an agile IT landscape, there is a need for loose coupling or decoupling of components as high integration combined and tight coupling of IT within architectures could negatively influence the agility of information systems since it can cause dependencies. There are methods to integrate internal and external components with interfaces that do not create tight coupling and dependencies, as is done in the event driven architecture (Michelson, 2006). It is therefore necessary to identify what integration patterns are used within the landscape to mitigate the degree of coupling and dependencies within the IT landscape.

Integration can be done on several levels of the IT landscape, one overarching form of integration described by Fazlollahi et al. (2012) is enterprise integration. Which is referred to as a form of integration encompassing multiple forms of integration, such as the integration of systems on a device and network level, integration of applications on a software and database system level, and integration of business on a business logic level. From a literature review on the benefits of these various levels of integration, Fazlollahi et al. (2012) draw a conclusion on several benefits over different dimensions of the IT landscape that come with enterprise integration which affect the agility of the IT landscape. For example, at an information level, the benefits identified are data entry automation

and an increase in data quality, data accessibility and reusability and data standardization. Whereas on an enterprise level, integration can improve reactivity, adaptability, and the ability to manage external exchanges optimally, reducing time-to-market.

7.11 Speed

An important factor for agility is speed, which can for example be expressed in the time it takes to reconfigure, add, or remove components. But it can also be the time it takes for information or data to flow through a system. Speed is an important factor for continuous sensing and responding and affects the ability to monitor the environment and internal actors. Additionally, it affects the ability to continuously deliver change through adding new components or adapting and removing existing components. This line of thought is supported by S. Wu et al. (2008), who argue that there is a need for simplifying data delivery and low latency analytics to enable seamless integration and adaptability in information systems at a higher speed. Bossert (2016) argues that for quicker response times to changes such as new customer demands, organizations should increase the level of automation in their operations and digitize business processes. For complex systems that generally take a long time to adapt, a solution for achieving shorter time-to-market is developing a two-speed architecture. In this two-speed architecture, there is a decoupling between the user-facing components and legacy components in which the release cycles of functions are generally longer.

To increase the speed of development and implementation of change, Bossert (2016) names several organizational and technological aspects that are of influence. Instant cross-channel deployment of functionality facilitated by microservices, where each

service contains a minimum amount of functionality. Ideally allowing for a possibility to develop these services in multiple programming languages, which helps to mitigate the risk of being locked into a single platform. Using real-time data for analytics, which allows for a higher integration of data analytics in operational processes. This will enable faster insights for product and development teams, allowing them to respond more quickly to user needs.

Down-time is one of the greater risks for businesses relying on their IT landscape to run operations. If a system is down, this can affect other systems and delay operations. Businesses can build test environments that allow for the deployment of new features without impacting the current system. If the new software is tested and complies with the requirements needed for it to successfully fulfill its functions, the software can be deployed. Configuration environments for business employees allow for faster reconfiguration of (automated) processes used by business departments. If each system function is only configurable by developers, there is a risk of developers getting an overload of tickets with request to change certain functionalities.

To increase the speed of change of the IT landscape, developers can facilitate business teams with capabilities to make small changes by themselves. Decoupling business processes from products allows for higher portability and duplicability of landscape components and increases speed. If processes are similar in multiple locations of the landscape, these components can more easily be duplicated and reused for other services. Clear high-level architecture and standards in place helps development teams to integrate new features more quickly. Especially when it comes to areas like cybersecurity it is important to have clear standards in place, as it mitigates both risks and allows for faster development processes.

Speed of delivery is strongly influenced by ways of working and team setup. Working with agile methodologies and DevOps teams centered around specific products and services allows the teams to continuously develop, test, implement and operate software in more iterative ways. These methods help in speeding up delivery as it lowers the number of hand-offs between teams. To be able to become more agile and create a higher throughput of information from business to IT to be translated into landscape changes, it is important for business and IT to work together in a more integrated way. For teams to work agile and DevOps, there needs to be a landscape setup that allows for teams to work in short cycles and autonomously.

7.12 Autonomy

Autonomy of an IT system can be described as the ability of a system to modify itself and its environment, by using data from both internal and external sources (Collier, 2002). In other words, the system senses internal and environmental stimuli to adapt its functions to increase the viability of its existence and boost its performance. The ability of the IT landscape to autonomously sense and respond to change could increase the speed of change and lower the effort and time required. Software and hardware components can be self-governing, not needing intervention of external authority, to be in control of many decision-making processes (Rovatsos & Weiss, 2005). Which will result in a higher level of automation in the IT landscape. This will mainly affect the functions and processes rather than the actual architecture of the landscape.

Autonomous software has a wide range of fundamental characteristics, from self-diagnosing and self-organizing to self-managing and self-governing to self-repairing and self-adapting. The main concept underlying these characteristics is to have software equipped with action and decision-making capabilities so that it can complete tasks even under challenging and unforeseen conditions (such as changes in the technological infrastructure or in application-specific user requirements) without needing human assistance, feedback, or intervention (Rovatsos & Weiss, 2005).

Generally autonomous software is used in the form of autonomous software agents, which are information flows that are mathematically formalized (Teubner, 2018). Artificial Intelligence (AI) and Machine Learning (ML) can be seen as applications of autonomous software agents, as it is capable of understanding goals and objectives, processing information and undertaking actions to complete based on this. Figure 36 shows an example of how information flows through a system automatically and could result in

new functionalities. Rovatsos & Weiss (2005) describe three ranges of activities which autonomous software can perform. The performative range, the deliberative range, and the normative range. The combination of these three ranges defines how the software operates autonomously.

The performative range describes what the software can do. Performative autonomy can be identified by the actions it can take, the reliability of these actions, the resources it able to engage with, and by the complexity of the actions it can undertake. The deliberative range describes the goal or motivations of the autonomous software. The deliberative range is defined by the needs of the software and the reasoning behind its actions. Without a specific reasoning for affecting change, the software cannot be autonomous. The normative range of activities define the actions based on commitment and expectations set by external actors and the software itself. It describes what the software is supposed to do and determines how the software operates within certain boundaries.

Although autonomy in the IT landscape seems to be desirable for the agility of the landscape, it does pose certain risks for the IT landscape and organization using technologies like AI and machine learning. Therefore, the governance and risk management of autonomous software are important for mitigating these risks. In many situations AI and machine learning might be conflicting with the compliance and cybersecurity in place.

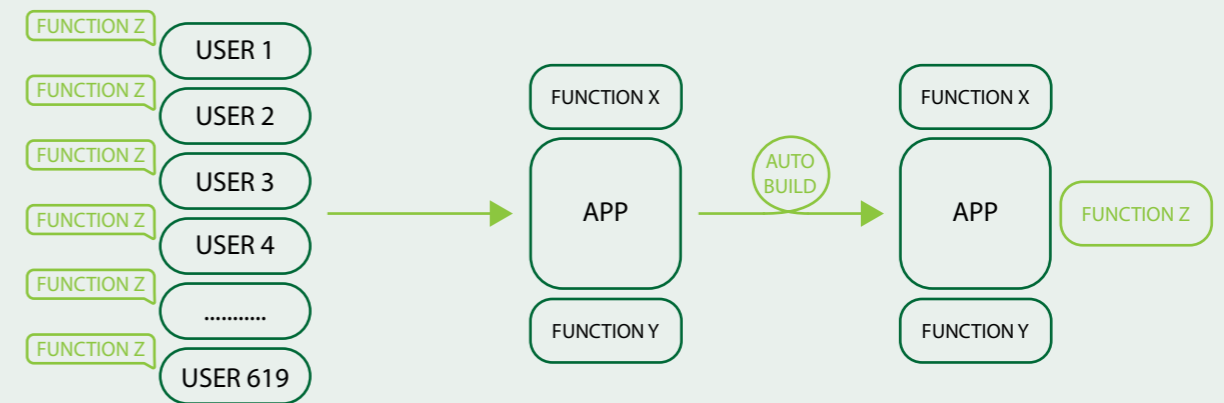


Figure 36 Example of autonomous software agents building functions

7.13 Conclusion on characteristics

In conclusion, enhancing the agility of an IT landscape is essential for modern organizations facing rapid technological changes and market dynamics. Landscape agility can be achieved by strategically managing system characteristics such as modularity, dependencies, coupling, homogeneity, redundancy, autonomy and scalability. Emphasizing modularity both professionally and technically allows IT systems to update and maintain components independently, reducing disruptions and facilitating quicker adaptations. Lowering coupling between components significantly mitigates the risk of widespread system impacts from local failures. Adopting homogeneous technologies simplifies integration and operational processes, leading to reduced costs and improved system compatibility. Although redundancy is critical for reliability, optimizing it prevents unnecessary complexities and fosters greater system agility. Scalability ensures that the system can adjust its capacity efficiently to meet fluctuating demands without extensive modifications. Additionally, fostering interoperability among diverse systems enhances seamless communication and functionality integration, crucial for rapid adaptability. Lastly, advancing autonomy within IT systems through intelligent automation, like AI and machine learning, supports dynamic self-management and decision-making processes, essential for maintaining competitive advantage in a fast-evolving digital landscape. These strategies collectively enhance the responsiveness of an IT landscape, enabling organizations to swiftly navigate and adapt to both anticipated and unforeseen changes.

Key takeaways

28. Modularity

- High professional and technical modularity allow components to operate independently, facilitating easier and quicker updates and maintenance without widespread disruptions, enhancing system adaptability.

29. Coupling and Decoupling

- Reducing coupling between components reduces dependencies and minimizes the risk of widespread impacts from localized issues, thereby enhancing system resilience and ease of modification.

30. Homogeneous Technologies

- Implementing technologies that share common standards across the system simplifies integration and management, promoting better interoperability and reducing operational complexities.

31. Redundancy Management

- Effective management of redundancy ensures system reliability without compromising agility. Optimizing the balance between redundancy for fault tolerance and efficiency is crucial for maintaining an agile IT landscape.

32. Scalability

- Scalability is essential to adapt system capacity efficiently in response to fluctuating demands. A scalable system can expand or contract its resources without extensive modifications, critical for rapid adaptability.

33. Interoperability

- Enhancing the ability of different systems and components to work together seamlessly is fundamental for agility, simplifying system integration and enabling swift modifications.

34. Autonomy and Automation

- Advancing autonomy within systems through automation and technologies like AI and ML supports rapid decision-making and adaptability, reducing the need for human intervention.

35. Agility in Data Management

- Efficient data management, especially in handling data redundancies and ensuring streamlined data integration, is crucial for supporting quick decision-making and operational flexibility.

36. Dependencies

- Managing dependencies effectively is key to enhancing agility. Reducing the amount of interdependencies between systems and components helps in simplifying the architecture, making it easier to implement changes without extensive coordination.

37. Speed

- Speed is a critical aspect of system agility, influencing how quickly a system can adapt to changes. Enhancing the speed of deployment, configuration, and integration of IT components ensures that the system can respond promptly to business needs.

38. Integration

- Streamlined integration processes are essential for maintaining agility in IT landscapes. Integration strategies should aim for minimal coupling and high interoperability to facilitate quick and efficient system upgrades and modifications.



Framework development

In the following chapter the development of the first framework will be described. When it comes to the different stages of the DSR methodology, this step belongs to the design cycle. The goal during the design cycle is to create an artifact that will be iterated in later steps based on insights from the relevance cycle and rigor cycle.

8 Framework

8.1 Approach

During the literature review, theories and frameworks on IT and IT landscape agility have been analyzed. For the creation of this initial framework, the focus has been on understanding what technological characteristics of an IT landscape can be evaluated or measured to define how agile an IT landscape is and what dimensions of the IT landscape should be included. Several characteristics influencing the agility of the IT landscape have been distilled from these theories and were combined in a framework. Focusing mainly on characteristics found in multiple articles about the agility of information and application systems.

8.2 goal

The initial goal for the creation of this framework, was to use it as a probe during interviews for evaluating the framework itself. However, after discussing the use of a framework as a probe during interviews, it was concluded that this would create leading questions during the interview. Where participants are steered towards confirming the characteristics shown to them within the framework. Therefore, this framework will solely be used for comparison with themes distilled from interview insights. After gathering input from experts the framework can be iterated by using the information from the relevance cycle.

8.3 Outcome

Theoretical grounding

After the analysis of different theories and frameworks on the agility of IT landscape such as the framework for measuring the agility of application systems by Nissen & Von Renenkampff, the design principles of Dove (2005) and the principles for ease of change and complexity by Arteta & Giachetti (2004) and Desouza (2006), it became apparent there are several

overlapping characteristics that can be evaluated to determine the agility of an IT landscape. Themes found in during this literature review on landscape agility have been combined into a framework which captures the overlapping characteristics. This first iteration of the framework is predominantly based on the framework developed by Nissen & Von Renenkampff, as it is empirically grounded for the measurement of agility for application systems using the DSR methodology.

Characteristics

The main characteristics covered in the initial design are on a high level described by functional agility and capacitive agility. Both factors combined determine the overall agility of an IT landscape. Capacitive agility can be evaluated by determining the scalability of the landscape and its components, both horizontal and vertical scalability should be considered for this agility. Functional agility is determined by the complexity, consistency, and autonomy of the IT landscape. Complexity is defined by the dependencies and homogeneity of the landscape, where a lower number of dependencies and higher homogeneity increases the agility according to literature. Consistency is determined by the modularity, redundancy, and velocity where high modularity, low redundancy and high velocity increase agility. Autonomy is determined by the self-sensing and self-responding capabilities of the landscape, the greater these capabilities are, the greater the agility of an IT landscape becomes. Velocity is determined by the latency and cycle times within a landscape, where low latency and high delivery speeds created by short cycles increase agility. As discussed in the chapter on characteristics for agility, interoperability and integration can also influence the agility of the IT landscape. Both characteristics depends highly on characteristics like complexity, homogeneity and

modularity. Therefore, interoperability and integration are not included in the initial framework. The initial framework developed based on these insights from the literature review, containing system characteristics and dimensions, is illustrated in Figure 37. An enlarged version of the framework can be found in Appendix D.

Dimensions

The IT landscape consists of different layers and components. It can be concluded that there is a data layer, software layer and infrastructure layer. The composition of the components within the IT landscape is often determined by different architectures, such as the enterprise architecture, solution architecture and information architecture. An overarching architecture such as the enterprise architecture generally describes how different architecture elements are connected to business and functional units and how they are managed. Initially the evaluation framework for IT landscape agility focuses on the technological elements but considers how they linked to the organizational context. Dimensions included in the evaluation of the IT landscape agility are set to the aforementioned data, software and hardware dimensions.

Data gathering

The idea behind this initial framework is that most of the data necessary for the evaluation can be obtained from secondary data. However, it does rely on the fact whether documentation on the IT landscape is up to date and available. For clients from Deloitte this might not be the case, resulting in an unrealistic and irrelevant outcome. In that case it is necessary to involve subject matter experts (SMEs) from client companies to gather data for the evaluation of the IT landscape.

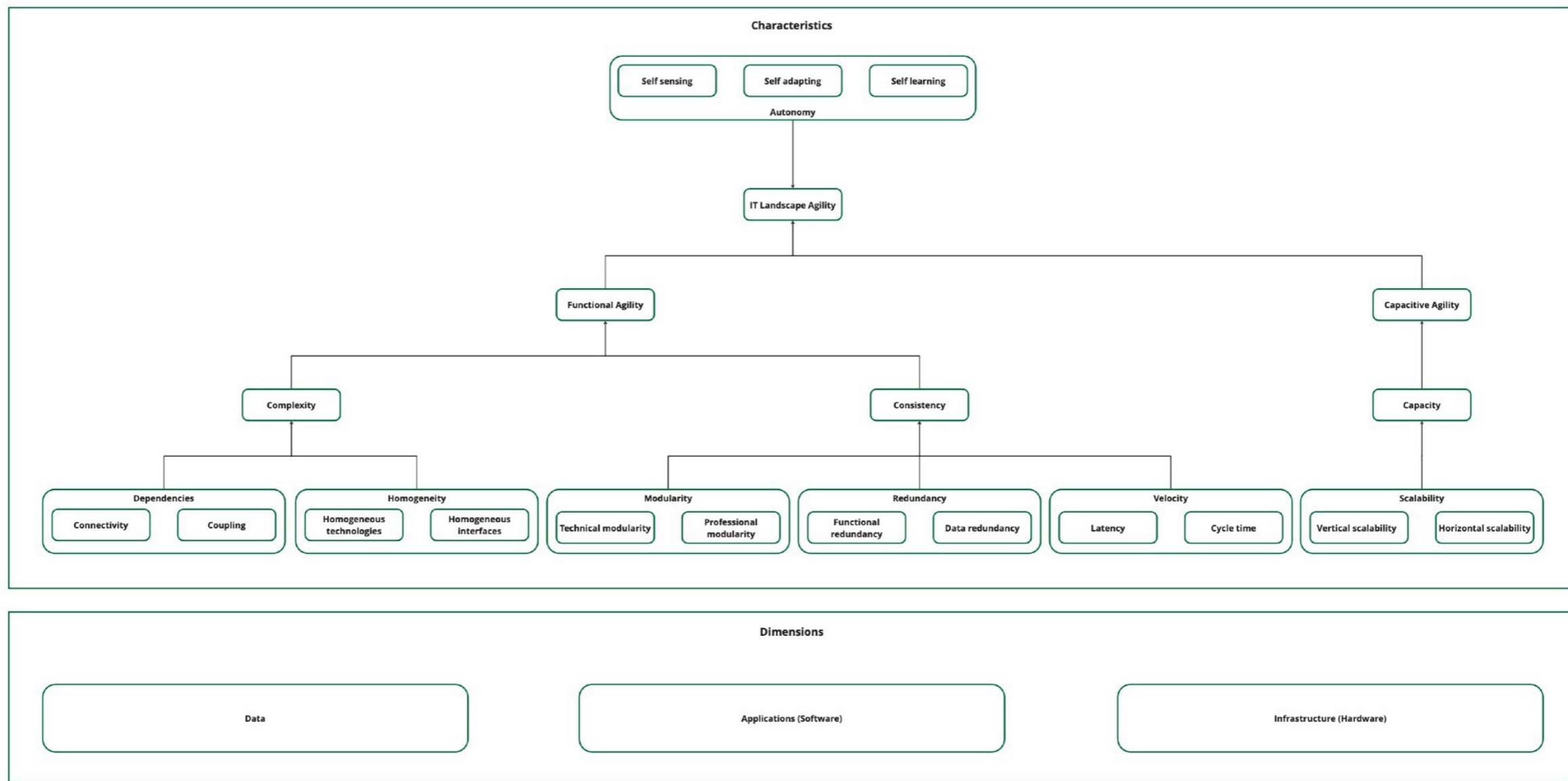


Figure 37 Framework for IT landscape agility (final version of first iteration)



Additional research

IT became apparent during the development of the framework, that additional research needed to be done before moving onto gathering expert input in the relevance cycle of the DSR methodology. This part of the report focuses on the types of data collection and existing assessment formats that can be used for gathering insights into the different dimensions of the framework for evaluation.

9. Data collection

Now that the first conclusions are drawn on the first research questions about the characteristics and dimensions of the IT landscape that should be included in the evaluation, it needs to be determined how data can be collected during the evaluation process.

During client projects there are business analysts, consultants and managers who request certain input from their clients. On the other end of this interaction are the actual clients, who need to provide consultants with data on their current systems and practices.

Therefore, different types of data collection will be discussed in this chapter. Motivations for doing so are understanding the application and the characteristics of the different types of data collection. At a later stage in this research, based on this information and expert input, a decision can be made about the most suitable method for data collection for the evaluation of IT landscape agility.

9.1 Quantitative vs. qualitative data

Within the research domain there is generally a clear distinction between quantitative and qualitative research. Where quantitative research is using a number-based or measurable input, allowing the researcher to draw conclusions on quantities of phenomena that exist using calculations. It allows researchers to draw conclusions on e.g. correlations and the significance of these correlations. Whereas qualitative research is used for descriptive analysis, allowing the researcher to understand what, how and why certain phenomena exist. This type of data gathering, and analysis uses words and meanings to understand situations and systems. There are different strengths and limitations to both methods, Queirós et al. (2017) describe the differences between both research methods in terms of different dimensions, which can be found in Table 2.

Dimension	Quantitative	Qualitative
Focus on understanding the context of the problem	Smaller	Bigger
Dimensions of group studies	Smaller	Bigger
Proximity of the researcher to the problem studied	Smaller	Bigger
Scope of the study in time	Immediate	Longer range
Point of view of the researcher	External	Internal
Theoretical framework and hypotheses	Well structured	Less structured
Flexibility	Lower	Higher

Table 2: differences between quantitative and qualitative research (Queirós et al., 2017).

9.2 Surveys

Surveys can be used for both quantitative and qualitative data collection. There are a few advantages and disadvantages for this method of data collection (Jones et al., 2008). One of the advantages of surveys is the fact that they can reach a large target audience, and they can be distributed through a variety of channels. Surveys require less time and cost for data collection and processing than a qualitative method like interviews, partially because anyone can administer the survey. Disadvantages associated with surveys are low response rates and probability of biases as there may be responses from participants that are not representative for the target audience, participants with a lack of knowledge on the subject or participants with a biased opinion (Singer & Couper, 2017). However, it may be easier to acquire higher response rates in the case of Deloitte consultants.

During client projects, the client can assist the consultant, for example, in obligating employees to take part in the survey. As mentioned above, surveys can be used for both quantitative and qualitative data collection. Qualitative questions in surveys can help to avoid biases, obtain richer data, and choose the right multiple-choice answers for quantitative questions in later surveys. Additionally, they can be used to assess

respondents' understanding of terminology, questions, or instructions, to determine respondents' responses or thoughts while being questioned, and to provide an exact measurement of material that was missing or reported incorrectly (Singer & Couper, 2017).

9.3 Interviews

Interviews can be conducted face-to-face, online or in a group setting. There are multiple advantages and disadvantages of using interviews to obtain both qualitative and quantitative data (Crandall, 1998, Seale, 2012). Interviews enable the researcher to get rich in-depth data through an "inside" look. Participants can elaborate on opinions and clarify material learned from secondary data. Interviews allow the researcher to obtain detailed information fostering great comprehension and allow for flexibility in the structure and questions used. Advantages of interviews over surveys or questionnaires can be the fact that interviews allow the interviewer to further elaborate on questions not understood and the interviewee to clarify given answers, allowing for more in-depth insights in the problems and needs of participants and the current state of the IT landscape. However, the time and effort required to conduct an interview,

especially face-to-face interviews, are an obvious drawback of interviews. Scheduling interviews can be a difficult task with limited availability of participants. An advantage, on the other hand, is that response rates are generally higher with interviews than for surveys or questionnaires, but they cannot be conducted anonymously. Whereas surveys and questionnaires can be conducted anonymously. The number of participants is generally lower for interviews due to the time and effort it costs to conduct the interviews. Additionally, there is a risk of interviewer bias, because of leading questions or the revelation of opinions.

9.4 Secondary data

Research based on secondary data, means extracting data from internal datasets, which have been established (long) before the research or evaluation started. Using secondary data for assessment could provide valuable insights in previous, current, and desired states of organizations and processes being investigated. Secondary data analysis can be used for exploratory, descriptive, correlational, and observational studies of data. If internal documents and datasets are up-to-date and fact based, this can result in highly valid input. The validity, however, still relies on the source, quality and quantity of the data and the input methods.

There are several advantages and disadvantages to using secondary data as input for research according to Castle (2003) and Smith (2008). Secondary data analysis has the potential to be resource and cost-effective method. It creates insights in data gathered months or even years before the assessment has started, which would take great time and effort to collect otherwise. Secondary data analysis lowers the number of researchers and participants required to collect and analyze data compared to other methods and it eliminates the need for finding the appropriate

participants and sample size. Secondary data analysis offers the opportunity to discover patterns and relations which were not apparent in the initial analysis, analyzing data from a new perspective.

Downsides to using secondary data are that the data has not been collected with the same research goal in mind and the analyst is further removed from the data source, being unaware of the context in which the data was gathered. There may be difficulties in detecting errors in data and reflecting on the validity of data if documentation on data gathering methods is insufficient. Not all organizations collect similar data or document data in similar ways, which could lead to difficulties in finding the correct data. Additionally, there might be resistance in finding data owners and getting access to data needed by analysis.

Key takeaways

39. Quantitative vs. Qualitative Data

- Quantitative research uses numerical data to draw measurable conclusions, useful for identifying correlations.
- Qualitative research uses descriptive data to understand phenomena's what, how, and why.
- Key differences include context understanding, study dimensions, researcher proximity, study scope, researcher's viewpoint, theoretical framework, and flexibility.

40. Surveys

- Surveys are versatile and can be both qualitative and quantitative.
- Advantages: Broad reach, low cost, and time efficient.
- Disadvantages: Low response rates, potential biases, and unrepresentative responses.

41. Interviews

- Interviews provide in-depth data, allowing participants to elaborate and clarify.
- Advantages: Detailed insights, higher response rates, flexibility in structure.
- Disadvantages: Time-consuming, extensive scheduling required, limited number of participants, and potential interviewer bias.

42. Secondary Data

- Secondary data involves using pre-existing internal datasets.
- Advantages: Cost-effective, timesaving, insightful historical data, fewer required participants, and researchers.
- Disadvantages: Potential misalignment with current research goals, removal from data source, difficulty in detecting errors, inconsistent data collection methods across organizations, and access issues.

10 Assessment types

Evaluation of systems and organizations is often done using assessments. Within Deloitte and the literature there are several different assessments for IT landscapes and architectures. This section describes a few of the options there are in terms of assessment types, namely the maturity assessment, quick scan and footprint. The goal of this section is to understand how these assessments are structured, what their outcome could be and how they are applied. Since the different types of assessments have different goals and outcomes it is hard to compare whether one is better than the other. Whether an assessment is applicable is context and preference dependent.

10.1 Maturity models

Maturity models are generally applied to assess the current state of a set of capabilities, define measures for improvement and prioritize these measures accordingly (Remane et al., 2017). The goal of these models is to assess the current maturity of an organization and define how to increase this, because in general, higher maturity means better performance (Dooley et al., 2001). Thordsen et al. (2020) Analyzed multiple Digital Maturity Models and provides a list containing 17 different digital maturity models and concluded that there are ample models to assess a company’s digital maturity, however, not all these models have theoretical basis or empirical evidence (Carvalho et al., 2017). Lack of documentation on the development of these models has led to missing validity and rigor (Brühl, 2017).

Maturity models, as the name suggests, result in a maturity level of an organization, system or capability, depending on its focus area. Maturity models often describe different characteristics of an organization or system at a specific level of maturity. They can describe what limitations and benefits a maturity

level has to offer. One of the advantages of maturity models, is that it allows for comparison between companies or industry benchmarks. Consultancies can leverage this by advising a client about the need of a specific maturity level as a prerequisite for specific activities or goals. Based on the gaps in their maturity, transformation goals can be set and carried out.

Within Deloitte there is a Digital Maturity Model which is currently being used for evaluation of the digital capabilities of clients. This maturity model is a survey based on five core business dimensions, divided in 28 sub-dimensions, broken down in 179 criteria based on which the digital maturity is assessed. The five core dimensions and 28 sub-dimensions are shown in Figure 38.

10.2 Quick Scans

Quick scans are generally questionnaires or surveys that can be filled in by the organization or conducted in the form of a structured interview. Quick scans often have the goal to identify gaps and opportunities in current states of organizations, systems and capabilities. Having the advantage of identifying what characteristics a system does or does not comply with. It helps a consultant, to understand what the current state of a client company is based on different technological or organizational aspects. Quick scans can result in scores or an overview of statements.

Current quick scans used, contain a set of statements or questions that allow the company to state on what level their organization or technology landscape complies with these statements. Based on the results

of a quick scan, the service provider can identify what opportunities and threats the gaps found create for a client. It allows for further investigation into specific elements to understand why these gaps exist and what risks or advantages they provide. This helps to in developing a strategy for mitigating risks and creating opportunities.

There is a quick scan available within Deloitte for the evaluation of DevOps. This quick scan uses qualitative methods in the form of interviews with C-level executives to find out what efforts the organization is carrying out. During conversations with several consultants it became clear that it lacks a clear overview of all characteristics and dimensions necessary for IT landscape agility and is mainly focused on operational aspects.

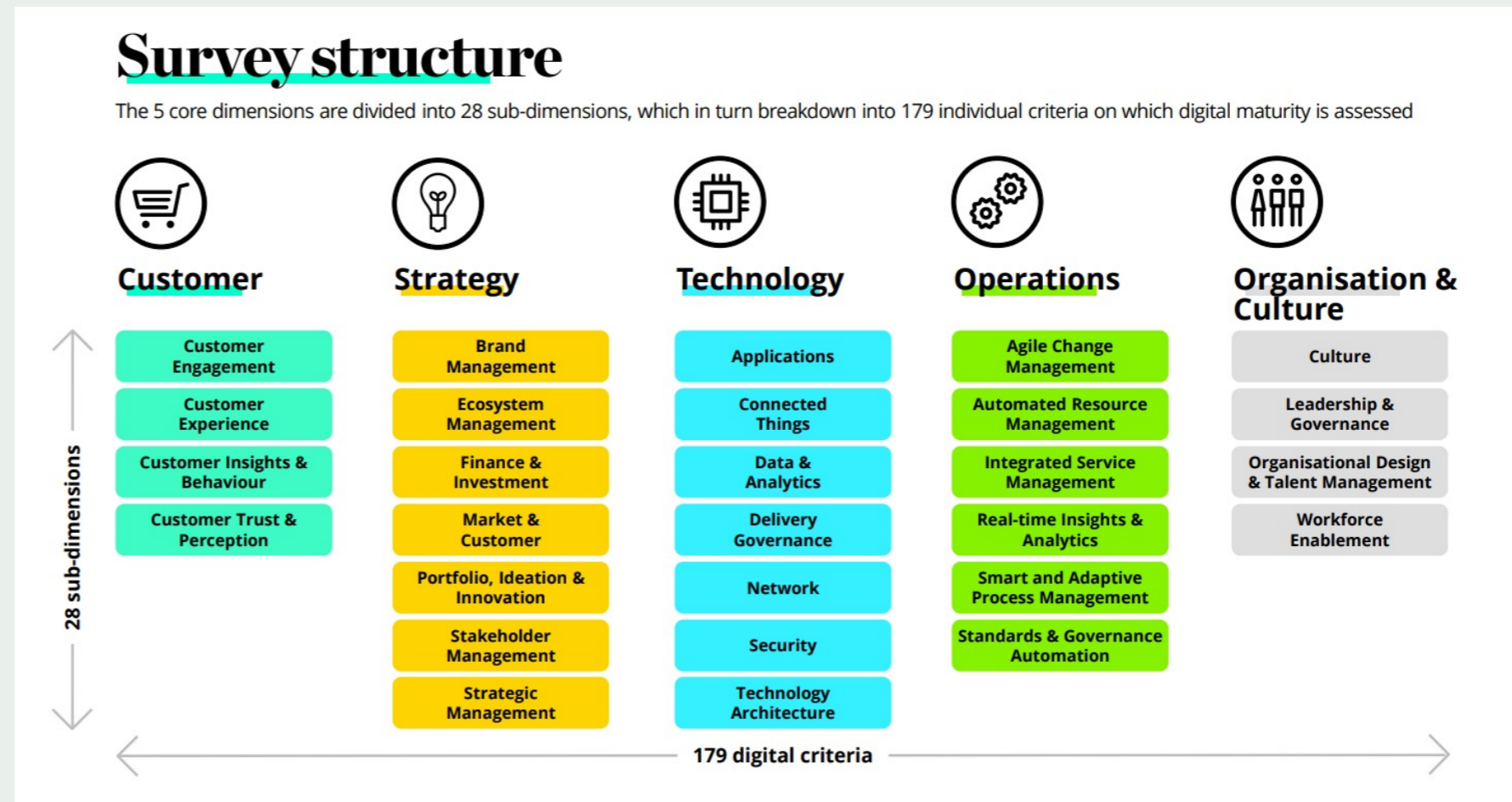


Figure 38 Deloitte digital maturity model

10.3 Agility footprint

Another form of assessing the agility of the IT landscape is the agility footprint of the IT landscape. Where different metrics show a relative level for each of the dimensions that are suggested to determine the agility of the IT landscape. A footprint assessment leads to a visual representation of the agility and would be useful for the comparison between systems or organizations but also for a before and after comparison. Nissen et al. (2011) describes such an enterprise IT applications landscape footprint and use some characteristics described in the IT applications landscape framework described by Nissen & Von Renenkampff (2017), namely complexity, redundancy, and coupling. Additionally, it adds the dimension of parameterization, measured by “the share of changes which can be made through changing parameters within an application landscape element without the need to reprogram.”

Figure 39 shows an example of the measurement of IT agility of an application landscape, performed on a large organization operating in the financial sector. The agility footprint helps in evaluating the average IT agility of the applications landscape and based on single indicators, allowing for the identification of elements that do not support or block the IT agility and the elements that are supporting a high IT agility. The characteristics used for such a footprint are measured based on quantitative values. This could be useful for consultancies as it allows them to benchmark with industry standards. It does mean, however, that data must comply with a certain level of quality and availability and that documentation must be up to date.

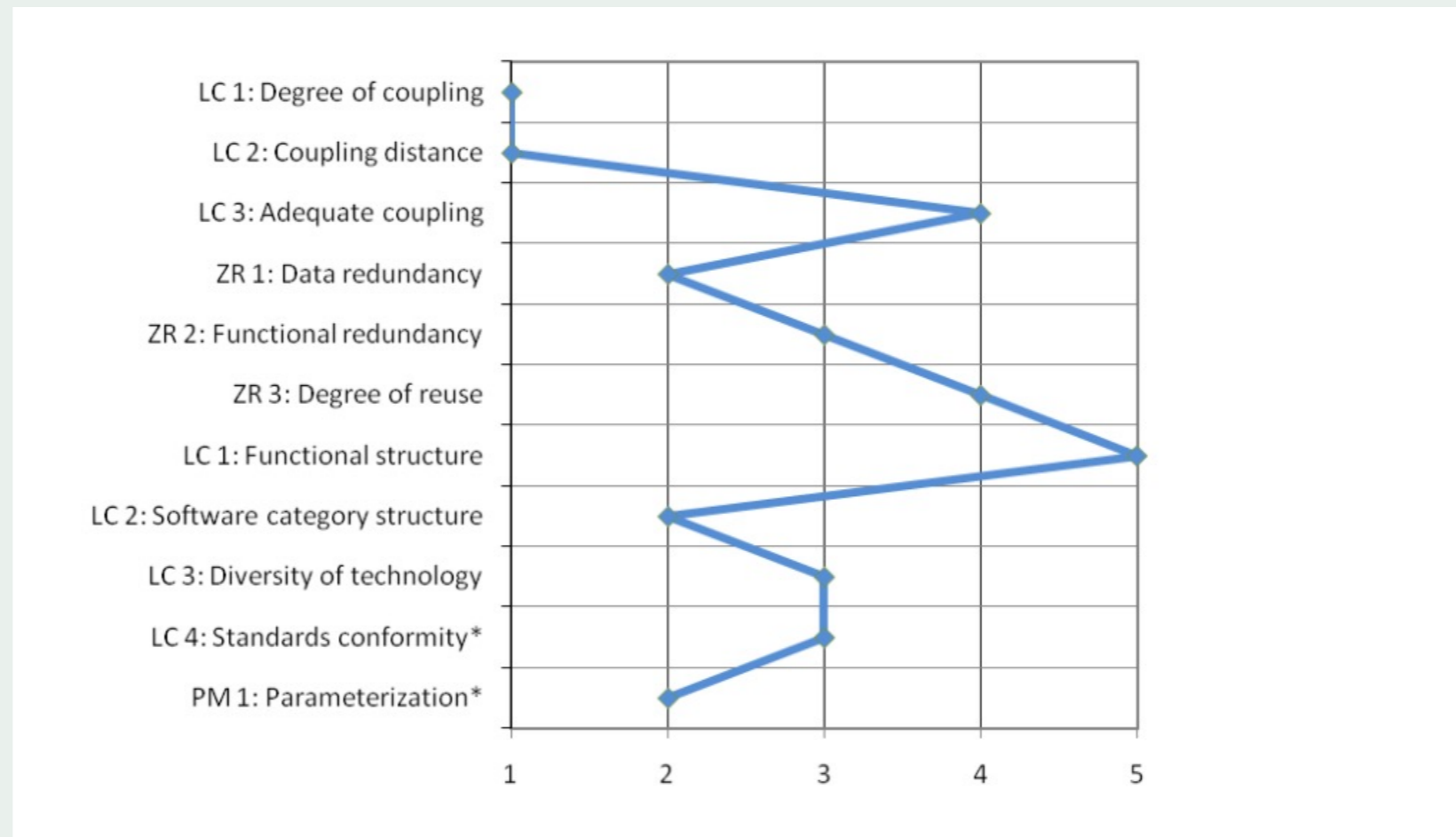


Figure 39 Agility footprint of an IT applications landscape (Nissen et al., 2011)



Application domain

This section of the report dives deeper into the context of the client, by developing an understanding of the organization, people and processes. This is part of the relevance cycle of the DSR methodology. The context analysis investigates Deloitte as a whole, but also the Technology Transformation and Acceleration team for whom this project was executed.

11 Context analysis

11.1 Competitors

There are many competitors in the consultancy branch, from independent consultants to large corporate firms. By growing its offerings and extending into new markets, Deloitte has reached a position as one of the largest service providers in terms of revenue. See Figure 40 for a comparison between several service providers ranked based on their annual revenue and company size in terms of employee count. This data was based on the annual reports from the consultancy firms included.

Deloitte has a strong position within the market, but this also means that they must maintain and protect an image by delivering the best service continuously. In terms of company size and revenue, we see that the main competitors are pwc, EY and Accenture. Relative to Accenture, the revenue per employee is significantly higher for Deloitte, indicating the high quality of work delivered. This could also indicate that the amount of work done per employee is significantly higher within Deloitte. There is a need to attract strong talent, ensure constant quality, and keep expanding to stay ahead of competition. The organization must continuously learn to increase knowledge and develop new capabilities.



Figure 40 Competitor analysis based on employee count and annual revenue

Besides comparing consultancies on their size and financial performance, the consultancies are compared on their performance in relation to 40 different sectors and areas of expertise, among which digital and agile. The consultancy firms are compared based on several criteria considering opinions from clients, reputations, analyst benchmarks, awards, online footprints and more. Based on these criteria consultancies are ranked into the five ranks, from bronze up to diamond (Consultancy.nl, 2024). The ranks gold, platinum and diamond are used in this project to compare different consultancy firms in the Netherlands in 2023, based on their expertise in digital and agile. An overview of these ranking can be found in Figure 41.

It becomes clear that Deloitte has a strong position in the consulting market. Being part of the Big Four, with an annual revenue of 59 billion euros. With 457,000 employees in total it can be concluded that there is a large number of employees that are knowledgeable on a wide variety of topics. Deloitte is performing well in the digital consulting market but has not reached the diamond rank for their services regarding agile. This means that there is an opportunity for Deloitte to improve their ability to consult clients on projects focused on agile. This opportunity would allow them to create competitive advantage over their main competitors, such as Accenture, PWC, EY and Capgemini.

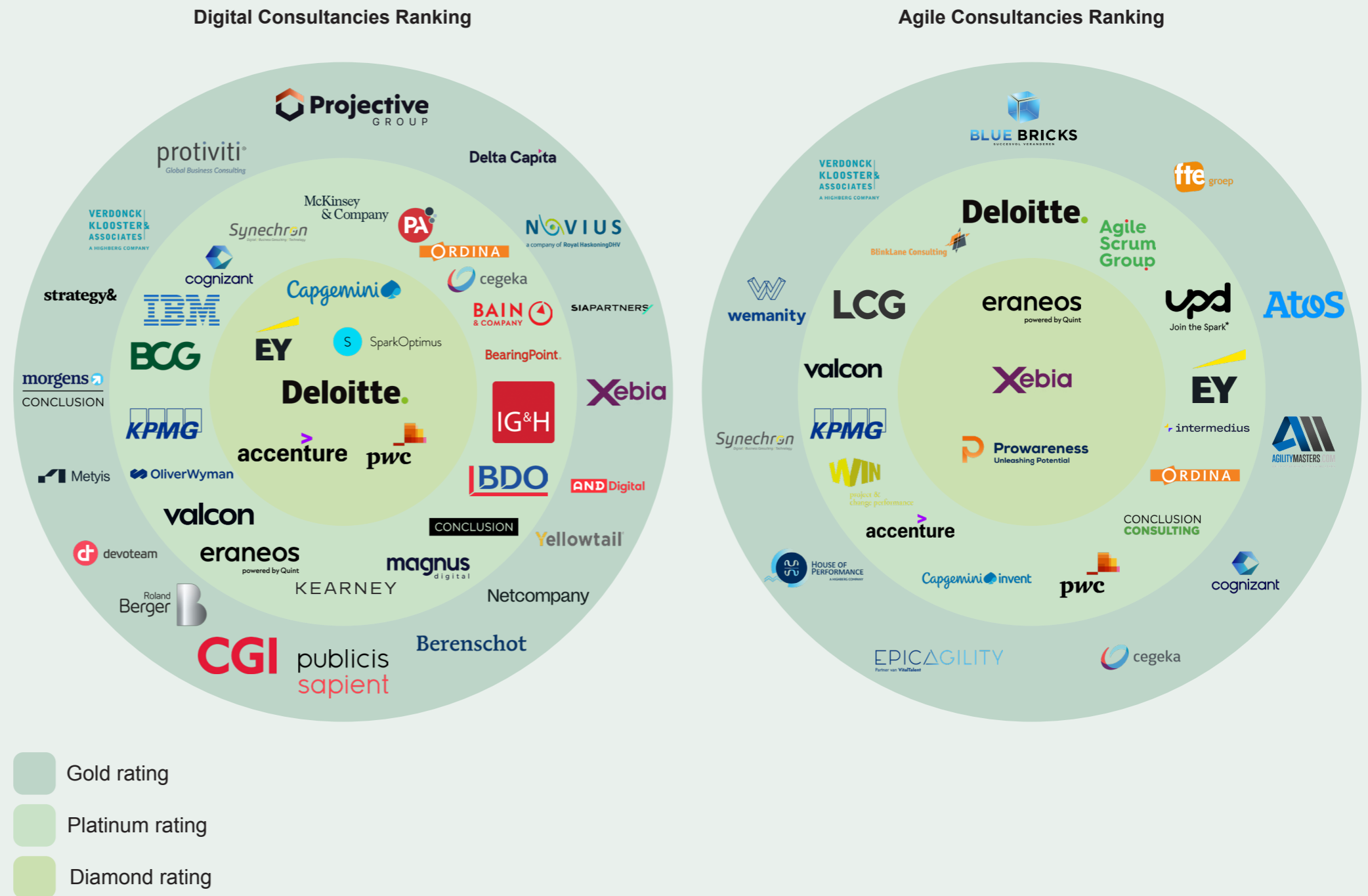


Figure 41 Competitor analysis based on digital ranking

11.2 Deloitte organizational set-up

Deloitte is a very large service provider that delivers different types of services. The focus of this project is on the consulting branch of the organization, which is split up in different offering portfolios. Each offering portfolio has a different focus and multiple offerings falling within the portfolio. Each offering consists of several teams providing clients with a specific service on a similar organizational component.

Within the scope of this project, the focus is on the team Technology Transformation and Acceleration (TT&A), which is part of the Technology Strategy and Transformation (TS&T) offering. This offering is part of the Enterprise Technology and Performance (ET&P) offering portfolio. Figure 42 shows an overview of the capabilities of Deloitte. This figure does not present the teams and offerings mentioned above, since this overview is only for internal use. It present similar offerings, however in this overview the offerings are focused on private companies.

By talking to employees from TT&A and other teams within TS&T it becomes clear that these teams often work together to share their expertise during client projects. However, because the organization is quite large and some teams exist out of more than 50 people, it can be difficult to get in touch with the subject matter experts. Sharing information is done via monthly meetings within offerings to get everyone up to speed on new developments, assets and wins.

Assets are shared via the intranet and Microsoft Teams, but finding the right files and data sources can be difficult. Employees do not always know what to look for or where to find information, adding an additional step of finding the right owner of specific information. This slows down processes that require certain data, tools and information. Communication and networking are therefore highly



Figure 42 Offering portfolio Deloitte Private

important for consultants during client projects.

When entering the organization as a new talent it can be challenging to quickly navigate through all the information within a large firm such as Deloitte and therefore it is frequently stated by business analysts and consultants that "learning is done on the job". For clients this might lead to unsatisfactory results, so it is important that the outcome of this project is self-explanatory. The final solution for the evaluation of IT agility can additionally leverage the fact that there is such a wide set of knowledge and expertise within the organization. Leveraging this relies strongly on effective communication and clear ownership.

11.3 TT&A Team

Technology Transformation is an important topic on client agendas and a key enabler of shaping the future of organizations. It is TT&A's mission to help clients develop their opportunities and help them transform into their best future-states. Their goal is to assist clients by "bridging business strategy and technology driven transformation" and to "rethink, reshape and reimagine their technology capabilities and organization, to maximize business value, outcomes and capabilities across the enterprise."

TT&A helps organizations to organize the IT landscape and operations of their clients in such a way that it creates alignment between business and IT and allows them to deliver better value to their customers. During client projects focus on realizing change with empathy for stakeholders, putting strategy into practice, accelerating business with technology and this is done by structuring, steering, and managing "the most complex transformations". Values they adhere to are delivering high quality, building strong relationships and trust among team members, and taking care of each other. TT&A as a team is capable of data migration projects, leading the implementation of large IT solutions and transformations, DevOps transformations and implementations and cloud strategy and implementation. The industries TT&A serves are listed below:

- Consumer
- Technology, media, and telecom
- Energy, resources, and industrials
- Financial services
- Public

The TT&A team consists mostly out of generalists who work closely with diverse set of specialists from within and beyond the team. They aim to deliver technology transformation and acceleration by connecting

the dots with other offerings within Deloitte. The big ambition of TT&A is to: Lead all technology transformations within Deloitte, which "indicates that TT&A will, together with the client, shape the future of its organization by successfully making impact on the Technology Landscape of the organization by driving the transformation towards the desired end-state". Figure 43 shows what the position of TT&A would be, being the connecting partner between several teams and clients.

TT&A should be the owner of the solution for the evaluation of IT landscape because they shape and design the transformation for Deloitte clients. They are a stakeholder that needs to understand where the current problems for the end user occur and how they can be solved together with their client. The input for the evaluation of the IT landscape agility does not only have to come from within TT&A since they are the connecting dot. The evaluation and the creation of a solution will require collaboration from several different disciplines.

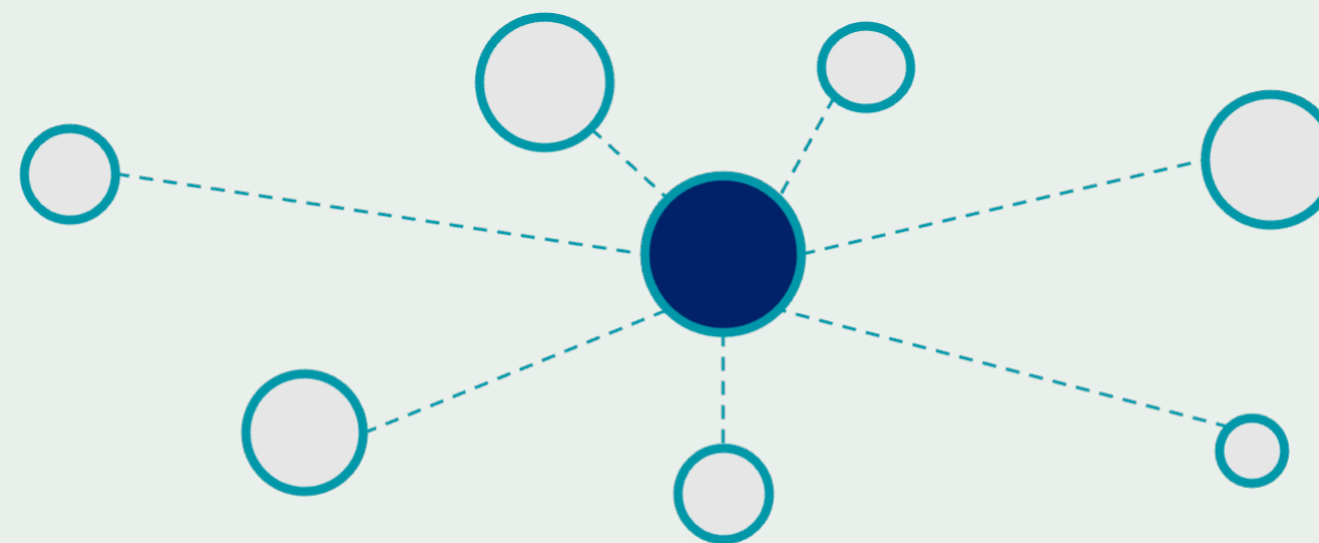


Figure 43 Position of TT&A as connecting partner

11.4 Consultation process

The last step of the context analysis is analyzing what an average client project on an IT transformation looks like. To understand what this customer journey looks like for a client, several meetings were attended, secondary data was analyzed and several conversations with consultants and business analysts were held. This customer journey helps to find out where the pain point and opportunities would be for a design intervention, such as a solution for the evaluation of the IT landscape agility. There are generally four phases in client engagements. A proposal phase, define phase, a design phase and execution phase.

The first phase is before a transformation starts. Client companies run into a problem and realize they need assistance from an external party such as Deloitte. In general, they talk to industry leads and request a proposal or they request a formal proposal through an official portal which can be accessed by several consultancy firms. At this point, Deloitte must make sure that they provide the client with the best proposal

to "win" the client project. There is a lot of competition within the consultancy branch and amongst the big four, so delivering proposals of high quality has a high priority within teams, offerings and portfolios.

The define phase is characterized by an analysis of the client company. During this phase it is important to ask the right questions and use fitting tools to collect data on the client company. At the end of this phase, Deloitte has a high-level overview of what must be transformed, why it must be transformed and how it can be transformed.

During the design phase there is a more detailed design created of a roadmap describing in comprehensive slices what needs to be done to execute the transformation and reach the target state. During this phase there are many interactions with the client to determine what strategy is manageable for the client.

During the execution phase, the transformation becomes reality and is managed based on the created roadmaps. Either from a distance, through regular check-ins, or from up close, by taking up managing positions within the client company. If all goes well, the target state is reached and there is a chance of identifying new opportunities for continuation of the project. Figure 44 shows a user journey based on the project timeline of an average client project.

The evaluation of IT landscape agility has an interface with all four phases of the transformation process and the proposal phase. During the proposal phase it is a way to show capabilities and reasoning for the project approach to the client. During the define phase it can help to identify what elements of the organization need to change to achieve a more agile IT landscape. During the design phase insights from the evaluation can be used to formulate

transformation goals and KPIs. During the execution phase the evaluation can be used again to analyze whether the desired staged has been reached and to identify opportunities for further improvement.

Within the customer journey we see a couple of pain point which became clear during the conversations with experts and observed meetings. There are tight deadlines for creating a winning proposal. There are sometimes multiple proposals simultaneously, combined with a limited capacity of available consultants. So, the evaluation should take as little time as possible. The fact that there is limited information and internal communication indicates that all the required information should be included, and internal communication should be stimulated. It also becomes clear that it can be difficult to find subject matter experts. The solution could assist in navigating its user to the product owner or subject matter experts.

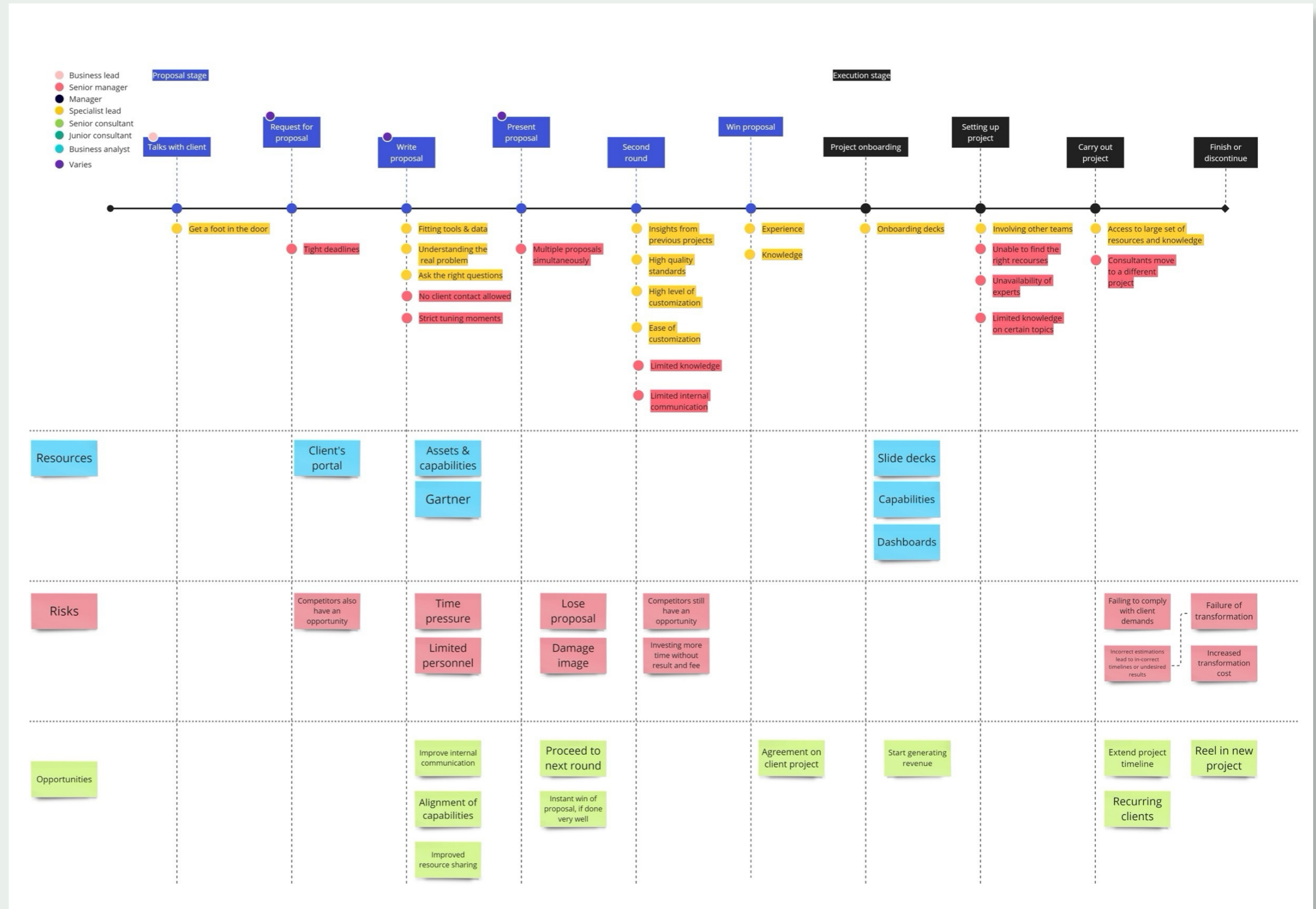


Figure 44. User journey based on project timeline

Key takeaways

43. Competition

- Deloitte is one of the largest consultancy firms in size and revenue but is under a competitive pressure. There is a continuous drive to learn, attract new talent, strengthen client relations and improve their reputation.

44. Deloitte

- Deloitte is a large organization with many areas of expertise, operating in almost any industry. Knowledge is available on almost any topic, but it may require intensive communication and networking to obtain knowledge, tools or enable collaboration.

45. TT&A

- TT&A has a strong focus on the transformation of IT landscapes and operating models for clients. With a team consisting out of generalists and several SMEs, their goal is to become the connecting dot in any IT transformation.

46. TT&A process

- There are several pain points and opportunities for a design intervention in client projects. Among which information sharing and availability, expert availability and time constraints are the most important ones.



Expert input

This part of the report will discuss the several qualitative methodologies applied to gather input from experts from within the application domain. During this phase, there is a variety of experts involved in different methodologies. This helped the researcher creating an iterative and co-creative process. This part of the research is part of the relevance cycle of the DSR methodology.

12 Expert input approach

Reviewing a large body of literature is part of the explore phase of this project. The literature research is part of the rigor cycle for the DSR methodology applied during this project. Determining how these insights can be used in a framework for evaluation of IT landscape agility is also part of the explore phase and of the relevance cycle of the DSR method. The relevance cycle focuses on analyzing the application domain, including the people, organizational systems and technical systems and the problems and opportunities within the environment of the organization that is analyzed. For the analysis of the application domain and environment, data is gathered through expert talks, observations, focus groups, observations, and the analysis of secondary data.

12.1 Goals

The main goal for gathering data from experts is to understand the Deloitte point of view on IT landscape agility and the evaluation thereof. Understanding types of evaluation currently used and desired, determining the dimensions and characteristics that should be included in the evaluation framework and determining the desired processes are essential to complete this main goal. These insights will in a later stage, during the define phase and design cycle of the DSR method, be used for the design principles and development of a solution. The following paragraphs will describe the different approaches used for gathering data from experts within Deloitte and TT&A.

12.2 Expert talks

The approach for the initial expert talks has a dominantly explorative character. The talks are unstructured, and experts are approach based on purposive and snowball sampling, where initially participants are invited for a conversation based on their area of expertise. After these initial talks, participants are asked to provide names of colleagues who could provide valuable input on the topic of IT landscape agility. During explorative talks the experts are asked to share their point of view on IT landscape agility and their experiences during client projects. Participants are asked to explain their methodologies and pain points during the evaluation and implementation phases of client projects.

Lastly, participants in the explorative talks are asked to explain what current solutions are used within Deloitte for the evaluation of clients and explain what type of evaluation they would prefer. The goal is to understand the current point of view and state of art in relation to the evaluation of IT landscape agility. There was no interview guide developed for the explorative talks, but these main topics are described and introduced during the talks. Notes were taken during these talks and grouped on a Miro board. These notes can be found in Appendix E.

12.3 Observation

Besides talking to experts, observations are done by the researcher. There are several capabilities within Deloitte, which have a focus on a certain topic. These capabilities are formed by several employees with a general interest or expertise in this topic and they work together in a cloud environment where they share knowledge and assets. Some of the topics for which capabilities exist are agile, technology agility and digital transformations. The researcher was invited to join these capabilities and had the opportunity to carry out tasks for the capabilities.

The main purpose of observing meetings by capabilities and monthly team meetings, is to understand how Deloitte operates. By observing meetings, the researcher can understand what and how knowledge is shared within and between employees and capabilities. Additionally, it allows the researcher to further develop an understanding of client projects and the assets used during client projects. During these meetings, notes are taken by the researcher and presented slides are analyzed. These insights are combined with the insights gathered during the exploratory talks and can be found in Appendix E.

12.4 Focus groups

Together with one of the capability members three focus groups were organized. This method is applied because focus groups allow participants to collaborate, these group interactions can lead to new insights. During the focus groups, a short slide deck was presented as a conversation starter, containing the current view on IT landscape agility. This initial point of view was a combination of technology agility and operating model agility. After narrowing down the scope of the research, this point of view was specified as the agility of the IT landscape focusing on the data, software and hardware dimensions. Additionally, current evaluation assets are presented to the participants of the focus groups to understand the pain points and opportunities for these methods. During the focus groups the business analysts, consultants and managers are asked what their point of view on the IT landscape agility is, what the strengths and weaknesses of current tools are and what requirements and wishes there are for a new evaluation method.

During the focus groups notes are taken digitally. These notes are coded and clustered again on a Miro board (see Appendix E). After clustering the codes, conclusions can be drawn on what the employees see as requirements for the evaluation of IT landscape agility. These clusters are then reviewed during a third focus group to iterate on the insights. Participants include business analysts, junior and senior consultants, and managers. In total there are 13 people involved divided over the three focus groups.

12.5 Interviews

Interviews were conducted to determine what is deemed important by subject matter experts with regards to evaluating an IT landscape. During these interviews, interviewees were asked what characteristics are important for an agile IT landscape. Considering the different dimensions of an IT landscape: data, applications, and infrastructure. Initially participants were asked what their current definition of IT landscape agility is, and the definition formulated during the literature review in chapter 6.4 is presented. There were multiple goals behind the interviews. Firstly, to gain insights on system characteristics, components and dimensions that should be considered during the evaluation. Secondly, to determine what factors work as barriers and enablers for agility. Thirdly, to formulate how a consultant and client can determine the desired level of agility, the format of the evaluation and requirements for the evaluation. The procedure, pilot interview, participants, sample size, sampling method and analysis are discussed in chapter 13.

13 Interviews

13.1 Interview procedure

Semi-structured interviews were used during this research. Questions were formulated based on the goals and topics mentioned in chapter 13.4. Semi-structured interviews were chosen because their flexible character allowed the researcher to prompt additional questions or encourage interviewees when additional information is required. It is valuable for this research to let participants elaborate further on certain topics of interest, especially when participants from different areas of expertise are included in the sample.

To invite participants for the interview, they were sent a document with a short description of the topic of the interview, the definition of IT landscape agility and the dimensions that are part of the IT landscape (see Appendix F). This was done so every participant had a similar understanding of the concept that would be discussed during the interview.

There were two options for the location of the interview, at the office in Amsterdam or online via teams. The participants were asked to choose their preferred location for the interview to take place in. After which they received an invitation for their preferred time and place through Microsoft Teams. The interviews were scheduled for a duration of 60 minutes.

Recordings of the interviews were made in Microsoft Teams, regardless of the location of the interview. At the start of each interview, the participants were asked to agree upon the recording of the interview. The interview would not be conducted if the participant did not consent to the recording. When a participant did agree, the recording was started, and the interview began.

Microsoft teams was set to automatically generate a transcript while recording. The interview was conducted in the preferred language of the participants, so the language setting of the automate transcripts was modified in between interviews. After each interview, both the video and transcript were downloaded. Each of the transcripts was then checked for errors and corrected by simultaneously reading the transcript and listening to the recording.

13.2 Sample size

To increase rigor and decrease bias, conducting interviews should continue until saturation is reached. Since participants from different areas of expertise were included in the sample, saturation might not be reached. The goal of the interviews was not to accept or reject a hypothesis, but to gather data that would be used for the define and design phase of this project. Without saturation there can still be valuable insights in the interview results that can support the development of a framework and solution for the evaluation of IT landscape agility.



It was decided to set a minimum and maximum amount for the sample size to limit the amount of time required for conducting and analyzing the interviews. But also, to gather enough data with enough in-depth information on the topics mentioned in chapter 13.4. The aim was to conduct a minimum of 5 interviews and a maximum of 15 interviews. After the analysis of the seventh interview, it was concluded by the researcher that only a small number of new insights was gathered, and saturation was reached.

13.3 Sampling methods

The type of sampling depends on research and interview goals. For this interview it was concluded that participants of different teams and areas of expertise should be invited. Purposive sampling is applied to make sure that these different areas of expertise are included. Snowball sampling is applied to include participants from areas of expertise deemed important by the participants from the purposive sample.

- Purposive sampling

A sampling method that has the purpose to select interviewees that will serve the research’s objectives the best. To gather detailed knowledge about a specific phenomenon, namely IT landscape agility. The inclusion criteria are participants are part of the TS&T offering, have a minimum of 6 months of experience on client projects within Deloitte and have experience with consultation on IT landscapes.

- Snowball sampling

Sample participants based on the references from the purposive sample and TT&A team members. Since there is not a complete overview of Deloitte employees with knowledge about IT landscape agility, this will be a convenient and quick method. Additionally, it will create more willingness to participate in the interview if it is referred by a colleague.

13.4 Participants

Based on the content of the interview guide, a list was created with possible participants that could be part of the purposive sample. Together with a business analyst and senior consultant, a selection was made from this list based on the relevance for this research and previous experiences with IT landscape agility. Participants range from business analysts to senior managers. Working in different teams, such as technology vision and architecture or technology transformation and acceleration. Apart from working in different teams, participants also have a different expertise, such as agility transformations, DevOps, merger and acquisition, agile architecture, scaled agile, or architecture assessments. Furthermore, participants worked with clients from different sectors, such as finance, telecom or consumer companies. Resulting in multiple perspectives on the factors important for the evaluation of IT landscape agility. Figure 45 shows an overview of the different participants of interviews and focus groups.

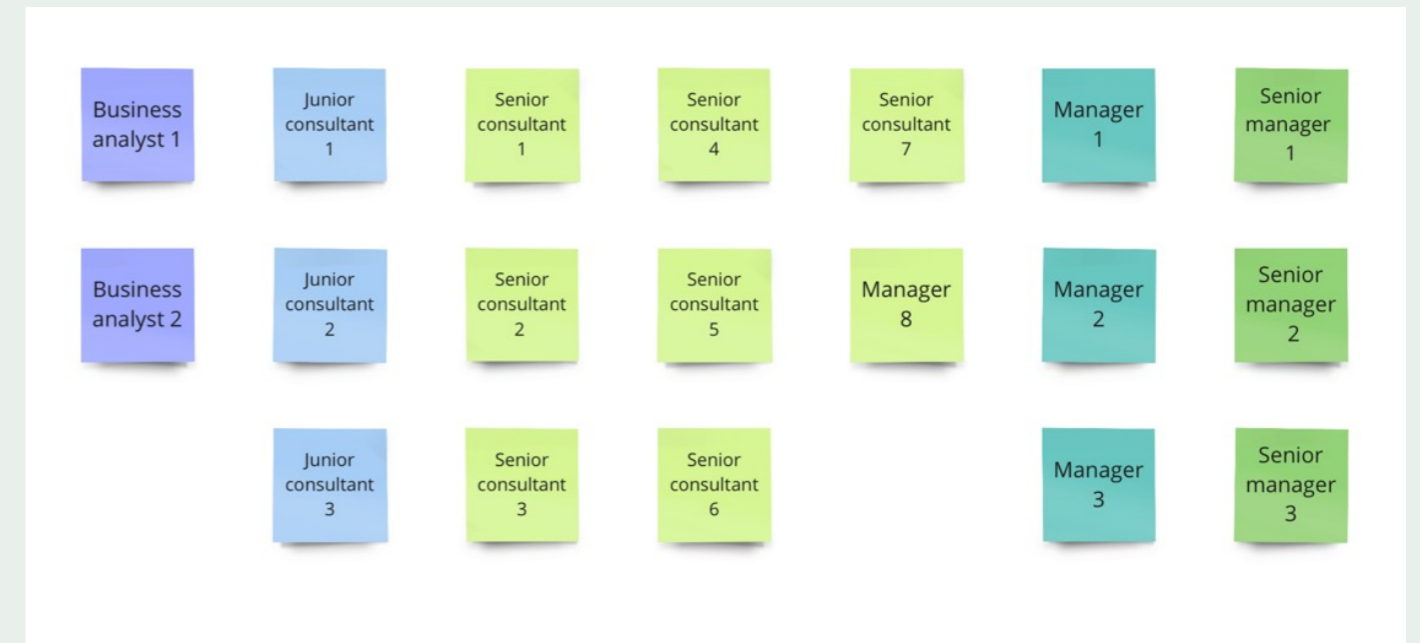


Figure 45. Participant overview

13.5 Interview guide

Based on the interview goals and topics, several interview questions were formulated, and a logical order of the questions was determined. This initial interview guide was evaluated together with two supervisors from the TU Delft and two supervisors from within Deloitte. After receiving feedback on the questions, topics and the order, the interview guide was iterated. Three iterations were made based on the feedback received from supervisors and a fourth iteration was created based on the pilot interview described in chapter 13.10. Because of the semi-structured character of the interviews, some answers and topics were asked to elaborate on more than others during the different interviews. This has to do with the expertise and experience of the participants. The final version of the interview guide can be found in Appendix G.

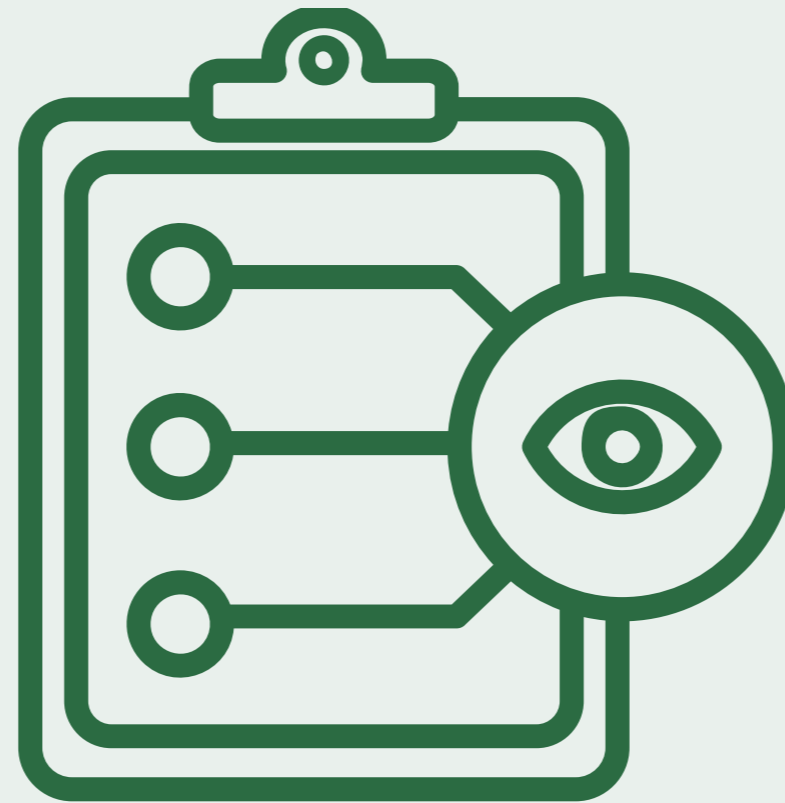
13.6 Pilot interview

When it seemed like the interview guide was structured properly, a pilot interview was conducted. This pilot interview was conducted to test whether the introduction, topics and questions and order of the questions were chosen correctly. During the pilot interview, the structure of the interview appeared to be effective but still needed modifications in terms of formulation and order of the questions, which led to the fourth iteration of the interview guide. This version of the interview guide will be used for the first interview.

13.7 Analysis

As mentioned in the interview procedure in Chapter 13.5, interviews are recorded and transcribed automatically using Microsoft Teams. The recordings are saved, and the transcripts are reviewed by listening to the recordings and correcting any errors. During this process, the transcripts are anonymized to protect participants and sensitive client data. Once the transcripts are corrected, the interviews are coded by copying quotes from the Microsoft Word transcript to a Miro board. Each quote is added to the Miro board with labels indicating the participant's team, position, industry, and expertise.

After pasting the quotes, a first-order code is assigned to each quote on the Miro board, and second-order codes are developed based on clusters of first-order codes. From these second-order code clusters, themes are identified. During the analysis, the codes are refined based on new insights from additional quotes. Relationships between codes are indicated with arrows. Coding and clustering are iterative processes, with clusters continuously adapted based on new insights. Additionally, codes and clusters were reviewed with two experts from Deloitte Consulting. The codes and clusters are documented in Appendix H. These clusters and themes formed the basis for the design principles and content and format of the evaluation of IT landscape agility.



Expert Insights

This section will describe insights gathered during the analysis of the interviews based on the themes created. To clarify some of the insights, the experts are quoted accordingly. The insights drawn from the interviews are clustered into the following themes: Content for evaluation, goal of evaluation, landscape transformation, IT landscape agility, barriers, enablers, drivers, way of working, target state, IT landscape, data, software, infrastructure, architecture. These themes are in line with expectations based on the goals of the interviews.

14 Insights from expert input

14.1 Goal of evaluation

It is important to understand what the goal of the evaluation of the IT landscape would be for Deloitte and their clients. This will be the starting point for the design statement and principles for this project. Several participants have mentioned what motivations Deloitte for the evaluation of the agility of IT landscapes and allows the designer to understand what outcome is desirable for clients. Furthermore, it supports the development process by pinpointing what is missing in current methodologies and what is required for future methodologies.

14.1.1 Identify gaps and opportunities

The first thing that becomes clear is that the evaluation of the agility of an IT landscape should identify opportunities and gaps in current IT landscape. Identifying what opportunities there are will help to define transformation goals and steer the process of transforming existing IT land-scapes, as mentioned by one of the senior consultants (SC1). *“You must have some kind of pro-cess logic, so you analyze a survey or assessment. So that we as Deloitte understand, this is what we figured out, these are the worst points at the best points of the current landscape” (SC1).* To understand the opportunities within the IT landscape of a client, there needs to be an understanding of currently unexploited potential.

There is a similar motivation for identifying gaps in the agility of the IT landscape. It should be-come clear what the biggest flaws or weakest points of the current IT landscape are with regards to agility. Identifying gaps means understanding the pain points an organization perceives with regards to adapting to changing needs from internal and external users and understanding. As mentioned by one of the senior consultants (SC2), the evaluation should allow the consultant and client to determine what the current state of the IT landscape is, what should be improved and what improvement should be prioritized. *“What do you already have, what do we need to work on, what is the most important?” (SC2).* Retrieving this information during the evaluation will again support the process of formulating transformation goals and steer the transformation process.

14.1.2 Current state vs. desired state

There are different opinions on whether the evaluation should aim at analyzing the current state or determining the desired state. On one hand participants mention that an evaluation should aim at determining what the desired state of the organization is, such as one of the senior managers (SM2). *“That can be a difficult question, but it might be the goal. How agile do you want to be? And how do you get there. You do not want to go for the maximum amount of agility, there should be a consideration based on cost, risk and agility” (SM2).* According to the participant the client should not aim at maximizing the agility of the IT landscape, but on determining the right amount of agility considering the cost, risk and agility. Deloitte can then determine what technologies and processes could be implemented, adapted or decommissioned to reach this desired state.

On the other hand, participants mention and agree upon the fact that there should first be an evaluation of the current state the IT landscape. As can be seen in the quote by another senior manager (SM1). *“What I think is best, is an assessment would go through the different facets of an IT landscape with several questions. So, you would get a good view on what these facets are currently like” (SM1).* Based on the current state, decisions can be made on what the desired agility of the IT landscape would be. This connects to the insights from chapter 14.1.1, where the evaluation should identify gaps and opportunities in the current state. The difference between the current and desired state, over different dimensions of the IT landscape, could help identifying required technologies and processes.

14.1.3 Conversation starter

Such as mentioned by one of the senior consultants (SC4), could the evaluation of an IT landscape at a client company act as a conversation starter. *“An assessment would be used to broadly define the current level of agility. That is a good starting point for conversations with the client about what their goals are and what requirements they have” (SC4).* Organizations often want to transform based on a problem they run into, e.g. long lead times on new projects. The evaluation should allow consultants to start a conversation and dive deeper into specific facets of the IT landscape, helping them understand what topics they should ask more questions about. Such as quoted by this senior consultant: *“You know before you say let’s do this, you first really listen to the client. But sometimes you have to first find out what to ask about” (SC1).* Instead of having to talk face to face about all aspects of the IT landscape, an evaluation should consultants to quickly dive deeper into the most essential components.

It becomes clear that a large part of consulting is asking the right questions and discussing with a client what their current problems are to understand what the real problem is they are facing with their business. When the evaluation of the IT landscape can point out what topics they should ask questions about, this could be a good starting point for further conversations on the transformation of the landscape. It could also help consultants in determining what employees or users to include in further analysis and goal formulation. When it becomes clear what department or team struggles most with the lack of agility, these employees can for instance be participants for follow-up interviews. When the client can talk to a diverse group of people based on the outcomes of the evaluation, this will allow consultants to determine whether the client company can realize the desired state according to one of the senior consultants (SC5). *“There’s a lot of internal things going on at the client, that’s why you have to make sure that when you talk to the client, you don’t just talk to one IT person, you talk to several people to understand okay what kind of frame we are in right? Can we actually deliver this or not” (SC5).*

14.1.4 Connecting clients with teams and experts

An important cluster for the goal of the evaluation is the ability to connect suitable teams and experts with client projects, this can be distilled from the quote from one of the senior consultants (SC7). *“We should be able to do the evaluation and based on the results connect the client to subject matter experts within our team” (SC7)*. When it is clear, based on the results of the evaluation, what aspects of the IT landscape need to be improved, it becomes easier to facilitate clients with the right service connecting client projects to teams, experts and resources with Deloitte. There are several offerings and teams with a certain expertise that should be involved based on what the outcome of the evaluation is, like mentioned by one of the senior managers (SM3) during the interviews. *“When it comes to technology, you should involve architecture, system development, cloud engineering for example. When it comes to change and people, you could involve HR advisory. For processes you can involve Enterprise Resource Planning and Management. For the customer facing side you could involve consumer and marketing. If you want to do this well, you would have to make it a cross competence activity” (SM3)*. It will most likely mean that there will be multidisciplinary teams working on the evaluation and transformation of the IT landscape. According to one of the participants of the group discussions this is what the Deloitte model is about. Strategizing for transformation is improved when consultants and managers with the required knowledge are involved, making the chance of successful completion higher.

According to one of the business analysts it can be quite difficult to find the right people with the right knowledge within such a large organization, so if this is improved by a solution for the evaluation and stimulation of IT landscape agility this would make the consultants’ job easier and improve the service they deliver. Cross competence content creation should also be part of the realization of the evaluation framework or eventual tool. So, the input for the framework could come from different departments and teams within Deloitte. They could collaborate on the content, or the content could be improved iteratively by sending it out to different disciplines who will then add or adapt the content based on their expertise and experiences.

14.1.5 Decrease time

There is an emphasis on the fact that the evaluation should speed up the delivery of new technology for client, as mentioned by one of the consultants (SC5). *“The goal for a Quick Scan is to speed up the delivery of new technologies and make the IT landscape and organization more agile” (SC5)*. Additionally, the theme of decreasing time could apply to the delivery of results by Deloitte itself. If there is an early opportunity to evaluate the components of the IT landscape, this could improve the ability of Deloitte to strategize for transformations. Initially this would be useful during the first phases of the process of a client project where the goals of the transformation are defined, and the second phase where the transformation is planned by developing a roadmap. The impact for the client comes in the last phase of the process where a transformation is executed and managed. There are several other KPIs that are essential for agility related to the theme of decreasing time, namely, change lead time, recovery time and time to market. One of the

senior managers (SM3) points out that the recovery time is also related to the stability of systems. *“Stability is also im-portant for the agility, let’s say you make a change, and something goes wrong. How long will it take you to recover from this?” (SM3)*. The KPIs can support in indicating how agile the IT land-scape is. They show how quickly IT assets can be adapted to changing circumstances, when the change lead times, recovery times and time to market are too high, the agility of the IT land-scape is generally too low.

For Deloitte the main goal is limiting time consumption during the research phase. A convenient quantitative evaluation could save a lot of time in comparison interviews. As mentioned by a jun-ior consultant (SC2), it would be desirable for the evaluation to not require the involvement of many consultants and take too much time and effort from the client to deliver data that is not available. *“It cannot be so that an evaluation takes too much effort, and you would need 10 peo-ple to gather data at the client. Neither can we expect too much data from a client that they can-not deliver” (SC2)*.

14.1.6 Early involvement of TT&A

According to secondary files and one of the managers (SM2), the TT&A team is often involved in client projects at a relatively late point in IT transformations. When the project set-up is already done, and boundaries of the transformation have largely been defined. *“It could be used to get involved in projects. Often, we are late to the show and can’t guide the project anymore” (SM2)*. One of the goals of the evaluation of IT landscape agility for TT&A would be to become an early point of contact for clients and other teams within Deloitte. An asset, such as an IT agility assessment, would allow clients and teams within Deloitte to understand what TT&A’s purpose during transformations can be. Communication and marketing of the solution would be a prerequisite to make sure awareness is created.

14.1.7 Convince clients

There is a strong competitive landscape in which Deloitte is operating, with competition from many other consultancy firms. When clients do a request for proposal, they will hire the consultancy firm with the best proposal. Meaning Deloitte needs the knowledge and tools to convince clients to select them as their partner for the transformation. The outcome of this project should be a proposition during the onboarding of new or existing client projects. Additionally, consultants should be able to convince clients to transform their IT landscape based on the outcomes of the evaluation. According to a senior consultant (SC3), this would be the first step for creating a more agile IT landscape. *“So typically if you want to do this, the first job you have to do is convince the client” (SC3)*. Because of the competitive landscape and reputation that should be secured, the outcome of this project must be thoroughly tested before it can be used in client projects. It is advised to start small and execute a multitude of tests to improve the evaluation framework. When the solution is tested and proven to be a success, it is also easier to convince clients of its purpose.

14.2 Process of evaluation

This section describes the insights gathered on methods for evaluating the IT landscape agility at client companies. These insights are valuable for the design process as they indicate what would be most suitable for both consultant and client. Results should indicate what method fits with the daily activities of the consultant and what method would be most effective for the evaluation itself.

14.2.1 Qualitative versus quantitative

Opinions differ on whether the evaluation should be qualitative or quantitative. Some participants leaned towards a quantitative assessment in the shape of a survey, quick scan or maturity model. Such as the senior manager and senior consultant (SM1, SC4). *“The desired format would be a survey. Why do I say this? Because you want to involve as many people as possible, from the complete breadth of the organization” (SM1)*. A quantitative methodology could be more scalable, as many participants could be involved as desired. With a standard set of questions, it can be easier to interpret data and have a clear framework for the presentation of results, like mentioned in (SC4). *“That would be nice as well, right. So let’s say you have a survey and then at the end you have like a whole framework and process just outputting like a summary of data and statistics” (SC4)*. Data can be transformed into graphs automatically and the data gathered is more measurable than for instance with a qualitative methodology. Additionally, when the evaluation would be done periodically, the results can be compared more easily with a quantitative methodology.

However, two participants also thought that a qualitative method would be preferable, such as one of the junior consultants (JC1). *“If qualitative would be doable, it would have my preference. But that is because I personally work more qualitative than quantitative” (JC1)*. Qualitative evaluation is perceived by one of the participants (M2) as easier and others mentioned that they currently already use qualitative methods, by interviewing clients. *“Qualitative is easier, but also more dangerous as you are relying on your own insights and experience. It is a lot more open to discussion” (M2)*. A side note here was that it could be riskier as the consultant is trusting on its own insights and experience and it is more open for discussion because it is subjective.

It is suggested to make the evaluation as measurable as possible, which can be difficult for a qualitative methodology. If there would be a qualitative method used, it should be a structured interview guide with clear and generalizable questions.

14.2.2 Scalability

If an assessment is created based on the framework for evaluation, this assessment should be scalable according to some of the consultants (SC5). *“It should be scalable. Um in the sense that if you have a small company of four people, it should work as well as for a company of, you know, 3000” (SC5)*. Deloitte works with clients in all shapes and sizes, ranging from a hundred to multiple thousands of employees in all industries and markets. Making an assessment that would work for all types of companies would be most

desirable and viable. Therefore the final solution should allow the consultant to evaluate any kind of client company, independently of the size and industry, e.g. by avoiding industry specific questions.

14.2.3 Involve different disciplines

It became apparent during the interviews that it is most valuable to involve both business and IT employees in the evaluation. *“It is a requirement that the population consists of a mix of business and IT employees” (SC2)*. Because the IT landscape is used by both IT and business, and these two disciplines have different experiences and use cases for IT facilities within the organization. *“The main conflict I see within companies, you will have business people and IT people and they have completely different views of the world, different ways of doing things. It is necessary to really have them together” (SC8)*. As mentioned by one of the senior consultants (SC8), different points of view of different people create different perceptions of the agility of the IT landscape.

Besides including different disciplines, one of the senior managers (SM2) mentioned that it is necessary to include different levels within the organization. *“It could very well be that on a C-level everything is completely unicorns and rainbows, but at the operations everyone is crying and burned out. That is something we see happening and an assessment could very well point this out. Those are very valuable insights” (SM2)*. These different levels could be e.g. operations, management, and C-level management. If a large difference becomes clear between the opinions and experiences from different levels, it is valuable to understand this misalignment comes exists for Deloitte and the client to be able to solve it.

If different departments and levels are involved, it could be valuable to use questions, like mentioned by one of the senior consultants (SC6). *“Subjective, do they think change is going fast or slow and you can compare this between different people, teams, departments or even within the hierarchy” (SC6)*. In a situation like this, there is no scientific value to the answers given, but the purpose is to understand what the employees feel like when working with on or with the IT landscape. How do respondents perceive the ongoing change or the lack thereof. *“Preferably a survey with as many respondents as possible, so you also see where they differ in opinion” (SM1)*. What becomes clear from the quote by the senior manager (SM1) as well, is that there should be an inclusion of many people from different organizational levels and departments. The evaluation would create most valuable insights when there is a large sample, and it becomes clear where the opinions differ.

14.2.4 Timing

The timing of evaluation can be key to the results of the evaluation. Logically there would be an initial evaluation at the start of a project timeline, to understand the state as-is and get insights in what needs to be improved. Furthermore, it is argued that it would be useful to repeat the evaluation periodically. When doing so, Deloitte would be able to keep track of progress and understand whether proposed changes are

influencing the agility of the IT landscape. One participant (SM1) also suggested evaluating in tandem with year plans to see if the client reached targets described in year plans, they also mentioned that it could be done each quarter. *“Or link it to the year plan, some companies have a three-year plan. After these three years, did we reach our target agility?” (SM1)*. Other participants (SC3) suggested doing it based on a project timeline, doing it during the assessment phase, the execution phase and at the end of the project. *“Okay, through our road map, right? So how has your agility evolved, right? So, what does your IT landscape look like now? Is it more agile, is it less agile?” (SC3)*

14.2.5 Benchmarking

Some of the consultants (SC4) mentioned that comparing the agility of the client to that of competition will allow organizations to understand if they lack behind or have a competitive advantage over their competition. *“The company would profit from knowing where they stand in comparison to their competition” (SC4)*. If a business relies on a less agile IT landscape, chances are higher that competition will be the first mover and will innovate more quickly. This forms a risk for business performance. Understanding and evaluating those risks is part of consultancy practices.

Creating industry benchmarks would mean Deloitte needs to gather data on multiple organizations within all industries and keep this data up to date. This can become a time-consuming task and would require consent and willingness from many organizations to share data frequently. Furthermore, it is not in line with compliance guidelines to use data from one client for another. Benchmarking is not necessarily seen as a requirement by all the participants, one of the participants (SM1) mentioned that it would be nice for reference. *“I wouldn’t say benchmarking is a requirement. I think benchmarking could be done for reference, but this is something we would do after we have a lot of data. Then you can say, they do it like that, that is why they are successful” (SM1)*. Meaning that the benchmarking will wait until enough data is gathered from a multitude of clients.

Benchmarking during the transformation process would, however, be a possibility. By doing a baseline measurement at the start of a project and repeating this during and at the end of a transformation would allow the consultant and client map progress and improvement of the agility. This method for benchmarking is also mentioned during the interviews by one of the consultants (SC6). *“What are your current agility levels? Are you happy with it? What has changed for you? So, you can really see from the beginning to the end and throughout what was learned and improved. (SC6)”*

14.2.6 Audit trail

What is also mentioned during interviews is the traceability of information, since the documentation is done manually during interviews, it can be difficult for consultants to understand which of the participants gave what answers. *“With interviews, the documentation is always done manually. You must carefully keep*

track of who said what and why. In hindsight we always get the question, right, I do not agree with this, where does this come from. Then you must proof it and that’s always browse endlessly in your notes and old versions of reports” (M2). Like mentioned in this quote by one of the managers (M2), is the who, when, where, and why of answers not always clear. This is why it is advised to have an audit trail in the results of the evaluation, to help the consultant understand where specific results came from. However, since employees and partners might not feel the confidence to be completely honest when answers can be traced back to them, this might also affect the insights.

14.3 Technology content for evaluation

The content of the evaluation is discussed during the interviews to understand what should be included in the evaluation. What dimensions, characteristics, technologies, stakeholders and processes influence the agility of the IT landscape and should thus be part of the framework for evaluation. During the literature research, the focus has been on the technological dimensions of the IT landscape, the data, software and infrastructure. These dimensions have been discussed during the interviews as well. However, there was a number of non-technical dimensions found in the interview results that are crucial for the agility of the IT landscape.

14.3.1 Data

When we look at data, we see a couple of themes that should be considered when evaluating IT landscape agility:

- Processes
- Technological characteristics
- Non-technological characteristics
- Data architecture
- Technologies

The processes, technological characteristics, non-technological characteristics, data architecture and technologies are connected and influence each other. There is not a one size fits all combination that results the highest agility. It depends on the use of data within the organization, the information needs and the needs of the users what combination creates the right amount of agility for an organization.

Data processes

When it comes to data processes it is deemed important to look movement of data throughout an organization, whether there is a standardized method for sharing data, and whether the organization makes use of value driven data sharing (JC2). *“We want to make sure we can leverage data driven decision making. These are the most valuable decisions” (JC2).*

One of the participants (SM1) mentions that the agility of the IT landscape depends on how an organization analyzes user data and customer needs to sense change. But also, on the IT landscape itself to track performance. *“There are a few key capabilities, like insights into customer needs and users. Those are enabling factors for the agility of the organization and IT landscape” (SM1).* Additionally, the organization must understand what the information demand is, so what insights do you need to draw from data. *“Let’s say there will be a new law, that says you need to report this data on your customers. But your data is stored in such a way that you are not able to deliver this. That’s what I mean by understanding the information demand” (SC2).* This helps the organization to determine what and how should data be analyzed.

Data analytics can be used to understand the current and future user or customer needs and information demand, but also to find redundant functions in the IT landscape. AI and ML can increase the speed of processing data, but there are risks associated with these technologies that should be considered. Data analytics in general increases the ability to make data driven decisions and therefore increases agility. *“You want to be able to make data driven decisions, making the right decision at the right moment, that will create most valuable and be most agile” (JC3).*

Participants points out that it is important to know how data is managed, e.g. whether there is master data management and a CMBD in place. *“If we look at data, we want to know how the master data management is configured, do you have a CMBD and is it integrated in the complete delivery process?” (SM2).* It is important to know what type of data is available and how it changes within the organization to use data for sensing change within and outside of the organization. An audit trail can justify the change history of data. Understanding how it changed, why it changed, and who changed it?

Technical characteristics

Four of the participants mentioned the technical characteristics of the data in relation to the agility of the IT landscape. Technical characteristics influence the ability to sense change and to quickly respond. Among the technical characteristics we see quality of data, referring to the completeness, timeliness, integrity, validity, uniqueness and consistency of data. One of the consultants (SC2) mentions that it is important to be able to continuously change data: *“Making sure you can continuously change data and make the correct version of data available in high quality” (SC2).* Which is also related to the continuity of data. Does the organization rely on real-time data, is there continuous availability and quality and can it continuously be modified.

Another important aspect for the agility of data is the integration and complexity of data. When data is integrated in one “coil mess of data”, the complexity becomes too high, the number of dependencies increases over time, and it becomes difficult to decommission parts of it. As illustrated by one of the senior consultants (SC8), creating many dependencies will lead to an integrated mess that cannot be adapted swiftly: *“In this particular case, there’s like one big block of integration with all their data. And then yeah, if you remove part of it, it will probably break everything else” (SC8).* Especially if critical processes rely on data, high complexity and low availability will become problematic for organizations, like mentioned by one of the managers: *“Availability, so how well can you make data available to other core systems?” (SM2).* Therefore, it is advised to make sure data has high autonomy and modularity, so it can be separated from core systems.

Non-technical characteristics

When we look at the non-technical characteristics, we see that participants mention database structures. Whether this is value driven and based on the ongoing processes within your organization. Furthermore,

stimulating agility could be done through setting clear guidelines for formats, sharing and architectures like mentioned by one of the senior managers (SM1). *“I think that is key, having strong guidelines and keeping to it. But what you often see is that the architectural runway, those epics become less urgent when business is screaming for changes” (SM1)*. One of the participants (SM2) spoke about the redundancy of data. Referring to having a golden copy and golden truth, for recovery purposes. *“It all sounds so easy, master data management, single source of truth, golden copy, those terminologies. It is conceptual but needs to be thought through very well.”* When working with a vendor, for example, it is wise to make sure you have one vendor in the EU and one in the US or having multiple vendors to recover data and prevent downtimes. These can influence the agility of the IT landscape since they build in resilience and can decrease e.g. recovery times.

Data architecture

The data architecture can be divided in multiple underlying themes, namely: data model, transformation and architectural archetypes. Zooming in on data models, we see for instance that it is perceived to be important understand the type of data that exists within the organization. What data types are and will be present will help to determine architectural guidelines. It helps defining how data is handled and secured, which is especially important when working with confidential data.

There are several archetypes for data models, such as e.g. monolithic or non-monolithic data models. A monolithic data model allows application data to be handled, consumed, converted, stored, and transmitted from a single, centralized data store. For smaller businesses with more straightforward business domains and a stable data environment, monolithic data models may be appropriate, but they can cause problems when working in a continuously changing operating environment with a multitude of less straightforward business domains. As mentioned by one of the senior managers, the chosen architecture can influence the agility of the complete IT landscape: *“A good data architecture will help you to make the complete landscape more flexible” (SM1)*.

During the interviews, different architectural archetypes have been discussed. Perceived as least agile is a traditional data warehouse, which often comes with high complexity when it is maintained over a long period of time. Many dependencies can exist making systems slow and easily delayed. Furthermore, different workflows from different departments are entangled, the smallest moderations can cause lags in data delivery. Traditional warehouses make use of a ETL process, where data is first extracted from the sources, then transformed to a certain format and lastly loaded into a database. This limits the interoperability of the data as it is already transformed when it is stored. The capacity of traditional warehouses can also be limited, making it less agile. Having to work with predefined structures in the IT landscape can limit the ability of the organization to implement change: *“When talking about traditional warehouses, making use of ETL, that is often one big spaghetti. They are existing structures where everything should fit in” (SM3)*.

Another architectural archetype would be a data mesh, where data is treated as a product. It makes sure data can be shared near real time. According to one of the participants this makes the data mesh very agile: *“It is very agile if you start seeing data as a product, through a data mesh construct. Where you make sure there is continuously, near real time, data available for a specific data product” (SM1)*. This allows organizations to organize around data and make data driven decisions, as was mentioned by one of the consultants: *“Data mesh is actually how you organize around data” (JC2)*. This archetype is effective when a business is ‘data heavy’. The idea behind the data mesh is that the organization can be split up in different domains and instead of a central orchestrator, each domain takes responsibility for their own data. Every domain team can then easily consume and create interoperable data products. Interoperability is achieved by standardization ensured by a central governance group. This makes sure data is available and usable for all domains throughout the organization.

Snowflake is also mentioned by one of the participants: *“It means you can transfer data blind, which is way faster. There are very intelligent mechanics behind Snowflake. It is a new type of data warehouse and a new way of structuring data” (SM1)*. Snowflake is based on a different process than traditional data warehouses, since it is based on ELT instead of ETL. Meaning data is first extracted, then loaded into a database and only transformed when needed. Which is a completely new method for structuring and presenting data, through a blind transfer. It allows for higher speed and requires less data management.

When it comes to transforming data models it was mentioned a couple of times that it would be the best for organizations with a complex non-agile data architecture to start from scratch, also known as Greenfield. The biggest problem of organizations is coping with legacy systems and data warehouses, which are often characterized by high complexity. This complexity is often caused by dependencies and a “mess of data and APIs”, which can be difficult to untangle. These traditional legacy systems consist of one big blob, on which core business processes rely, these are most of the times difficult to decommission. Decommissioning one part will break another, making it very time consuming and expensive. One of the participants explains this using one of his projects: *“In my current bank project, the bank relies heavily on one particular legacy system, with like a huge coil mess, with all data of clients and loan information, bank information and whatever. If we were to decommission this, the whole bank would just go down” (SC8)*.

When it comes to technologies in relation to data, it becomes clear that cloud-technologies create higher agility. When data is only stored on local devices this can limit the availability of data throughout an organization. It creates dependence on the hardware on which data is stored, lowering the agility of the IT landscape. For many organizations it appears to be a driver for cloud migrations: *“Because really, what drives us all, or a lot of clouds initiatives is the data, where do we store the data? How do we store the data?” (SC4)*.

14.3.2 Software

When looking at the input from participants on the agility of the IT landscape with regards to the software and applications, there are a few themes that seem important. Such as processes, technologies, technical characteristics, non-technical characteristics and architectures.

Software processes

In-house development refers to development of software and applications by developers working for the company the software is developed for. It is mentioned that in-house development can be costly in terms of time and money. However, it comes with the advantage of having more control over testing, deployment and feature management.

Processes should be streamlined within and between different teams. Continuous deployment allows organizations, to implement new features at any moment. Making software more agile, since the organization can quickly respond to changing needs. Additionally, it helps organizations to minimize downtimes. This is mostly desired for core systems supporting core processes, where there is a high risk of downtime. Something that is advised to increase the agility is to adopt DevOps methodologies, with a DevOps pipeline that allows for continuous integration and continuous deployment, which speeds up the delivery of new features. As mentioned by one of the senior consultants: *“CI/CD pipelines help to increase your agility by deploying automatically” (SC6)*. DevOps pipelines allow for automated deployment and automated testing, which is mentioned to increase the agility of the IT landscape: *“They worked with DevOps principles, with automated testing. You can switch very quickly. You do not have to do complete tests before your release something” (JC2)*.

With user acceptance tests, performance tests and integration tests, organizations can release faster and increase their release frequency without interference of people. *“The UAT’s and performance tests, everything! There’s no human involvement anymore. However, your audit and compliance need to agree with that” (SM2)*. It is mentioned that the integrity of the test environment must be maintained, ensuring the test environment is an exact copy of the actual system and audit and compliance does agree with the automation. Additionally, organizations can profit from implementing standard operating procedures, which allow teams to connect and integrate software more easily.

Besides development by developers, it also happens that software is developed by business employees. This can be done through no-code or low-code solutions. In case this happens, organizations may have shadow IT, which can cause security issues. There should be a handover from business employees to IT, as the software needs support from the IT department. It is advised to give business employees the freedom to develop within boundaries that comply with governance guidelines. Which can be very agile, because business employees might know more about the needs of business and customers. This also mentioned by one of the senior consultants: *“Low code could be a nice solution. It enabled a company to create new functions quickly by businesspeople. Part of the ERP can be done in low code, by people who use it most.*

They can configure the standard components in the right order” (SC5). However, business employees might experience resistance from software engineers in finding support for low-code and no-code solutions. Even among the participants there was some resistance towards this concept: *“I don’t have any knowledge of no code or low code. We make a lot of jokes about it in the community” (SC4)*

Another option mentioned is outsourcing software development. There are two options, either hire a third party to develop new software or use off the shelf software. Organizations choose off-the-shelf software because it is cost efficient: *“Limiting cost! Buying platforms off the shelf, PaaS or SaaS products are eventually cheaper. It might not be exactly what you need, but you do not have to spend and pay a thousand man hours on it” (JC1)*. But there are risks involved with off the shelf software. When internal or external changes require changes to software and organizations start to build custom additions to these software packages, a sprawl of add-ons can start to form. When a software provider would update software, all these customizations could break due to dependencies, like mentioned by one of the managers: *“Updating the package itself can be problematic. There is a new version and all of the customization around it will stop working” (M1)*. Additionally, it could become difficult to switch from service provider because of all the specific modifications or contracts, which is known as a vendor lock-in. Vendor lock-in is generally seen as the largest downside of using third party software as you can become reliant on the vendor and its plans. When using large platforms like SAP for instance, it is more difficult to deploy simultaneous and continuous. In general, more than one team relies on this software, so changes to software will affect other teams as well.

Software technologies

When it comes to technologies within the software domain, it is mentioned by multiple participants (SC4) that agile IT landscapes have a test environment in place. *“What we often see is multiple test environments running. So, the moment you release, from development to test, from test to production, there is a traffic light that says, there is something wrong. Check this” (SC4)*. When new code is deployed, and deployments go from development to testing to production, teams will receive instant feedback on the functioning of a system. It is important that test environments are available and production-like, to make sure that testing can be done continuously and there are no unexpected errors occurring at release. These test environments are part of DevOps pipelines with CI/CD functionalities.

For the connectivity within applications and between applications it is mentioned that the use of APIs might be most agile: *“You would want to force developers through principles to make APIs separate from each other. Why? When an API is changed on the website side, then the core system using this API as well would be affected if it would not be the case” (SM1)*. Especially when there is decoupling in the standard operating protocols: *“Make sure there’s decoupling in the standard operating principles with APIs. Teams can easily connect and disconnect” (SC3)*. However, if a landscape is made completely modular with 200 APIs and these are not managed well, it may not increase the agility of the IT landscape.

Cloud native applications are seen as the more agile type of application. Many organizations are transitioning or have transitioned applications to cloud environments to establish this agility, however, software running in cloud environments are not always more agile. This was mentioned by one of the consultants with regards to cloud migrations: *“Cloud migration with lift and shift won’t help a lot for your agility. You have to redesign from the core and make application more scalable when you build them on cloud infrastructure. But it comes at a price”* (SC6).

Another technology which is promoted for the agility of the IT landscape is virtualization through containers: *“When it comes to technology, I am thinking about containerization. You know you have a certain workload, but you do not know where it is operating or on what. But it just works”* (SM2). Containerization encapsulates software and OS, making it compatible cross platform, operating on any type of infrastructure. Allowing for high fluctuations in workload leveraging cloud technologies.

Technologies that are not implemented a lot yet, as of conducting the interviews, are machine learning and artificial intelligence. These are perceived as very powerful tools, but with a lot of compliance and security concerns. Same goes for using blockchain, which can be used for an audit trail to keep track of change. From a consultancy perspective, there needs to be more education on these topics to mitigate reputation risks. Additionally, it seems that legal procurement, IT compliance and cyber security processes are time consuming for the implementation of new technologies like ML and AI. One of the participants mentioned that this is because it is difficult to estimate what will be the outcome of the implementation: *“Especially with AI right, it is not a deterministic science. We cannot really assert exactly what is going to come out of it”* (SC4).

Software characteristics

There are two main characteristics that sometimes influence the agility of software and the IT landscape. First, application size in terms of the number of functionalities. The bigger the application, the more complex it becomes. Requiring broader testing and increasing the complexity to make changes to specific functionalities without affecting other functionalities: *“We run into very large applications that support a lot of functionalities. It means you need very broad testing when changes are introduced. When something breaks, it is like looking for a needle in a haystack. Implementing and testing solution will cost you even more time”* (SC5).

Second, the age of a system. Legacy systems especially do not adapt quickly to external and internal changes due to complexity and reliance of core processes. This influences the potential to be transformed: *“Software wise we look at the potential to transform it. Do you have like a 30-year-old legacy system, that is absolutely not changeable. Then any IT professional would just say: throw it in the trash and make a new one”* (SC7). Older systems often make use of outdated methods, protocols or coding languages, requiring specialized employees. With outdated systems, it can become more difficult for an organization to attract new talent.

Technical characteristics for software and applications include modularity, scalability, complexity, dependencies and autonomy. Modularity increases the agility of the software as it allows you to easily add and remove modules. Like mentioned by one of the consultants: *“How modular is it. Can you add and remove modules easily?”* (SC1). High scalability enables software to cope with an increase and decrease in capacity. Complexity slows down change, the simpler a system is, the easier it is to change. It is not clarified what is meant by autonomy, but it is assumable related to software being independent. Looking at dependent systems and communicating systems, it is suggested to look at the change lead times, which is a key performance indicator for the adaptability of software systems.

Software architecture

When it comes to increasing the agility software from a development point view, it can help to have a clear separation of responsibilities based on the business functions. This separation starts with the creation of the solution architecture. The separation should be clear within and between applications according to some of the participants: *“There should only be a couple of things that an application should be able to do, so a clear separation of responsibilities”* (SM2). But also in the enterprise architecture for the teams working on the different applications, as mentioned by one of the consultants: *“How can we organize based on our business architecture? What processes are there, what capabilities and what teams do who put on that? Make as many unique capabilities as possible to make sure we have autonomy”* (JC2).

14.3.3 Infrastructure

The infrastructure within the IT landscape is an essential element for the agility of the IT landscape. During the interviews a few themes were distilled from the codes. There is the infrastructure hosting model, the processes applied to the infrastructure and requirements for the infrastructure. For the hosting model of the infrastructure there is a distinction between on-premises, hybrid and cloud infrastructure. In relation to cloud infrastructures the results also touch upon the topic of platform-as-a-service.

On-premise infrastructure

As with data and software, the term 'legacy' was mentioned again by one of the participants. With legacy infrastructure, consultants often refer to on-premises infrastructure. Traditionally this was done with mainframe computers that hosted databases. On premises infrastructure is perceived to be less flexible than IaaS: *"From experiences it turns out that on-premises landscapes, with own hardware and servers, are less agile"* (SM1). But the rigidity of this type of hosting model depends on the integration of PaaS and SaaS as well as the application architecture.

On-premises landscapes use own hardware and servers. For smaller companies this might be a suitable option creating the adaptiveness needed. For large companies it may require a large quantity of qualified personnel making it less adaptive: *"if you need to handle whole infrastructure for a large company on site. You really need a lot of qualified employees"* (SC7). Scalability is limited by the inability to quickly increase the capacity of hardware; servers need to be installed manually and outages need to be handled by qualified personnel on site.

Hybrid infrastructure

Hybrid delivery models are also mentioned, where there is a combination of IaaS and on-premises infrastructure. Three of the participants have mentioned the hybrid infrastructure, since they have experienced this at clients: *"Sometimes the company really wants their data on site, or their operations on site is a requirement. In that case we would work typically with a hybrid setup"* (SC7). This might be done for security reasons, because some of the operations and data are not allowed to be handled by external parties or in specific countries. *"So I mean by not possible like security things like sometimes the company really wants their data on site or their operations on site is a requirement, like it cannot be put anywhere else. And in that case we would work typically with a hybrid setup"* (SC3). Like mentioned by this senior consultant, the operations and data that need to be on site are separated from the data and operations that are allowed to be in a cloud environment. This could mean that there is also a difference in the agility of the systems. When the on-premise infrastructure is completely separated from the cloud infrastructure, they might influence each other in terms of agility. When the cloud infrastructure relies on system components in the on-premise infrastructure, this might influence the agility of the complete IT landscape.

Cloud infrastructure

Cloud infrastructure is generally perceived as the most agile type of infrastructure by all the participants, like emphasized by one of the participants in the following quote: *"So when it comes to infrastructure, typically we would recommend clouds unless not possible"* (SC5). But the agility is not guaranteed in every landscape. Requirements mentioned for the agility of cloud technologies are the use of standard solutions, the ability to effectively leverage cloud services such as scalability, and the use of cloud native applications.

Advantages of cloud native applications are the ability to quickly add new functionalities and adjusting and monitoring performance, like mentioned by one of the participants (SC7). *"If you have cloud native applications, you can very quickly add new features, intervene in performance and you can monitor everything tightly"* (SC7).

The advantage of standard solutions, like for example Amazon Web Services (AWS), is that cloud service providers use the newest technologies which are continuously improved. Additionally, for IaaS the hardware is shared among users, lowering its cost. One of the requirements for being agile, according to one of the respondents is having cheap availability of infrastructure. As a customer of IaaS, you pay for what you use, while private clouds or on-premise infrastructures require investments and cannot be decommissioned very easily.

Cloud technologies are perceived as a trend, because it offers more flexibility for users. There are ample benefits of using cloud for infrastructure solutions. Cloud environments increase agility because of automated scalability on demand: *"If you land your complete landscape on the cloud, you create agility because of scalability"* (SM2). One of the participants points out that it becomes easier to implement DevOps pipelines using cloud: *"It is technically possible to do without cloud, but the implementation of DevOps pipelines becomes easier when using cloud technologies"* (SC4). These DevOps pipelines increase agility by automatic testing and deployment. Migrating to cloud environments reduces costs of maintaining infrastructures. There is no depreciation of infrastructure investments. IaaS can ensure business continuity, since setting up, monitoring and maintaining is outsourced. Lastly, IaaS is generally continuously improved and renewed.

Cloud technologies can be private, hybrid and public. A private cloud is setup and maintained by an organization itself. Hybrid clouds mean that organizations utilize both private and public clouds. Public clouds offer most of the benefits mentioned above, however, according to one of the participants (SM2), public cloud has its ifs, ands and buts. *"Of course, public clouds are most flexible, but there are some ifs ands and buts"* (SM2). This is probably due to the risks of not controlling the cloud and the fact that the cloud is shared with other users. For compliance reasons it is important to understand where and how cloud providers store data. This does not necessarily affect the agility of the IT landscape. However, this may limit the options to choose from.

Platform-as-a-service

PaaS means that also the platform on which applications operate are maintained by a third party and thus purchased as a service. According to participants (SM1) this has constraints, and its functioning relies on the maturity of the organization. *“If you would leverage PaaS over SaaS, it means your platform is managed for you. There are some constraints, it depends on the maturity of your own organization” (SM1)*. The agility is largely determined by the application running on this platform. When applications are self-build, it depends strongly on the architectures of these applications build on the PaaS. Another option would be leveraging SaaS on PaaS on IaaS. The agility would then rely on the characteristics of all three of these services. The risk of vendor lock-in could potentially become high and the customization options lower.

Infrastructure requirements

One requirement that has been mentioned already for the infrastructure, is to have cheap availability of infrastructure. This resonates with the fact that it should be scalable and employable. Companies should have alternatives available, e.g. multiple clouds. As mentioned by one of the participants: *“It is an infrastructure agnostic idea, to have no dependence of your core business on the bare metal in your datacenters” (M2)*. For security and disaster recovery, data should be stored in multiple locations and on cloud environments from different service providers. *“I always say they have to make sure not having to worry about that kind of sh*t, just make sure you have both AWS and Azure, and make them hot swappable” (M1)*. This quote also prescribes to have hot swappable environment, this functional redundancy increases the resilience of the IT landscape.

Infrastructure transformation

Hardware can be bought and is relatively cheap, so expanding the infrastructure by buying additional components can be relatively cheap and easy. This makes it an easier option than improving the software and databases on the infrastructure. As mentioned during the interviews: *“What is always being said, is hardware is cheap and software is expensive. For many companies it is the quickest and cheapest option to ‘throw’ in some additional hardware” (SC1)*. When an organization decides to move from on-premise and self-maintained infrastructure, a lift and shift is generally manageable for organizations. The participants think, however, that this will not make the IT landscape more agile in the long run: *“Businesses often move their on-premises landscape as-is to a cloud. But then you are as agile as you were before, your swapping hardware for hardware.” (SM2)*

14.3.4 Architecture

Architecture is a big theme and was mentioned frequently when participants were asked about one of the biggest issues of non-agile IT landscapes. Generally referring to the technical architecture of applications. The architecture describes how different modules and components are connected and what logic the composition is based on. Several archetypes were mentioned, such as the monolithic, service oriented, serverless, cloud, hexagonal, event driven and microservice architecture. These architectures have different pros and cons relating to the agility of IT landscapes. Lastly, there is several characteristics that apply to agile architectures, which will also be described in this chapter.

Monolithic architecture

The monolithic architecture is characterized described as “one big block”. It can be cost efficient and fast, if kept simple and standardized. Uniform skills can be applied, and data quality can be assured. As mentioned by one of the consultants: *“I think you can say that it is cost efficient and it creates standardization within the organization, which is really good” (JC2)*. The following downsides are mentioned: splitting up large monoliths can be costly, time consuming and employees with knowledge on outdated systems might already be retired. There are often separate teams for developing, testing and operations, making processes less streamlined. If monoliths grow over time, it can be hard to untangle components. According to the participants this makes it difficult to introduce changes in separate components: *“With big monoliths like back in the day, where a hundred machines are whirring side by side like in banks, that’s not an option anymore. You can’t change things separately” (SM1)*. A risk of the monolith is the existence and creation of dependencies. These dependencies can cause delays in deployment and risks of complete system outage caused by one component. *“When you choose a monolith with one big platform for all the functionalities, if your platform is down, all of the functions will be out as well” (JC1)*.

Service-oriented architecture

The service-oriented architecture is an architecture making use of a service bus which carries most of the logic. It might not be preferable, according to participants (SM1), to be stuck to an architecture using a service bus. Since the service bus carries most of the logic, every module is connected to this service bus, creating a single point of failure. *“If you use a service bus, it becomes like a single point of failure, but it is a good step moving away from a monolith” (SM1)*. It can be adapted more quickly than a monolith, but supposedly slower than for example a microservice architecture.

Serverless

One of the participants mentioned the serverless architecture: *“It is more focused on infrastructure, on which you can easily scale up and down” (JC1)*. However, the participant did not go into much detail about the capabilities, pros and cons of this archetype. This type of architecture is focused more on the infrastructure and scalability is high. It allows the organization to scale the capacity both up and down.

Service-oriented architecture

The cloud architecture is an architecture based on a combination of several functions from multiple vendors, as mentioned by one of the managers. *“In a cloud architecture, multiple functions from different vendors are put together” (SM1)*. This could be a combination of IaaS, PaaS and SaaS, but could also be combined with in-house developed software. One of the main pros is the fact that it can be a cheap solution when many off the shelf solutions are combined. The result is that man hours needed maintenance are relatively low in comparison to other architectural archetypes.

Hexagonal architecture

A hexagonal architecture describes specific patterns which are not further specified during the interviews. One of the participants mentioned: *“These are specific patterns that make sure there is decoupling between the infrastructure and application” (SC3)*. What does become clear, is that this architecture ensures decoupling between the software and infrastructure to ensure there are no point-to-point solutions. This could mean that changes can be made more quickly, without changes in one component affecting the other components.

Event driven architecture

Event driven architectures work with an event layer such as Kafka. As explained by one of the participants, this event layer allows for integration between applications and systems without point-to-point solutions: *“Then you’re not working with point to point solutions between applications and systems, but you decouple them with an event layer, like Kafka” (SC4)*. This makes the architecture loosely coupled. It allows for asynchronous communication making sure there are even less dependencies.

Microservice architecture

Many of the participants focused on the microservice architecture, when the interview got to the topic of architectures. Components within this type of architecture are generally small and modular, making it easier to understand what function is encapsulated within each component. Multiple teams can support multiple microservices and allowing teams to work more agile in short cycles. Companies generally do need larger development teams for microservice architectures, but it does allow for the adoption of a DevOps setup to control services end-to-end. Because of the small sized services, functions can be clearly specified, and it is clear what value is created by what component. The modularity is relatively high, there are few dependencies, there is high maintainability, replaceability and resilience. This is also confirmed by multiple participants, for example: *“Scalability and interoperability, so how they can interact. Maintainability is also important, you can continuously work on maintaining the system, but also make maintenance easier” (SC5)*. Downsides can be the infrastructure behind a microservice architecture being complex, it requires a mature cloud environment, and it is not easy for large enterprises to adopt a microservice architecture. Changes becoming easier is not guaranteed by a microservice architecture and it can be an expensive solution.

Technical architecture characteristics

To understand what the architecture must comply with to be most agile, participants were asked what characteristics are required for high agility in IT landscapes. There are a few characteristics which are perceived as undesirable, such as: bottlenecks, single points of failure, point to point solutions, tight coupling, dependencies and high complexity. Bottlenecks and single points of failure form weak points within components and between components, making a system more vulnerable. Point to point solutions are related to tight coupling and dependencies, as mentioned before, these can limit the ability to change as a small change in one component can interfere with the functioning of other components.

According to the participants, speed is generally lost when systems become too complex and change in many places is required for new functionalities: “Maintaining legacy systems becomes a band-aid approach, at a certain moment that doesn’t work anymore, and you will start paying with your speed. Systems become too complex, and you will have to make changes in many different spots to keep the system running” (SC8). Complexity is often caused by dependencies and tight coupling and can be related to the size of components. Complexity can make it more difficult for (new) employees to understand application systems and cause loss of overview as mentioned by one of the participants: “Complexity plays a big role. Not everyone might understand how the landscape operates, the overview may be lost.” (M1)

There are many characteristics mentioned that would be desirable, such as: maintainability, flexibility, testability, scalability, standardization, independence, loose coupling, modularity, interoperability, and integration. These are the more technical characteristics of architectures. Maintainability refers to the ability to continuously and easily maintain systems. Flexibility is like agility and means that a system and architecture can easily be adapted. With high testability, developers can easily test systems. Scalability is important for an IT system as it allows the organization to increase capacity when the number of users increases, but also decrease capacity to save costs when the number of users decreases. Standardization supports the ability to scale, by for example setting standards for data sharing developers do not have to rethink certain principles. It can save time and can increase the interoperability of systems. Independence is important is mentioned since it allows changes to be put through in one component without affecting other components. Loose coupling is desired for the same reason as independence and the amount of coupling is linked to the modularity and interoperability of a system: “There is a relation between modularity, coupling and interoperability” (JC3).

Modularity increases the ability to add and remove modules and generally increases the number of components as well. When a system has high modularity, changes in one system, will not impact other components within the system, it is therefore influenced by the coupling and dependencies within systems. As mentioned by the participants: “The theory behind modularity is decreasing the number of dependencies between different components” (SM2). Interoperability could be increased through standardization. Interoperability ensures that different modules or components can connect and transfer data without the need of significant changes. Interoperability is related to the characteristic openness and integration. These characteristics refer to the ease of integrating components, which can be in-house developed applications

or third-party services. “Can you integrate third party services? It means you need a strong integration layer” (SM1). Which can be done through APIs, and it is suggested for high agility to have a mature API management system. Determining who can access and change API and when an API would expire. This is also important for security reasons. It becomes clear that there are quite some technical characteristics to keep in mind when evaluating the agility of the IT landscape based on the architecture dimension, many of which are linked or influenced by each other.

Non-technical architecture characteristics

Some non-technical characteristics were mentioned during the interviews as well, namely, omnichannel integration, independent channels, business alignment and documentation. Omnichannel integration is important for ecosystem thinking. It allows users to have multiple touchpoints with systems, through different channels. It might be necessary to integrate new technologies with existing systems, adding a new channel, e.g. VR technologies. To create independent channels there needs to be a smart build-up of the application layer. When one channel is modified, it should not influence the functioning of other channels, which is also important for safe and secure change. There should be alignment of the IT architecture with the enterprise architecture, meaning the IT architecture logically connects to the architecture of the organization and business. As illustrated by one of the participants: “We would generally look at an overview of the organization and the architecture. These are compared and we ask, does this seem logical. Most of the times it is not” (SC8). Interviews are often used to find out where weaknesses are within the architecture, in these interviews employees are asked what the biggest pain points are. Pain points are then plotted on the architecture of the IT landscape.

Documentation of the architecture is mentioned during the interviews as well, since it should provide a clear overview and understanding of current architecture, if it is up to date. Documentation can be hampering the agility of IT landscapes as it can make it more difficult to allocate problems, involve the right employees and collaborate. In-comprehensive naming and incorrect or outdated documentation can be a few of the reasons.

An enabler mentioned for IT landscape agility is the architecture governance, governing the guidelines and standards, allowing teams to be autonomous within boundaries. As mentioned by one of the participants: “Did you make decent agreements, about what to use and what not to use. And is it clear why not to use certain architectural rules?” (M1). Architectures can be defined iteratively to make sure that the architectures itself are also based on the needs of users such as developers. It can help organizations to think ahead, thinking about their future architectural needs and base their architecture on this.

14.4 Organizational content for evaluation

14.4.1 Complete breath of organization

It has become clear during focus group discussions and interviews that there is an influence of technology on the operating model and vice versa. For evaluating IT landscape agility, the entire breadth of an organization should be considered. As mentioned by one of the participants in the following quote: *“How the operating model should work in the complete breadth. To be agile in your landscape, isn’t only about the landscape. It is depending on your operating model as well”* (SM1). The organizational dimensions include people, teams, processes, management, organization, compliance, risk, strategy and vision. Since IT landscapes do not function or change without the interference of the organization, they influence how well the information technologies are set-up and respond quickly to internal and external change. It should be understood what the influence of these organizational dimensions is on the IT landscape is to evaluate the agility of the IT landscape.

14.4.2 People

An IT landscapes relies on the people operating the components of the landscape. People within an organization have knowledge on the workings of systems in place and can modify them. People are essential for gathering new knowledge, to improve systems and implement new functionalities or technologies. The implementation of new functionalities and technologies and the removal of old ones, depends on people within organizations gathering and applying new knowledge. Therefore, one of the consultants even perceived people as the most essential dimensions: *“And I expected something more binary right, but when you are consulting, you are dealing with people right. People is the most important factor. You want to make them happy to this? There is the lack of organization. There is stress, there is these kinds of things these factors that make IT work a bit more challenging”* (SC6).

When a system is strongly outdated, it can be difficult for an organization to attract new employees. One of the options would be outsourcing development and maintenance on old systems, but this can limit agility due to lack of competence, communication and control. People are not always willing to change, there might not be a change mindset within the organization or change is perceived as stressful. When employees get older, habituation might start to form, and employees might not feel the urge or see the need for change in processes or systems. People can be an expensive resource, which may limit the available capacity for change.

When there are people, there tends to be a certain shared mindset or culture, which according to the participants needs to be considered as well: *“Take a look at the culture and people, such as the people maintaining the IT landscape. This should be a part of it, the human aspect is quite important”* (SM3). There might be an aversion to certain methods, technologies or even to third parties. Ignorance can play a role as well, people might not understand the benefits of change in the long term, they do not want to face the truth or do not want to adapt if there is no direct threat. Lastly, there might be internal conflicts and powerplays influencing employees and their willingness to change certain aspects of processes, the organization or the IT landscape.

Some of the enablers mentioned for an agile IT landscape are motivating people to change by for instance repeating the shared goal, which one of the senior managers sees as a success factor: *“It seems tiring, but what I always do is repeat the goal on daily basis. Why are we doing this?”* (SM1). Additionally, an organization can think of hiring new talent and competent professionals to take on the job of modernizing the IT landscape and creating a culture of change.

14.4.3 Teams

During the interviews participants mentioned that there are desired characteristics for teams that help to increase agility. As mentioned by the participants, there is a need for the teams be agile in order for them to create and support an agile IT landscape: *“So if you have an agile IT landscape, but the team is not agile at all, then it will not work very well. So typically it goes hand in hand. So we try to have an agile IT landscape. We need to have agile teams”* (SC6). If the IT landscape would be highly adaptable, but teams are not able to sense change and quickly respond, the IT landscape will not become agile either.

Teams adopt new ways of working to become more agile, like the agile way of working or according to DevOps principles. It helps to have autonomous and independent teams. Being completely independent also relies on the architecture of both the IT landscape and enterprise, teams need to have the ability to deploy autonomously. However, being autonomous should not be at cost of the collaborative character of teams. It is suggested that teams need to be supportive to create feedback loops, which increases their ability to sense change. One of the participants mentions that it is best if teams are composed based on process and consist of multiple disciplines. Additionally, the modularity of teams is important for the agility, meaning that teams can be easily changed and reconfigured.

14.4.4 Processes

Processes and ways of working have an impact on the adaptation speed of the IT landscape. Some of the aspects potentially influencing the agility are communication, alignment of IT with business, feedback loops and cycle lengths. Working in short cycles allows the organization to quickly adapt and iterate on the existing assets, which is deemed important by many participants and illustrated in the following quote: *“Do you work with agile teams or DevOps teams in short sprints, making sure there are short cycles?”* (SM2). According to the participants it helps organizations to predict changes and innovate based on this, for example by following trends early on. *“Without even knowing what changes will be or how big they will be, we have to prepare for them far ahead”* (SM1). There can be multiple ways of coping with change, e.g. by making plans and persevering to complete these, or through trial and error. This last option is more agile and is supported by a change mindset. To adapt to business requirements, it can help to first understand business processes and capabilities, by aligning business and IT most business value and created through IT solutions.

There are different ways of working that have different pros and cons. Traditionally many organizations

worked based on a waterfall methodology, which can be efficient in steady environments with processes that do not change much. There can however be a lack of adaptiveness. Change can take a long time and a lot of planning is generally required. Like mentioned by one of the participants, it can happen that new change is already required before the previous one is released: *“If you must be agile, it won’t be efficient. It takes too long before the first release is released, and you have to start on the next one already”* (SC3).

Then there is the agile way of working, with agile product teams that work autonomously on their own scope. This should be supported by the setup of the IT landscape. Teams are generally based on the value streams within the organization. It means that the organization becomes more product driven, based on the processes within the organization.

Lastly DevOps is mentioned a few times during interviews, which can increase release times and creates shorter release cycles. Teams oversee end-to-end processes, from development, to security, to operations. Working in continuous cycles, making this type of process very adaptive. Working according to DevOps or DevSecOps principles, does require organization to adopt DevOps pipelines to allow for continuous development, testing and deployment.

14.4.5 Leadership

Leadership from management can be a driver for change, especially C-level management. When a new C-level is boarded, they come with new insights, ideas, visions and strategies. If the IT landscape is not agile enough, these cannot be realized in time. Which exemplifies the need for an agile IT landscape. One of the participants mentioned the following: *“The shoe pinches most at the point where the C-Level board has to be replaced every 3,4,5 years. They come in with new ideas and visions and a new strategy. And then the IT landscape won’t be able to incorporate within time”* (SM3). Management can stimulate agility by prioritizing investments in IT and promoting the need for an agile IT landscape.

However, during interview it becomes clear that leadership can also be a barrier for change and an increase in agility. When changes are drastic, there may be risks involved, CEOs, CIOs and CFOs might not want to be associated with these risks. Their reputation will be at risk as well, which is why they might prefer to stay in control and pass on responsibility of introducing big change to their successor. The lack of CEO, CIO or CFO backup can therefore be a barrier for the agility of IT landscape agility.

14.4.6 Organizational structure

Agility is influenced by the organizational structure, which is closely related to the people and teams. When an organization is very hierarchal or silos exist, there may be resistance to change, less collaboration and adaptivity within the organizational structures. It can take more time to receive approval for change. Having a modular organization helps, by having clear separation of responsibilities for different

departments, as stated in the following quote: *“As an organization you should be modular as well, just as your IT landscape”* (SM1). Additionally, it helps organizations to have a self-service portal as support model. This can result in earlier communication of needs and requirements, improving the ability to sense change. The way of working is linked to the organizational setup, working agile can work well if the organization uses a product driven setup: *“To become more agile, you should adapt the organization as well. Instead of working waterfall, the organization should become more product driven”* (SC7). Therefore, organizations might need to consider restructuring for the IT landscape to be more agile.

14.4.7 Compliance

Regulations and compliance guidelines can force an organization to make certain changes, by adopting certain features or collecting and presenting data to regulators. Organizations must understand that future regulations might require them to make certain changes and need to adapt quickly. As mentioned by the participants: *“It is funny to see that in that project, the client was forced to adopt services from third parties for legal reasons. They are legally forced to adapt”* (SC5). Therefore, agility in the IT landscape may be required. On the other hand, the organization may be forced to have certain protocols in place regarding their IT landscape which may limit their ability to be agile. These regulatory and compliance guidelines need to be understood by the consultant when evaluating the IT landscape of a client. The effect of these compliance processes is illustrated in the following quote: *“So typically when you deal with IT people, they are a lot more innovative, you know going forward these kind of things and then you go to business or compliance or legal and then there is a lot more waiting, wait a bit, wait a bit, we need to evaluate and then six months later they come back”* (SC1).

14.4.8 Risk

A part of agility is being resilient and mitigating risks involved with IT and cybersecurity. Risks, like compliance, can slow down the process of change. Depending of willingness of organizations to accept the risks involved with adopting new technologies and making changes. Cybersecurity and risk can be more important than the customer or user needs that are directly visible, as shown in the following quote: *“Banks are mostly risk averse and compliance driven. Essentially the risk and cybersecurity drive the whole transformation”* (SC2). To be agile and adapt quickly, the organization should understand the risks involved. To evaluate a client, the consultants need to understand how risk averse the organization is and what drives the risk management and cybersecurity.

14.4.9 Strategy and vision

According to participants, the strategy and vision of an organization can both limit and stimulate the agility of IT landscapes. It depends for example on whether the agility is part of the IT strategy. If the vision does not aim at becoming more digital or agile, this can cause a lack of investment in IT and C-level support. If the vision lacks focus this can also lead to too many initiatives being started, which increases complexity. Like mentioned by this quote on the architecture strategy: *“We see in organizations that there is a mixture of architecture, there is no general vision and strategy that determines how and why*

decisions are made” (JC2). There needs to be alignment of business and IT when it comes to the strategy and vision. An IT push can become unorganized and lack business value, but a business push with a lack of technical knowledge can lead to frustration or unorganized change. Therefore, organizations need to understand how IT landscape agility can become part of their strategy to increase business value, improve value streams and accelerate innovation. For the evaluation of the IT landscape agility, it is crucial to know to what extent it is currently part of the IT strategy and how this is aligned with the business strategy and vision. This is illustrated by the following quote: “For the strategy, it is depending on the importance of IT agility for the organization. If you are a bank that differentiates based on an application, then it has to be part of your overall strategy. In general, the IT agility is mainly part of the IT strategy” (SC1).

Key takeaways

47. Format

- There are many insights into the format of the survey, such as the need for it to identify gaps and opportunities, be a conversation starter, consume little time and increase knowledge sharing within Deloitte.

48 Process

- The interview results show that the timing of the evaluation is essential, the participants should cover the complete organization and it should connect clients with experts.

49. Technological content

- The content of the evaluation should cover the data, software, infrastructure and architecture. Additionally, the system characteristics from the literature research were confirmed and need to be included.

50. Organizational content

- There are several organizational dimensions such as people, teams, processes, leadership, organizational structures, compliance and risk management, and strategy and vision that need to be considered during the evaluation.



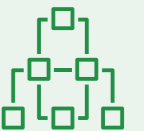
Define

During the define phase the goal is to translate the insights gathered from the literature, the observations, interviews, and focus groups into design principles. The define phase serves the purpose of guiding the design process towards a result that is desirable, viable and feasible. After developing the design principles, a future vision and vision statement will be formulated. The combination of these three elements, the design principles, future vision and vision statement is the starting point for the design phase. With the goal to guide the design phase into a direction that is defined based upon the findings of the explore phase. With regards to the DSR methodology belongs this step to the design cycle since the design requirements are determined.

Expert Insights



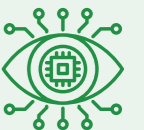
Framework



Design principles



Future vision



Design statement



15 Defining the design principles

15.1 Approach

As a result of the analysis of the data gathered from observations, expert talks, secondary data, focus groups and interviews, clusters were formed around several themes regarding the evaluation of IT landscape agility. These clusters have been structured iteratively on a Miro board with the involvement of two of the consultants from within the client company. Now that the clusters have been explained in chapter 14 it is time to translate these themes into design principles. During this phase, it is important to formulate unambiguous principles. After having defined the principles, the design principles will be prioritized. Design principles are used as a guiding principle during the design phase of the project and can be used for evaluation purposes at the end of this project.

15.2 Linking insights to design principles

Several clusters were formed during the analysis of interviews and focus groups. Design principles are primarily distilled from the clusters around the cluster goals of evaluation. Additionally, some principles can be distilled from the cluster around the content for evaluation. These clusters describe what needs and wishes the consultants and managers within Deloitte consulting have for an evaluation of IT landscape agility. To understand what the link is between the explore phase and the design principles, Figure 46 and Figure 47 were developed on a Miro board. This figure illustrates the link between the themes distilled from the data, the key insights drawn from these themes and the design principles which are formulated based on this.

Interview goal	Theme	Key insights	Design principle
Format of the evaluation	Use case	<ul style="list-style-type: none"> It can be difficult to existing tools/assessments Documentation on existing tools/assessment is missing or difficult to allocate Creators of assessments find other jobs, resulting in inability to ask for explanation 	Self explanatory
	Ownership	<ul style="list-style-type: none"> If there is no clear owner, an assessment will not be promoted and left unused There should be a point of contact if explanation is needed Further development should be guided by someone or a group of people 	Clear ownership
	Requirements	<ul style="list-style-type: none"> Every hour counts for consultants Interviews, currently used for data gathering, and analysis are time consuming Clients want to see results quickly 	Low time consumption
	Timing	<ul style="list-style-type: none"> An evaluation should help clients and consultants in understanding the current state An evaluation should help clients and consultants in determining what the desired state is The client wants to know what the impact is of the changes that have been made Consultants would like to do a null measurement and a measurement when the transformation is ongoing and completed 	Current state vs. desired state

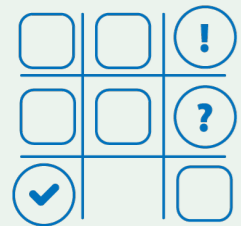
Figure 46 Themes, key insights and design principles

Interview goal	Theme	Key insights	Design principle
Goal of the evaluation	Outcome	<ul style="list-style-type: none"> The evaluation is most valuable when it shows what elements block agility The results of the evaluation should be able to identify what opportunities the client has Gaps and opportunities are the starting point for transformation roadmaps 	Identify gaps and opportunities
	Connecting	<ul style="list-style-type: none"> It can be difficult to find the right expert for a client project An evaluation should be able to point out on which topics experts are required 	Connect client with experts
	Project involvement	<ul style="list-style-type: none"> TT&A is generally being involved too late during client transformations TT&A would like to be involved at the start of a client project, during the proposal stage TT&A has to become the connecting team within all IT transformations 	Involve TT&A early on
	Knowledge	<ul style="list-style-type: none"> As an IT consultant you learn on the job The evaluation should stimulate knowledge being shared on the topic of IT agility Users of the solution should be able to learn about IT agility while using the evaluation 	Increase knowledge sharing
	Outcome	<ul style="list-style-type: none"> It should become clear from the evaluation what change should be prioritized The evaluation must identify weights for each of the topics included 	Identify impact
	Purpose for client	<ul style="list-style-type: none"> The evaluation should be at the start of the project It should serve the purpose of starting a conversation between client and consultant The results should be a starting point for a discussion within the client and between client and Deloitte 	Conversation starter
Content of the evaluation	Expert input (cross competence)	<ul style="list-style-type: none"> TT&A consists mostly out of generalists There are many subject matter experts within Deloitte, with expertises on almost any topic The evaluation should combine the expertise of experts for each of the topics included 	Collaborative content creation
	Development	<ul style="list-style-type: none"> Digitalization is an ongoing process in the current era Technologies are currently evolving and new technologies are continuously being developed Contents of an evaluation should continuously be adapted to new standards 	Continuous improvement
	IT landscape	<ul style="list-style-type: none"> The IT landscape consists of three dimensions: Data, software and infrastructure Each of the technological dimensions influences the overall agility of the IT landscape The evaluation must touch upon each of the dimensions 	Landscape dimensions
	Content	<ul style="list-style-type: none"> There are multiple organizational dimensions that influence the agility of the IT landscape Evaluating the IT landscape agility must consider the organizational dimensions The opinion of both IT employees and non-IT employees is important for the evaluation 	Complete organizational breadth
	Technologies	<ul style="list-style-type: none"> Many different types of technologies exist within IT landscapes Different technologies have a different impact on the agility of the IT landscape Technologies can possibly be categorized based on their agility in a certain context 	Categorization of technologies
	Relations	<ul style="list-style-type: none"> Relations exist between different landscape and organizational dimensions Relations can be mapped based on their influence on the agility of the IT landscape Relations can be taken into account in the planning of transformations 	Relations

Figure 47 Themes, key insights and design principles

15.3 Design principles

In this chapter, the design principles will be explained, this will help the designer to implement them during the design phase and the reader to understand what the design principles mean and how they should impact the design.



Identify gaps and opportunities

One of the key insights from conversations with experts on IT agility was that an evaluation of landscape agility should allow for the identification of gaps and opportunities in the current landscape.



Connecting clients with experts

The ability to serve the client in the right way, is by connecting the client with to the teams that have an expertise in solving the client's problem. If certain aspects of the landscape lack behind on their agility, it should be easily identifiable who can best help the client to improve these aspects.



Early involvement

The solution should stimulate the involvement of TT&A in client projects earlier on in the project timeline. Increasing the number of times, they will be the selling party of transformations and reducing the number of times they are involved only when the execution phase of projects has already started.



Conversation starter

The evaluation of the IT landscape should be a conversation starter for consultants. The solution does not necessarily have to point out all aspects that are wrong with the current IT landscape. A global indication as a conversation starter can already be sufficient.



Collaborative content creation

The solution needs to make use of the knowledge and capabilities that exist within Deloitte. Collaborating on the content of the solution, using a multi-disciplinary approach, creates more depth in the evaluation and stimulation. Additionally, it provides the potential to involve other teams more during client projects as it helps to identify to what capabilities or expertise the gaps and opportunities are linked.



Increase knowledge sharing

It should help consultants in finding the right information, for examples on KPIs, to use during client projects. Improving the way knowledge is shared would make the work of consultants easier and more efficient as they do not have to look up the information themselves or ask experts to share the knowledge with them.



Self-explanatory

The solution should be completely self-explanatory, so other teams and new hires can quickly understand what the purpose is of the solution and know how they can use it during client projects. This means that all the information about the guidelines for use and understanding of results needs to be provided within the solution itself.



Clear ownership

It is important for the solution to have clearly defined ownerships. Clear ownership roles help to involve stakeholders in keeping the solution up to date and makes sure there is active participation in the promotion of the solution.



Continuous improvement

As the technology changes quickly, the solution is required to change accordingly. By continuous generation of new input, the solution can grow with trends occurring in industries and stay up to date.



Low time consumption

As Deloitte depends on their employees making enough client hours, there is a rather strong focus on full time commitment on client projects during work weeks. This means that there is limited time to work on the maintenance and development of assets. So, the solution should be designed in such a way that it requires little time to maintain.



Current state vs. desired state

The evaluation should help Deloitte and clients to understand the current state of the IT landscape based on the agility and should help them to determine what the client's desired state is. Determining the desired state of the company helps them to formulate what ambitions the client has for their transformation.



Landscape dimensions

The evaluation and stimulation of landscape agility should be done based on the different layers of the IT landscape. Considering a large variety of landscape components will lead to a more thorough evaluation and identification of components that need to be stimulated.



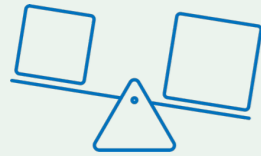
Complete breadth of organization

Evaluating the complete organization instead of just the technological components of the IT landscape. This means that also the organization, people, teams, processes, leadership and strategy should be included.



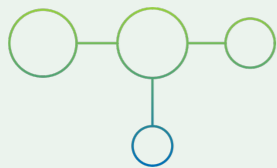
Categorization of technologies

There should be a clear categorization of technologies that need to be evaluated and that can be used for increasing the agility of the IT landscape. A clear categorization helps to identify in what part of the IT landscape and in what way the agility can be increased.



Identify impact

The evaluation should be able to identify what components have the largest impact on decreasing and increasing the agility of IT landscapes. Helping consultant to identify the priorities of transformational elements.



Relations

The solution should incorporate the relationships between different landscape components, technologies, or dimensions. If the relations are clearly defined, consultants know what elements are dependent of each other when they plan out a transformation, making changes more effective.

16 Prioritizing design principles

The final solution might not adhere to all design principles, to make keep in mind during the design phase of this project what is most important for the client and realizable within the scope of this project, the design principles are prioritized.

16.1 Approach

During the prioritization, there are three different levels of priorities. First priority principles, second priority principles and third priority principles. The first priority principles are the essential principles, if the final solution does not comply with these principles, it is very likely that the solution will not be desirable, viable or feasible. The second priority principles are principles that are still desired but might be more challenging to integrate or need longer term involvement by consultants. Third priority principles can be seen as wishes from consultants that are either not manageable within the timeframe of this project or fall outside of the scope. If these can be incorporated it would be nice, but the solution will not fail without it.

16.2 First priority principles

1. Identify gaps and opportunities

What? The solution should allow consultants to identify gaps and opportunities for the agility of IT landscapes.

Why? These gaps and opportunities will be the starting point for further research into a client landscape.

How? Asking clients questions different questions about the current state of their IT landscape, organization and processes.

2. IT landscape dimensions

What? The evaluation should include the different constructs defined during the research phase: data, software and hardware.

Why? These constructs are at the core of IT landscapes and therefor essential for evaluation.

How? Analysis should be done based on these three constructs. Other topics included should be evaluated with relation to these constructs.

3. Complete breadth of organization

What? The complete breadth of the organization refers to the inclusion of people outside of the IT departments in the evaluation process. Additionally, the organization should be analyzed over all dimensions of the organization, from people up to the strategy and vision.

Why? Generally, we see that almost every nook of the organization makes use of IT nowadays and multiple facets of an organization can influence the agility of the IT landscape.

How? Including both IT and non-IT personnel in the evaluation of the IT landscape. Additionally, include topics such as, people and teams, processes, leadership and strategy and vision.

4. Clear ownership

What? It should be clarified who has ownership over the solution and makes final decisions for changes in content and format.

Why? There should be one team of person in charge of making decisions, otherwise consistency will be lost. Someone needs to take the lead on further development, otherwise it might be left unused. If consultants do have questions on the use of the solution, they should know who they can contact.

How? Make the tool an asset of a specific capability or guilt, this way specific people can foster development of the solution and stimulate its use.

5. Self-explanatory

What? The solution should be completely self-explanatory, making sure it is clear how to use it, when to use it and why is should be used.

Why? There are many tools within Deloitte and due to time constraints consultants should be able to use tools quickly. Capabilities do not always have the time to explain to other teams how their assets work. There is a high throughput of employees within Deloitte, so when a solution owner leaves the company, others should still be able to use the tool.

How? The solution can be supported by a complementary document explaining how to apply the solution for evaluation of IT landscapes and how to process outcomes.

6. Low time consumption

What? The solution should consume little time of employees within Deloitte working on a client project.

Why? The evaluation phase is generally short, and the consultant has limited time to spend on different tasks.

How? Implement an evaluation methodology that requires little input from Deloitte in terms of gathering data and analyzing the results. There can be a standard format for presenting the results.

7. Conversation starter

What? The evaluation should serve the purpose of starting a conversation between consultants and with clients about the agility of their IT landscapes.

Why? By starting conversations about the outcome of the evaluation it will become easier to understand what the needs of clients are.

How? By giving a global indication of the current state of the IT landscape.

16.3 Second priority principles

8. Collaborative content creation

What? Creating the content and improving the format of the evaluation tool together with disciplines focused on each of the topics within the evaluation framework.

Why? Topics in the evaluation should be diverse and therefore a diverse set of skills and knowledge should be applied. The TT&A team consists mainly out of generalists, input from different experts would increase the quality of the evaluation.

How? This can be achieved by using focus groups, creative sessions or an open-source methodology. Subject matter experts can give feedback on the solution or can be granted permission to make changes.

9. Connecting clients with experts

What? Based on the outcome of the evaluation it should be clear what expertise is needed for a client project.

Why? When clients are connected to suitable subject matter experts and teams, the project outcomes will be improved. Delivering high quality services is essential for the success of consultancy firms.

How? By specifying what topics score less than others, it could become clear on what topics expertise is necessary. Within the intranet and personal networks, consultants are able to search for experts and teams specialized in certain topics. It can also be specified within the documentation of the solution itself.

10. Continuous improvement

What? If there is a tool developed based on the outcome of this project, it should continuously evolve and be adapted to the current state of art.

Why? New technologies are constantly developed and knowledge on agility and IT is constantly evolving. Therefore, the tool should continuously adapt to these changes.

How? There can be periodic reviews of the content for evaluation and different experts can be requested to give feedback.

11. Early involvement of TT&A

What? The client of this project, the technology transformation and acceleration team should be involved in projects early on in project timelines.

Why? The team perceives being involved at a late stage, where the transformation is already ongoing. They can have more input in the early stages of formulating the timeline and transformation goals.

How? By promoting the evaluation of IT landscape agility using an asset that is owned by their team will allow them to internally promote the capabilities of their team and team members.

12. Increase knowledge sharing

What? Improve the amount and methods for sharing knowledge within Deloitte consulting.

Why? To make it easier to navigate through all the available knowledge within Deloitte. It can be difficult to find the correct and most recent documents on specific topics.

How? Link different topics within the solution to different documents or locations in the intranet.

16.3 Third priority principles

13. Current vs. desired state

What? The outcome of an evaluation illustrates what the current state of an IT landscape is and compare this to the desired state of the landscape.

Why? This can help consultants in setting goals and formulating steps for transformations. It gives clients the opportunity to articulate what their preferences are.

How? By evaluating the current IT landscape and requesting clients to state their future goals.

14. Categorization of technologies

What? Categorize different technologies based on their characteristics in relation to IT landscape agility and their use cases.

Why? There is no clear overview of technologies and the level of agility they offer. Different consultants have different opinions on different solutions, which could be better aligned.

How? Document different technologies and categorize them in a clear overview, letting subject matter experts define the characteristics and updating them frequently.

15. Identify impact

What? Different topics and categories can be evaluated, these topics and categories can have a weight factor attached to them.

Why? This can help in prioritizing transformation milestones and helps understanding how strong the effect of different outcomes is on the agility of the IT landscape.

How? Experts could score the different topics and categories, based on the average score the weights could be determined.

16. Relations

What? Identify relations between different topics and components within the evaluation.

Why? To understand what the influence of one component of the IT landscape is on the other, learning about the effects of changing one component will have on other components.

How? This could be concluded from case studies or interviews with experts.

17 Future vision

17.1 Future vision

The future vision is used during the design phase to take a future-oriented approach to designing a solution for Deloitte. The future vision can be seen as a focused direction that leads to stronger motivations for developing a solution (Simonse, 2018). By improving the solution over the course of multiple years based on the envisioned future the desirability, feasibility and viability of the design will be strengthened.

17.2 Approach

By imagining what the world will look like in five years, 2029, the need for the implementation in the long term is defined. This helps in creating a solution which can be implemented now and is still relevant in the future, A future vision can be an expression in many formats (Simonse, 2018)., for this project it is chosen to create a written narrative accompanied with an image. The future vision is based upon the insights from the literature and expert input.

17.3 Input

During the initial research it became clear how important digital technologies are for organizations. IT will continue to be a driver for business performance when opportunities are leveraged, and risks are mitigated. The ability to be agile in the current and future world therefor relies more and more on the ability of organizations to create an IT landscape that is agile and enables the organization and its value streams to be agile. One of the key takeaways from chapter 1, used to define the future vision is: “The implementation of new digital technologies and the adaptation of existing systems are crucial for organizations to create new value and remain relevant in a rapidly evolving business landscape.” This key takeaway underlines the role (digital) technologies will play in the future and emphasizes the need for agility for businesses and their IT landscape.

17.4 Vision

In 2029, every organization will rely on information technology to run its businesses. Due to high environmental pressures, rapidly changing market conditions, and increasing speed of technological developments, the ability to adapt the IT landscape at high speed will become the most essential element of an organization’s strategy to survive.



18 Design statement

18.1 Goal

The design statement will help me to envision what the purpose of the solution will be for Deloitte consulting. It describes the goal of the final solution, how it empowers end users in day-to-day activities. TT&A generally focuses on analyzing client companies and formulating and guiding IT transformations. The goal of the design statement is to articulate what role TT&A and Deloitte can play in assisting clients increasing their ability to quickly adapt their IT landscape based on internal and external changes. Design statements are known to give a sense of purpose that can be pursued for many years (Kantabutra & Avery, 2010), which will support the design and its ongoing development.

18.2 Approach

Based on the insights from the literature and expert input, the vision statement is developed. One of the key takeaways from chapter one forming the basis for the design vision: “Organizations must evaluate their current IT capabilities and desired states to effectively to plan and execute digital transformations while emphasizing agility and iterative processes.” The statement has to be brief, contain a prime goal to achieve, will likely be unchanged by market developments and is viewed as desirable by employees (Kantabutra & Avery, 2010). The next section will first describe the vision statement, which has been iterated multiple times. After which each of the elements is further defined.

18.3 Design statement

For the employees of Deloitte working within the Technology Transformation and Acceleration team, I will develop a solution that **enables consultants to evaluate** the current **agility of IT landscapes** and guides them in **stimulating** the IT landscape agility of their clients. The solution provides them with the **knowledge** and **guidelines** to be an IT consultant who can guide clients through transformations towards **future-proof** and **agile IT landscapes**.



18.4 Key elements

There are five key elements in the design statement that are explained in this chapter because these are most essential for the design and should be considered during the design phase.

Enable: The solution should provide consultants with the means to evaluate the IT landscape of their client. It should ease the task of evaluating agility and enable consultants to focus on determining the right strategy increase the agility, together with their client.

Evaluate: The main goal of the solution should be the evaluation of the IT landscape. To formulate a desired state and strategy, the first step is understanding the current state.

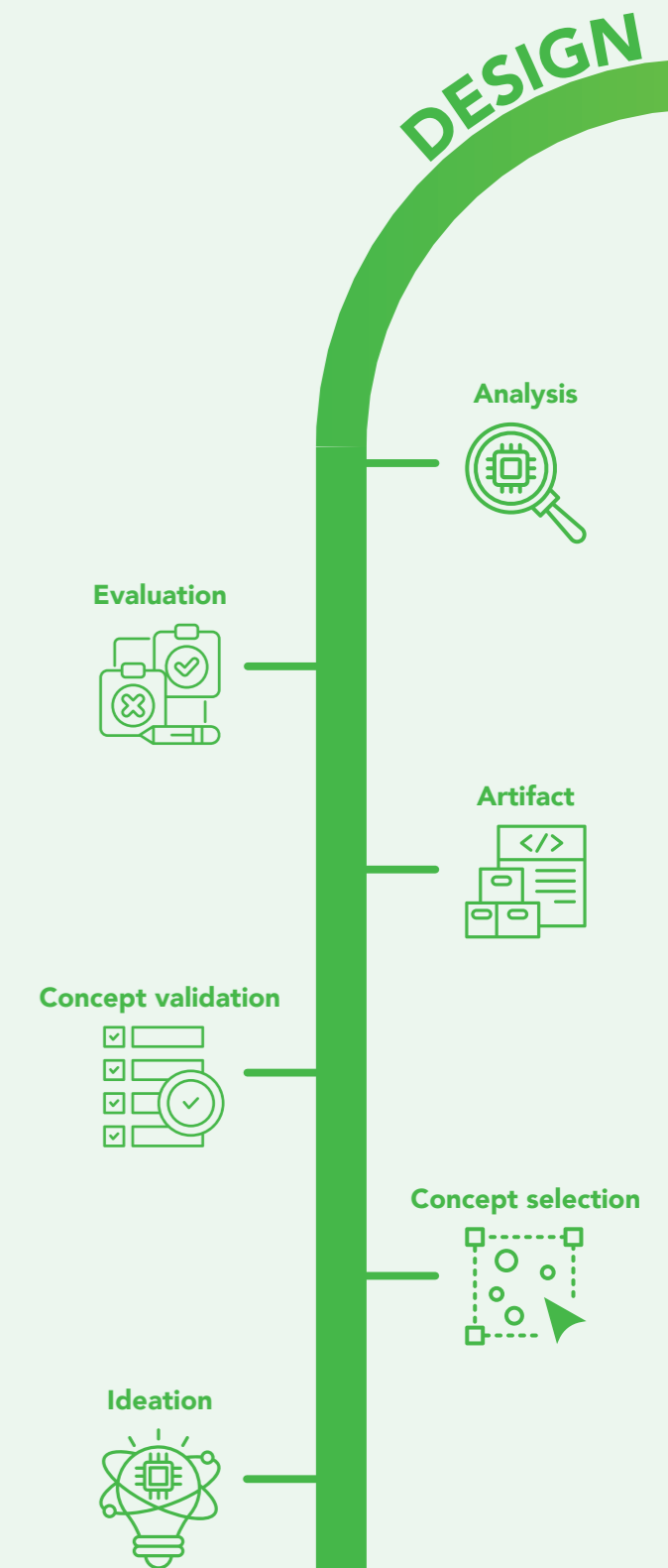
Agility: The agility of the IT landscape and thus the evaluation thereof will be the focus of the solution. Being the ability of the IT landscape to continuously adapt, and be adapted to, internal and external change at high speed.

Knowledge: To be able to interpret the results of the evaluation, the solution should also include the knowledge needed to evaluate the IT landscape. One of the secondary goals is that the solution itself also increases the knowledge sharing within Deloitte.

Guidelines: There should be clear guidelines included for the how, when, where and who of the solution. Making it clear how to implement the solution and use it during client projects. This ensures correct use and makes it easier for consultants to understand.



After the completion of the explore and define phase, it is time to start designing. For the DSR methodology this phase is also part of the design cycle. In this phase of the project, the insights distilled from the literature research and expert input are used as a basis for the development of a framework for the evaluation of IT landscape agility. This framework will then form the basis for a solution that can be used by the client of this project to evaluate the IT landscape of their client. To create this solution, there will first be a conceptualization, in which multiple ideas are developed for the evaluation of the IT landscape. After deciding together with the client which of the concepts would be most desirable, the concept is detailed further. When there are enough details available on the concept, the concept can be validated together with the client. After the validation, the concept will also be evaluated on the content and format, together with a client of Deloitte. This evaluation leads to multiple iterations that will improve the concept.



19 Framework

This chapter describes the approach, goal and content of the framework that was created for the evaluation of the IT landscape. This framework will be the starting point of the design process based on the insights gathered and synthesized during the explore and define phase. The second and third iteration of the evaluation framework can be found in Appendix K. The third iteration, which is used during the design phase can also be found in Figure 48.

19.1 Goal

A framework should describe what system dimensions and characteristics should be evaluated by the client to understand how agile the evaluated IT landscape is. Furthermore, the framework should include some of the process requirements. When these are clearly formulated, the framework will accomplish its goals of being the foundation for a concept for the evaluation of IT landscape agility.

19.2 Approach

Based on the overlapping insights between theory and real-world phenomena, a conceptual framework was developed. The insights from chapter 14 on the insights from expert input, explaining the important factors, such as the system dimensions and characteristics, have been combined with the insights drawn from the literature research. Insights drawn from the literature research used in the framework can be found in chapter 7 on the constructs of the IT landscape, chapter 8 on the characteristics of the IT landscape. By comparing these insights with each other, we can see what similarities and differences are found between the application domain and the knowledge base. The framework that is distilled from these insights, can be used in the design cycle, where there is a combination of developing and evaluating to iterate the design.

19.3 Content

System dimensions

When we look at the insights from the interviews, we see that the participants look at the IT landscape through three lenses: people, process and technology. This project was scoped at the start to focus only on the technological elements of the IT landscape. However, since the agility of the IT landscape depends on and is utilized by the people and processes these cannot be left out of the evaluation. Therefore, the dimensions of the IT landscape can be split up in two high-level dimensions. Technical dimension and non-technical dimensions.

The technical dimensions are the dimensions described in chapter 7 on the constructs of the IT landscape, namely, data, software and infrastructure. The agility of these technical dimensions is influenced by the system characteristics, which are generally determined by the architecture of the different dimensions and the technologies used.

Non-technical dimensions focus on the people and process aspects that influence the agility of the IT

landscape. During the interviews it became clear that there are quite some dimensions within the organization that impact the IT landscape, such as the processes, people, teams, organization, management, risk and governance, and vision and strategy. There are many ways in which these dimensions influence how the IT landscape operates and how agile it is. When we look at the combination of the technical and non-technical dimensions, we see that it describes similar system boundaries as the concept of IT agility described by Yousif et al. (2017), like visualized and described in chapter 5.4.

Technological characteristics

Based on the interview insights it can be concluded that the system characteristics that could be evaluated are maintainability, testability, scalability, modularity, complexity, dependency, coupling, interoperability, standardization, and integration. During the literature research it became clear that the system characteristics that should be evaluated are modularity, coupling, homogeneity, redundancy, scalability, interoperability, autonomy, dependencies, speed, interoperability and integration. It becomes clear that there are a couple differences between what was found in theories from Dove (1999, 2005), Desouza (2006), Nissen & Von Rennenkampff (2017) and Mikalef et al. (2021) and what was concluded from the interviews.

The interviews result included the testability and maintainability of systems. Which is not considered in the reviewed literature. Motivations for evaluating the testability and maintainability are that they improve the ability to introduce changes quickly and decrease recovery times. Redundancy was mentioned during the interviews, but not considered as important for the agility of the IT landscape. Speed was mentioned during the interviews, in terms of data collection and change frequency, e.g. by having real time data available and being able to continuously test and deploy. Autonomy was only mentioned in relation to automation of testing and deployment and its relation to machine learning and artificial intelligence. The insights from the interviews and literature support each other and are therefore all considered in the framework. The characteristics apply to the technical dimensions of the IT landscape and are therefore connected to these dimensions in the framework.

Internal and external change

During the literature research little attention has been paid to evaluating the actual change affecting the organization, both internal and external. What became clear during the interviews is that a client should never have the goal to make the IT landscape as agile as possible. This can be very expensive and return on interest is not guaranteed. But it may also become a risk if the IT landscape changes too quickly. Therefore, it is important to understand how volatile the internal and external environment is, to determine what the right amount of agility would be for the client company.

Participants

For the target group there is a clear outcome from the interview results, namely including the complete breath of the organization in the evaluation of the IT landscape. This way, the input does not only come from the IT employees who feel a sense of ownership over certain assets, but the input also comes from

employees using the IT landscape. The business employees can be seen as the user of the IT landscape and their opinion on the adaptivity is therefore crucial for the evaluation.

Timing

It became clear during the interviews that there should be a repetitive evaluation, during different phases of an IT transformation. This would mean that one of the evaluations should take place at the start of the transformation, when nothing is transformed yet. The second evaluation could take place when the first changes have been implemented, which can be seen as a mid-term review. Lastly there would have to be an evaluation at the end of the transformation, when all changes have been implemented. It became clear during the client analysis that each transformation is planned in a roadmap, the timing of the evaluation could in such a case follow the steps in the roadmap. After each phase of the roadmap the consultants will be able to see if the suggested changes impacted the agility as planned.

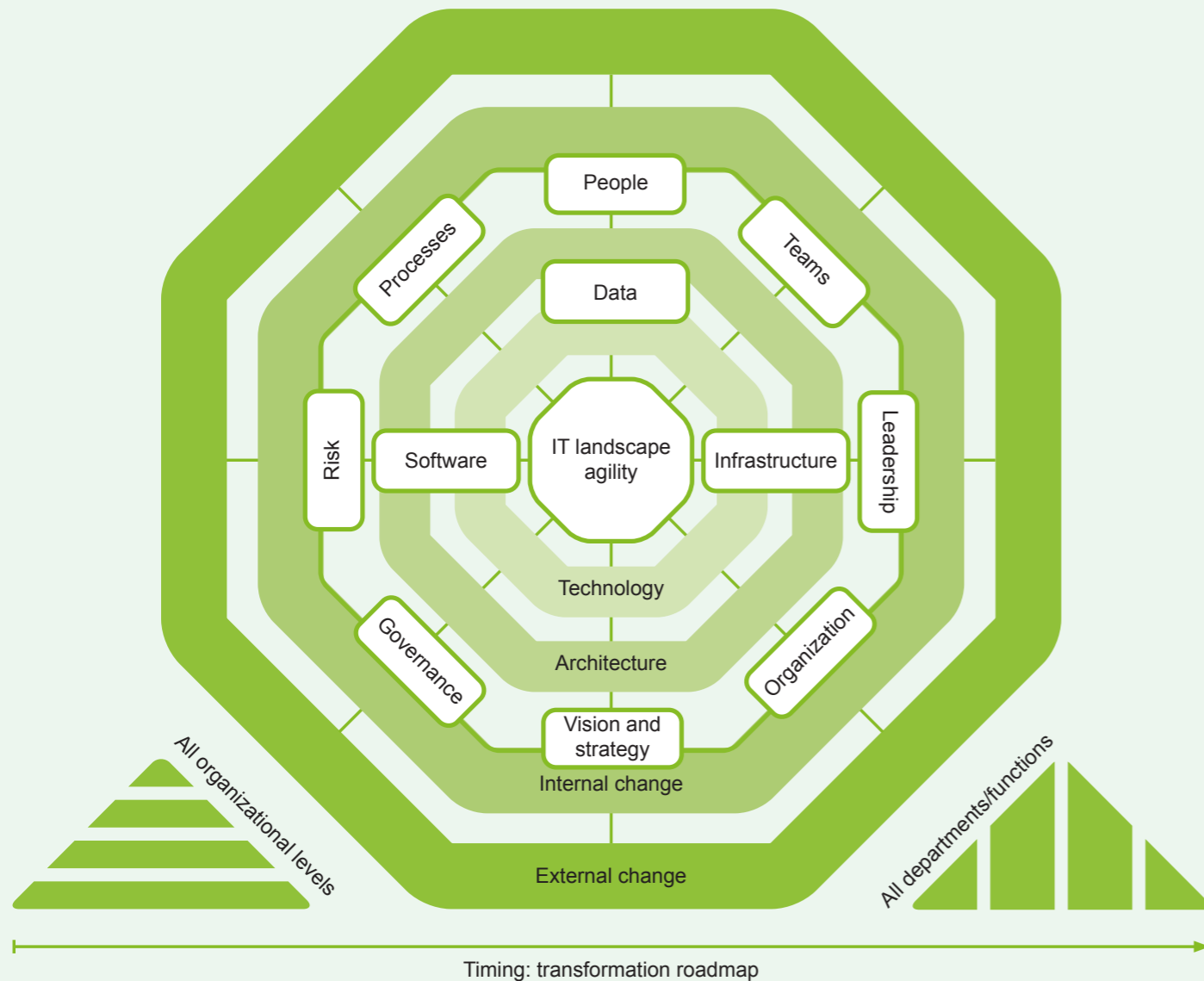


Figure 48. Framework for the evaluation of IT landscape agility

20 Conceptualization

20.1 Goal

The goal is to understand how the consultants perceive different design directions. By letting the consultants discuss what the different pros and cons are for each concept, the designer will be able to understand which concept would be most desirable for the consultants in their daily routine. The outcome should therefore be one concept that will be developed during the design process of this project.

20.2 Approach

Based on the future statement, design vision and design principles three directions are developed. There was a short round of ideation during the different interviews in which the participants were able to come up with different ideas for a format for the evaluation of IT landscapes. The number of possible directions drawn from this was limited, because the consultants are used to certain methods of for evaluating client. It was decided to keep the number of concepts limited as well. Based on the insights from the interviews it became clear that there are three possible direction which are detailed during this phase.

The detailing of the concept is done by create a visual that illustrates what type of methodology is applied in the concept. To support the concept visual, there is a short description for each of the concepts. Which will be described in the outcome section of this chapter. The different visuals and descriptions are shown in Figure 45.

After having detailed the concept, there was an evaluation session organized with three consultants. During the evaluation session, the consultants were shown the different concept visualizations and were able to read the description. The consultants were then given the time to discuss the different pros and cons of each concept, while the designer wrote down the different pros and cons being discussed.

The pros and cons are used for the concept selection, since only one of the concepts can be chosen for the continuation of the design process. It was decided that the concepts with most pros and least cons would be the most desirable concept for the consultants and would therefore be the best starting point for the final design.

20.3 Concepts

Since there was not a strong majority in favor of either a qualitative or a quantitative method, both options have been considered during the concept development. Three concepts have been developed, the Interview Guide, the Quick Scan and the Landscape Maturity Model. These three concepts are explained in this section of the report.



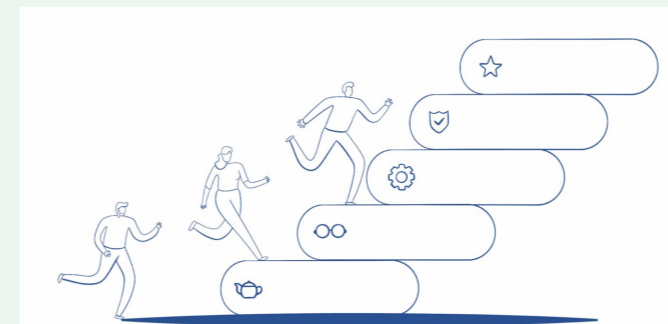
Interview guide

An interview guide for business analysts and consultants, containing structured interview questions. The interview questions are structured, this way the interviews will be consistent to ensure the comparability of results. Participants come from different departments, functions and levels within the organization. The interview questions dive into the different topics of the of the framework, making it an extensive guide.



Quick Scan

The agility quick scan will consist of a list of multiple-choice questions, based on a Likert Scale. Different questions will touch upon each of the dimensions of the IT landscape agility framework. This Quick Scan will have a survey format and will be sent to people from different hierarchical levels, departments and roles within the client company. Ranging from IT roles to non-IT roles. The Quick Scan is supposed to be sent to a large sample. The goal is to quickly identify what IT and other organizational aspects score low on the Likert Scale and identify a gap or opportunity. The Quick Scan can be applied repeatedly.



Landscape Maturity Model

The Landscape Maturity Model will provide the client with different statements about the state of their IT landscape, describing multiple levels of maturity. This will allow the client company to select the archetype that matches their current state, based on the different dimensions in the framework. The maturity model can be filled in by a small sample, from a limited number of hierarchical layers or departments. The outcome would be an overall maturity level of the IT landscape of the client company. The maturity model would require little effort from the consultants.

20.4 Outcome

Together with three consultants from Deloitte the pros and cons of different options were evaluated, which is illustrated in Figure 49. The green Post-it notes contain the pros and the red Post-it notes contain the cons for each of the methods.

It was concluded based on the pros and cons of each of the methods that the Quick Scan, using a survey format, would be most desirable for consultants. The interview guide would generate in-depth and detailed insights and it is perceived as a pro that the guide would be very structured, leading to consistency. However, it became clear that the analysis is more complex than quantitative analysis and thus be more time consuming. Which is not desired and does not match the design principles. Additionally, it is a con that gathering participants and conducting the interviews is also too time consuming.

For the maturity model it becomes clear that it would be a nice tool for industry benchmarking. Since there would only be a limited number of participants, the process of filling in and analyzing the maturity model would be efficient as well.

However, the consultants found that maturity models are sometimes too abstract. The level of detail cannot be too high, because it would not be generalizable anymore. Filling in the maturity model may be subjective, which does not have to be a big con. But the participation of a small number of employees would be.

The quick scan survey complies several design principles such as low time consumption, the ability to include a broad range of participants and the identification of gaps and opportunities. An aspect that the consultants like about the Quick Scan, is that the quantitative analysis makes the analysis both quick and comparable. This could mean that results can even be benchmarked within the industry of a client. The biggest con is that a survey could be subjective, but this depends on the formulation of questions. On the contrary, some of the interview participants would prefer subjective questions to be included since they would like to know the opinions of employees on certain topics.

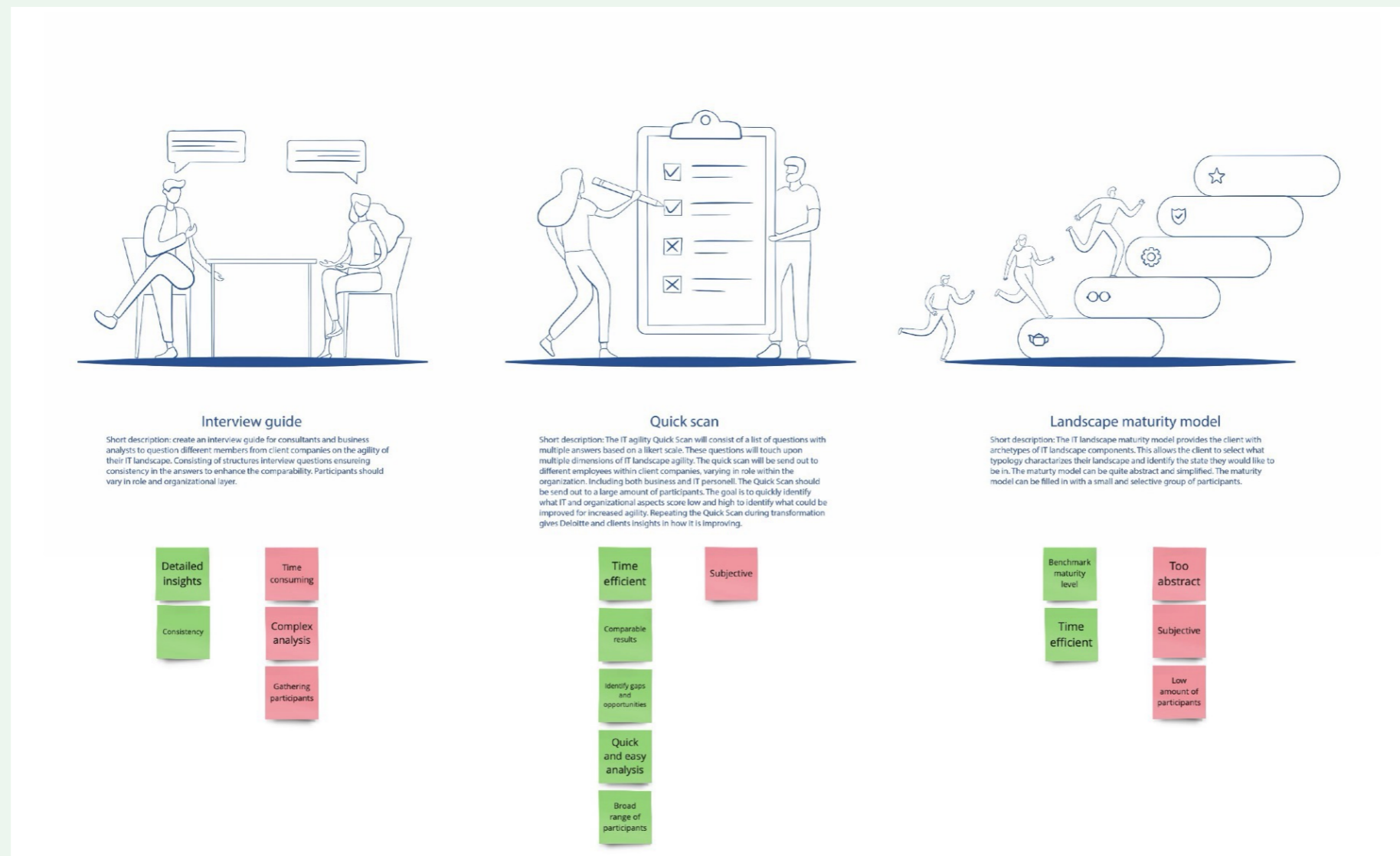


Figure 49. Overview of the evaluation of the Quick Scan

21 Validation

This chapter contains the validation of the framework and concept. Validation is done to understand what value is created, delivered, and captured, by evaluating the framework and concept based on its feasibility, viability, and desirability. This principle is known to be at the core of design thinking. Design thinking is a human-centered way of innovating, by combining what is technically possible, needed by the user and required for business success (Brown, 2008).

21.1 Goal

The main goal of this validation is to understand whether the concept and framework that it is based upon are feasible, viable and desirable by the future user. This validation is also done to understand whether the definition of IT landscape agility, the topics for the evaluation and the Quick Scan survey format are chosen correctly. Results of this validation will be more viable if participants are able to interact with each other and respond to the comments made by other participants. This is why it was decided to organize one collaborative session with as many participants as possible.

21.2 Approach

After the framework was completed and the concept was chosen, a meeting was set up with twelve employees from Deloitte from within the IT agility guild. The group of participants consisted of employees having a specific interest and expertise in information technology agility and operational agility. There was a broad variety of functions attending this meeting, from business analysts up to a director.

This validation session started with a presentation, this presentation introduced the research objectives, the drivers for evaluating the IT landscape agility and the definition of IT landscape agility. Then the findings from the literature review, interviews, focus groups, expert talks, observations and analysis of secondary files were explained to the participants. After this was clarified to the attendees, the findings on the different system dimensions, characteristics and topics that should be included in an evaluation were presented. Finally, the concept was presented to the employees, illustrating how the Quick Scan would be applied, what the contents would be and what the goal and possible outcome of the Quick Scan would be.

The final and most important part of the session was dedicated to asking feedback on the concept and framework. The employees were asked whether the solution would be feasible, viable and desirable for TT&A, their capabilities and their clients. If these three criteria for human-centered design are met, a solution is in the so called “innovation sweet spot”. During the session the designer was taking notes and only join in on the conversation when deemed necessary by participants. Notes are gathered on a Miro board and clustered around the concept itself and the content, the goal and the outcome of the Quick Scan.

21.3 Topics

Many comments were made on the concept, ranging from pitfalls to compliments. Comments were collected on the content of the evaluation framework, the concept itself and the goal and outcome of the solution. The different comments on the topics, as collected and clustered on the Miro board are shown in Figure 50. The comments have been anonymized, but the position of the participant that made the comment is attached to note itself on a black Post-it.

21.4 Feasibility

Can the solution be implemented by TT&A or one of the capabilities and is it technically possible? The answer on this question is yes according to the participants. Since Deloitte is used to working with surveys during client projects, they are familiar with this methodology. It was stated that the content of the Quick Scan should incorporate more knowledge from different perspectives, e.g. on topics like architecture or vision and strategy. Since this is generally not the focus of TT&A during client projects. It was mentioned that there should be a clear owner of the Quick Scan within the TT&A team, but that it would be a great addition to current assets and builds upon the knowledge that is already present within Deloitte.

The most difficult aspect of developing the concept is the time needed to develop, since every hour should be justified within Deloitte. Each hour that is not spend on a client, is an hour that will most likely cost money. The number of hours available for internal tasks are limited for most consultants, especially for subject matter experts and employees in higher positions such as senior consultants, managers, directors and partners.

However, it was also mentioned that using a quantitative tool could save a lot of time compared to qualitative tools. The time saved by not having to transcribe and code interview, could in that case be spend on the development of the Quick Scan. There were still some questions on how the survey would be validated with real users, e.g. with a client, since the participants would like to know whether the concept would also be desirable for their client.

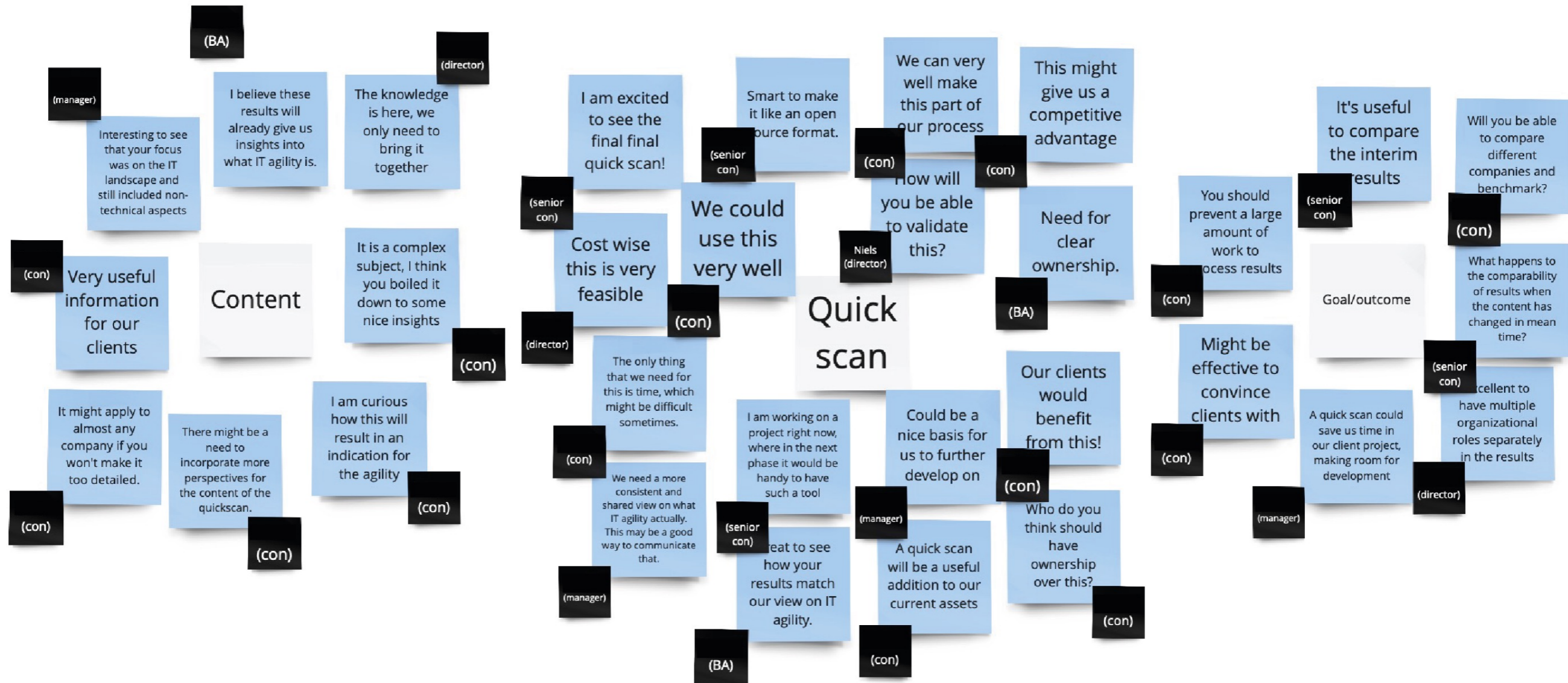


Figure 50 feedback on the feasibility, viability and desirability of the concept

21.5 Viability

Will it be an addition to the current offering of TT&A and is it needed for business success? Based on the input from the participants it can be concluded that the Quick Scan will indeed be a valuable addition to the current offerings of TT&A and could stimulate business success by improving their current processes.

One of the consultants was curious to see the final product and was already eager to use it, since they were working on a client project where they would go into the assessment phase within a considerable amount of time. A tool like the presented Quick Scan was something they did not currently have but would be able to use during the assessment phase.

During the validation session one of the participants mentioned that it can be an effective tool to convincing clients with, which would make it a great addition to their assets in the long-term. Another consultant literally mentioned that the evaluation tool would be a great addition to the assets currently owned by Deloitte. The participants would like to make the evaluation of IT landscapes, using the Quick Scan survey, part of their current processes and suggested it could create competitive advantage.

Participants still wondered what the results of the survey would look like, how they would be presented and whether they could compare several companies amongst each other. It will be useful for consultants and clients if there are no company or industry specific questions, since this will allow consultants to use it on almost any client company.

21.6 Desirability

Is this a solution that can solve pain points experienced by consultants, do the consultants need it and do their clients need it? The biggest pain point that the Quick Scan would solve, is the absence of an established methodology to evaluate the agility of IT landscapes. Which is the main motivation for the scope of this projects as well.

It became clear during the validation session that this solution is something both Deloitte and their clients could use very well during projects. Both information presented based on the insights from literature and expert input and about the design direction was perceived as useful and could be applied in client projects. By illustrating where the gaps and opportunities are in the client landscape, consultants would be able to convince their client more easily. It was mentioned that there should be a more consistent view on what IT landscape agility is. A Quick Scan survey and the conclusions from this research would be a suitable way of establishing a shared definition within Deloitte. Some participants mentioned that they are excited to see the result, which also indicates that there is a desire for the Quick Scan within TT&A and Deloitte. The participants additionally reflected on the desirability for their clients and concluded that clients could also use a solution like this. Clients generally think they have a certain problem within their IT landscape, but the Quick Scan could point out what is actually wrong with their IT landscape.

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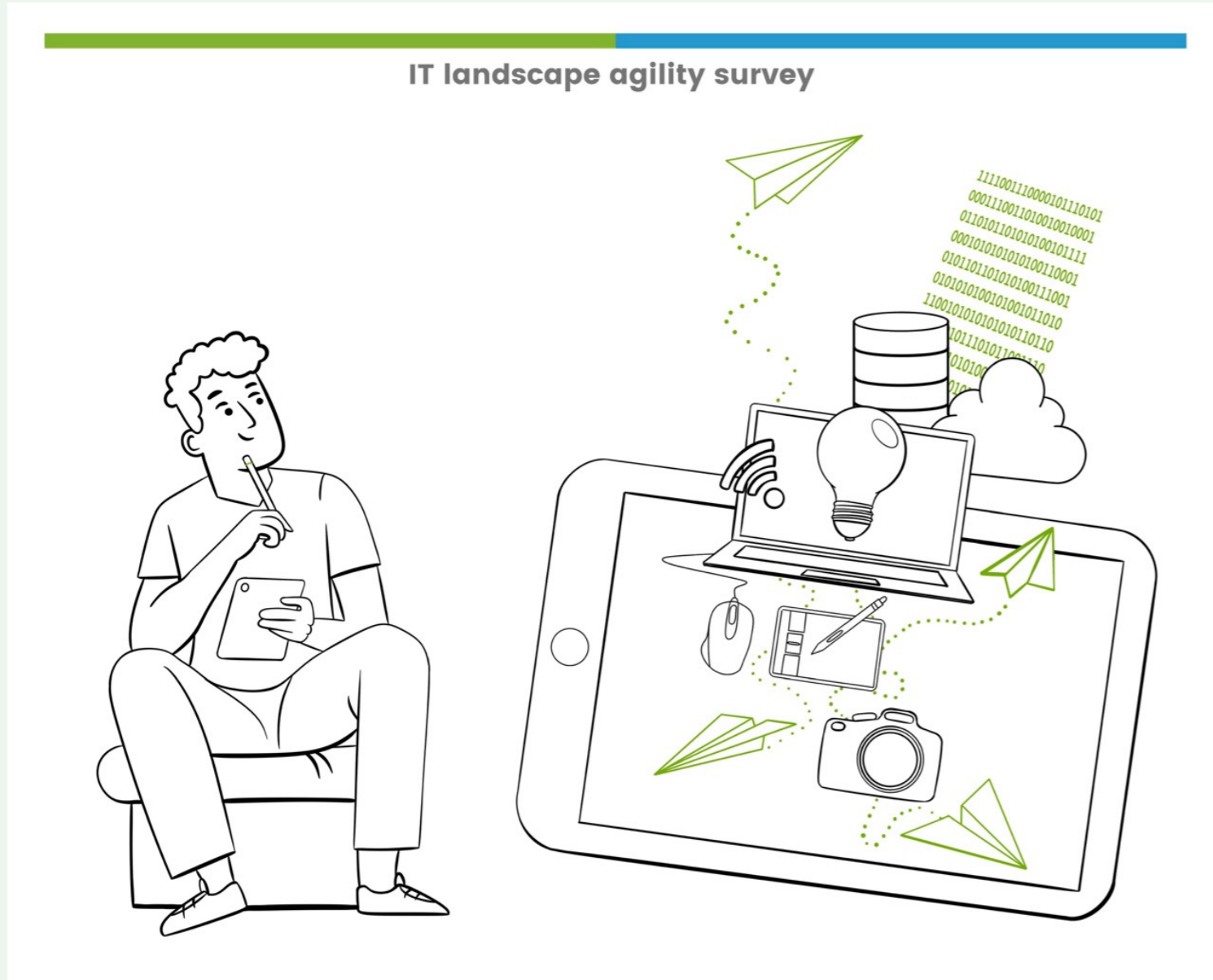
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Participants still wondered what the results of the survey would look like, how they would be presented and whether they could compare several companies amongst each other. It will be useful for consultants and clients if there are no company or industry specific questions, since this will allow consultants to use it on almost any client company.

21.7 Conclusion

We can conclude that the concept of the Quick Scan as presented during this validation session with twelve employees from within TS&T, would be feasible, viable and desirable. The agility guild showed excitement, while staying critical on the requirements necessary for the concept to become a finished product. To implement the solution, there is still a lot of work to be done on the content of the Quick Scan, such as the questions itself. Whether the survey will deliver the desired results also depends strongly on how data will be analyzed, and results can be presented to clients. Development would involve additional efforts from colleagues outside of TT&A and further development relies on the available time and motivation of the employees. Clear ownership and dedication would be required to make the concept succeed as a widespread tool within Deloitte consulting.

22 Concept detailing



For the evaluation of the framework and chosen concept, the Quick Scan was created based on the framework for evaluation of IT landscape agility. The Quick Scan is based on a survey, of which the content is on the framework for the evaluation IT landscape agility.

22.1 Approach

The survey was developed in Qualtrics, which was chosen because it is the dedicated software provided by the University of Technology Delft. The first iteration of the concept was created based on the exact topics from the concept. For each of the topics a different page was created in Qualtrics. Additionally, there was a page with an introduction into the subject and purpose of the Quick Scan. For each of the topics there are several questions formulated. The introduction, topics, question formulation and respondents will be explained in this chapter. The complete first version of the survey can be found in appendix L.

22.2 Introduction

To introduce the concept of IT landscape agility to respondents, the survey starts off with an introduction into the topic. Participants in the evaluation are given an introduction explaining what the concept of IT landscape agility is based on the definition formulated during the explore phase of this project. Next to the definition of IT landscape agility, the different dimensions which are included in the IT landscape are mentioned. Then the purpose of the IT landscape is explained, indicating what the use is for the organization and the employee filling in the survey: understanding how agile their IT landscape is. It should be clear for the respondent what the benefit is for them as a user as well. Lastly, the introduction indicates that all data gathered in the survey is treated confidentially. Respondents should feel the freedom to be completely honest without it having consequences.

22.3 Personal information

After the introduction the respondents are asked to fill in personal information, such as their age and gender. This is done because some of the issues with agility of people can be related to the age of employees. Furthermore, respondents are asked to fill in their current department, team and function. In this way results can be compared between for example business and IT, or different functions within the IT department, and so on. Lastly it is requested to fill in the duration of employment. This is done to so Deloitte could check if there are any correlations between the years of experience and certain perceptions of agility.

22.4 Topics

As mentioned, the contents of the survey are based on the framework distilled from interview insights and literature research. The framework containing the dimensions on which these topics are based can be found in chapter 19. The initial survey contains the following topics:

- IT landscape in general
- Data
- Software
- Infrastructure
- Architecture
- Processes
- People and teams
- Leadership
- Organization
- Governance, risk and compliance
- Strategy and vision

As mentioned, does each of the different topics have a dedicated page in the survey. Each page contains a number of questions, varying per topic. How the questions are formulated will be explained in chapter 22.5.

22.5 Question formulation

Part of the questions included in the Quick Scan survey are formulated based on the insights from interviews found in chapter 14, on the insights drawn from the literature research in chapter 5 up to and including 11 and based on secondary data e.g. DevOps maturity assessment from the client. The questions aim to understand to what extent the client, which is being evaluated, achieves IT landscape agility. E.g. by asking the respondents whether certain standards are applied, certain characteristics are applicable or certain methods are used. Some of the questions or statements that resulted from these different types of data collection are mentioned here:

Are dependencies between modules within application documented (if relevant)?

Teams collect customer feedback to prioritize features.

Development tools are standardized across all teams in the organization.

Teams use information from monitoring tools to prioritize non-functional requirements.

22.6 Question and answer format

Questions for each of the topics are based on a multiple-choice format. With a multiple-choice format, the survey can contain more questions, while the respondent has to take less time to answer, compared to open questions. This supports the design principle of consuming little time, for both Deloitte and their client. Data analysis can be done quicker results can be compared with different respondents and even companies more easily.

Questions generally had six options based on a Likert Scale of five and can be selected in a drop-down menu. This was done so each choice on the Likert Scale could be given a value, from 1 to 5. The sixth option is a not applicable option, which can be chosen if the respondent thinks the question is not related to the topic or should not be used for the evaluation of IT landscape agility. The not applicable option is linked to the value zero. This value should not count for the mean value during the analysis and has to be filtered out. It was decided that if more than 25% of the respondents chooses the not applicable option, the question should be removed from the survey. Some of the options on the Likert Scale are as mentioned in Table 3, with the accompanying ratings in the top row.

26.7 Survey design

For the layout of the survey there are a few factors considered. The brand of Deloitte should be communicated through the survey, this is done by using the green and blue colors used by Deloitte on their websites and in their slide shows or reports. These colors are used for the graphics that are inserted and for all of the buttons in the survey.

Since the survey is used for the evaluation of an IT landscape, it was chosen to use a background image of a natural landscape in black and white. This refers to the topic but is not too literal or distracting. The goal of this background was to make the survey look calm. Lastly it was decided to make the Quick Scan look more attractive by inserting illustrations and animations on top of most of the pages. The illustration or animation had the goal of visualizing the topic of each of page. An example of this can be found in Figure 51.

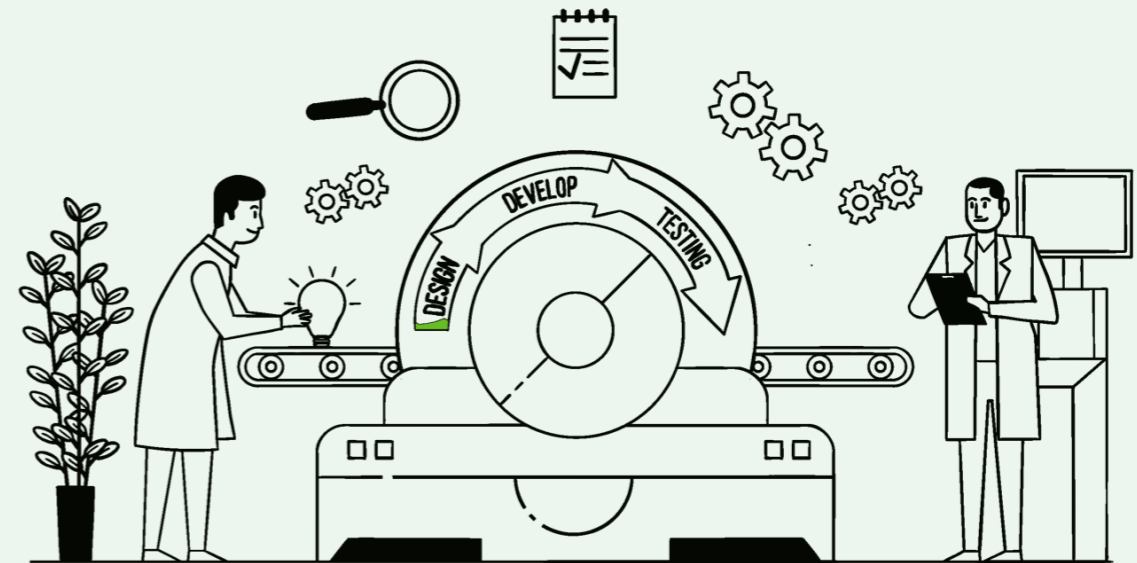


Figure 51 Example of one of the animations from the first survey

1	2	3	4	5
Very poor	Poor	Fair	Good	Very good
Very dissatisfied	Dissatisfied	Neither satisfied/ dissatisfied	Satisfied	Very satisfied
Strongly disagree	Disagree	Neither agree/ disagree	Agree	Strongly agree

Table 3 Likert scales used for survey questions

26.8 Sample

Like described in chapter 15 on the design principles for the evaluation design, the solution should include the complete breadth of the organization in the evaluation of the IT landscape agility. Therefore, initial survey is developed for employees from all the different departments within in an organization, ranging from IT to e.g. human resources. This is mainly done because the interview results point out that it is essential for understanding the agility of the IT landscape to involve both IT employees and non-IT employees. When these different types of respondents answer similar questions, results can be compared for different departments and different functions within these departments. It can then become visible where the opinions between departments differ with regards to the agility of the IT landscape, which will lead to the identification of a gap and becomes an opportunity for improvement. Furthermore, can it also be a conversation starter and a starting point for further investigation when it becomes clear that a specific department scores the IT landscape low on a specific topic.

26.9 Timing

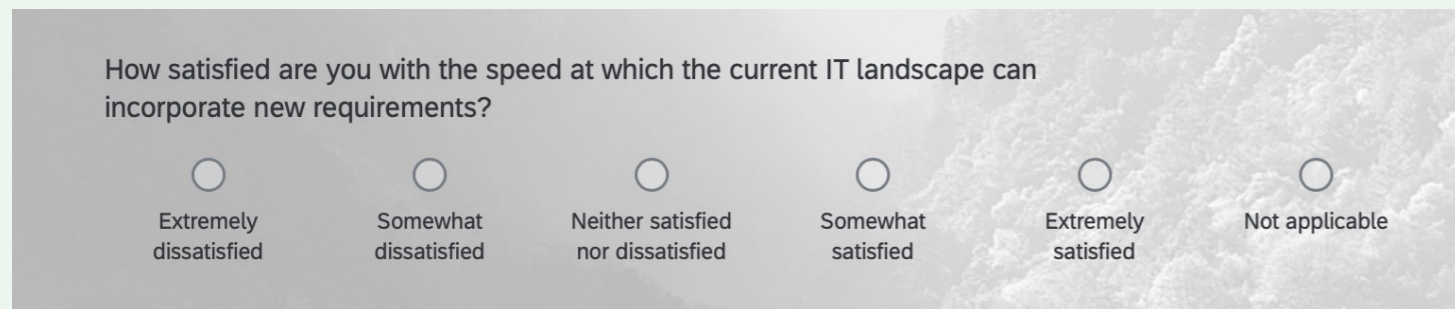
The timing of this initial survey is supposed to be based on the project roadmap. At the start of a client project, during the assessment phase, there will be a so called 'null measurement' in which the current state of the IT landscape will be evaluated. These results can be used during the design of the roadmap for the transformation towards the desired state that is formulated by the consultant and client. During the transformation, based on the steps in the roadmap, the consultant can choose the best timing for a mid-term measurement. The last evaluation should be done at the end of the transformation. The mid-term and final evaluation are done to evaluate whether the implemented change has had the desired effect and led to the desired state.

23 Concept evaluation & iterations

The artifact is the first iteration of the survey and is still conceptual, created for feedback purposes. Involving potential users in the evaluation increases the chances of success, by creating a sense of ownership as they have contributed to the final solution. For this reason, it was chosen to include a client from Deloitte to give feedback on the conceptual tool. Since TU Delft is one of Deloitte's clients and the researcher is a student at this institution, it seemed a logical step to include the university in the test process.

23.1 Approach

To generate feedback on the survey, it is first sent to two supervisors from the University of Technology Delft. Their feedback allows for initial adaptations of the concept, such as formulating the questions in a different way and presenting the answers horizontally as shown in Figure 52. Initially the answers were presented through a drop-menu, where it takes more time to see what the answers options are and to fill in the survey. After adapting the survey based on the feedback from the TU Delft supervisors, it was time for an evaluation by a potential client from Deloitte.



How satisfied are you with the speed at which the current IT landscape can incorporate new requirements?

Extremely dissatisfied Somewhat dissatisfied Neither satisfied nor dissatisfied Somewhat satisfied Extremely satisfied Not applicable

Figure 52 Example of one of the survey questions

The first step in the process of evaluation was contacting the head of the ICT department within the IDE faculty. A meeting was planned in which the research and goals of the evaluation were explained. During this meeting the researcher discussed together with the head of the ICT department what would be the best approach for inviting participants to evaluate the survey. It was decided that it would be necessary to iterate the concept one more time. So, the first step was receiving feedback from the head of the ICT department. After implementing this feedback, the survey can be shared with several employees for evaluation purposes. Snowball sampling was used for selecting participants in this evaluation round. The head of the ICT department offered to share the survey, assuring that the evaluation is executed by colleagues, and feedback is generated. The survey was modified each time feedback was received, which created an iterative process in which the survey was continuously adapted based on the feedback received. This made the development of the survey more agile, ensuring that the result of this project is catered to the needs of the target user.

23.2 Evaluation goals

The evaluation was set up with two goals in mind:

- Evaluate the content of the framework/assessment
- Evaluate the format of the evaluation tool

The content of the assessment is evaluated to see whether the topics and questions included are understood by employees of a client company. It is important to understand whether the topics and questions used apply to and would give a good indication of the IT landscape agility. The format of the evaluation, a survey, is also being evaluated. This is done to understand whether a client company would find this a suitable methodology.

23.3 First round of feedback

The first round of feedback contained the feedback from the head of the ICT department, who filled in the survey, made notes and send them via email to the designer. The feedback suggested to change the structure of the survey, by moving the section requesting personal information to the back of the survey. This could be a barrier for respondents to start the survey since they want to stay anonymous. Although the section on personal information does not request participants to fill in their name.

Additionally, feedback is given on the questions itself, regarding the content and formulation of the questions. Some questions were unclear, such as: "How well does software support your organization in sensing change in the operating environment?" It was questioned whether this is even possible. It was not clear either what was meant by sensing internal change. Feedback on the content of the questions is considered and the questions are removed or modified. It is difficult to reflect whether questions about e.g. sensing change using software, are incorrect or just not applied within the client organization. Therefore, the feedback is correct and implemented in the next iteration. Lastly it became clear that many questions about technological characteristics of the IT landscape would not be suitable for employees who do not work within the IT department. So, it would be more valuable if there would be a separate survey for them, focusing more on their use of the IT landscape.

23.4 Second round of feedback

After iterating the survey used during the first round of evaluation, a new request for feedback was sent to the head of ICT. For this round of evaluation there were two versions, one version for IT employees and one version for employees in other departments. This way employees with little IT knowledge did not have to answer questions about technical aspects of the IT landscape. Questions are formulated in such a way in both versions, that they share similar topics and results can still be compared to each other for most questions. Figure 53 shows an example of this. Many questions were reformulated to make them more comprehensible. Additionally, the section requesting personal information was moved to the end of the survey, so this will not form a barrier for respondents anymore.

Software can quickly be adapted to changing business processes.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

If there is a change in one of our processes, the required change to the software used is generally implemented quickly.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Figure 53 Comparison of separate questions for IT and non-IT employees

This time feedback is provided by four employees from the university, two IT employees and two business employees. These participants were found using snowball sampling, through the head of the ICT department.

One of the comments received is that some of the questions are subjective and prone to interpretation. A project manager would read and answer these questions different than an administrator. This is something to consider when asking a multidisciplinary group of people to participate in such a survey. Furthermore, it was found that it could be desirable to split questions up and make them less ambiguous. Instead of asking about the performance of applications, the questions could be about speed and customer satisfaction, according to one of the participants in this round of evaluation. The survey was perceived as visually attractive, making it more pleasant to fill in, which is a positive note. The university is seen as a more traditional organization, which is why one of the respondents was not familiar with the concept of agility. This responded therefore suggested it would be necessary to more clearly explain the concept of agility and in particular IT landscape agility. Feedback gathered during the second round of evaluation was incorporated in the next iteration, which at this point consisted of two versions. The survey for IT employees is shown in Appendix M and the version for other employees in Appendix N, these were used for a final evaluation round.

24 Final evaluation

24.1 Approach

This last round of evaluation will be slightly different from the first two rounds. For this evaluation respondents will be selected again from the University of Technology Delft. A mix of IT employees and employees from other departments will be asked to look over the questions of the survey and answer them. It differs from the first two evaluation rounds because of the open questions at the end of the survey. Respondents do not necessarily have to answer the multiple-choice questions but critically look at the type of questions and the format of the evaluation. Both versions of this iteration of the survey can be found in the appendixes. The IT version of the survey can be found in Appendix M and the version for other departments in Appendix N. Drawing insights from the data is done by analyzing the quotes of respondents, gathered in the comment section of the survey. The results of the final round of evaluation are described in chapter 25 of this report.

24.2 Goal

The main goal is to evaluate whether the format of a survey is suitable for a consultancy firm to use during client projects. Additionally, the goal is to find out what the biggest shortcomings are, what the biggest strengths are, what topics/questions should be included or excluded, and what target audience would be suitable to sample from. Respondents are asked how they would prefer the results to be shared with them and are given the opportunity to make other suggestions. This is done to find out how client companies would perceive the evaluation survey in its current form, when Deloitte would send it to them.

Understanding the largest shortcomings will help the researcher during the final iteration of the artifact or in formulating recommendations for further research and development. The biggest strengths will confirm the aspects of the survey that are already improved sufficiently during the last iterations. Understanding what target audience should be used for the evaluation of the agility will help in recommending Deloitte who should be included during the evaluation phase. The analysis of the data and presentation of the results is not included in the evaluation phase of this project, but to make a proper recommendation on this topic, the participants were asked to give their preferences. Additionally, there might be suggestions on the survey which cannot be specified within the aspects above. Which is why respondents are given the opportunity to also make suggestion at the end of the survey.

24.3 Sample

The survey is sent out to a total of 75 employees, considering not all the invited employees will respond or make it to the end of the survey. Divided over a total of 40 IT employees and 35 non-IT employees. The employee catalogue within Outlook was used to find participants from different departments and different functions, making sure there was a somewhat equal distribution of functions among the invited employees. Ranging from architecture to data management and from campus and real estate management to finance. An overview of the different departments is shown in Table 4.

It was remarkable to see that initially none of the invited employees working in other departments than the IT department responded to the survey. While there were six respondents from the IT department within five days. Eventually, there were 11 respondents from the IT department and two respondents from none IT departments. Low respondent rates might be the result of IT employees understanding why it is important the IT landscape and its agility, and it impacts their daily work. However, it can also be that IT employees have a higher willingness to fill in surveys in general. Almost all the IT employees responding on the survey initially replied to the email, requesting information on how their contact details were found and why they specifically were approach.

The low willingness to participate in the survey could be reflective for other organizations. This is why there should be a proper introduction of the evaluation and its goals when implementing it at client companies. With a low respondent rate, results may not be reflecting reality or may not even be analyzed due to the small body of data gathered. Making the survey obligatory would be another option for client companies to ensure high respondent rates.

IT department	Other departments
IT management	HR management
ICT coordination	Finance management
ICT ops	Facility management
IT support	Finance & control
Applications	Project administration
Technical app management	Communication management
Functional app management	External partnerships
Data management	Education contracts
Information management	Funding management office
Information security	Research contracts
IT security	HR
Architecture	Finance
Infrastructure	Communication
IT project management	Marketing
IT research and development	Education

Table 4 sample for the final evaluation

24.4 Survey structure

The survey consists of 16 sections, with each section presented on a new page. The first section introduces the topic of IT landscape agility and the purpose of this survey. The second section dives deeper into what dimensions are considered to be part of the IT landscape and what the definition of IT landscape agility is. After these initial sections, there are a total of twelve sections with different topics in the survey for IT employees and ten different sections for other employees. These topics can be found in Table 5. After the sections with multiple questions on each of the topics, there is a comment section giving respondents the ability to do a suggestion for changes that would improve the ability of their IT landscape. Lastly there is a section for respondents to fill in personal information such as their age, gender, current department, team and function and their years of experience within the organization. Respondents are not asked to fill in their name. When filling in the survey anonymously, respondents may feel more comfortable to give an honest opinion.

IT department	Other departments
IT landscape in general	IT landscape in general
Data	Data
Software	Software
Infrastructure	Infrastructure
Architecture	Processes
System characteristics	People and teams
Processes	Leadership
People and teams	Organization
Leadership	Risk and governance
Organization	Strategy and vision
Risk and governance	
Strategy and vision	

Table 5 Agility dimensions included in the different surveys

24.5 Questions

Questions for the survey used during the final evaluation are based on three different input methods. For one, the questions are formulated based on the insights drawn during the literature research. Such as questions about the characteristics of the IT landscape:

“Connectivity refers to the number of dependencies between different components within the IT landscape creating dependencies. Within our IT landscape there is:”

- Very high connectivity
- High connectivity
- Neither high nor low connectivity
- Low connectivity
- Very low connectivity

Secondly, there are questions included from secondary files from within Deloitte. These questions have been reformulated into multiple-choice questions with a Likert scale. The questions can be found in multiple sections, such as the section for data, software, infrastructure and more. The following question is an example of this:

“We actively protect data from unauthorized access and data corruption throughout the lifecycle, including data encryption, tokenization, and key management practices”.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Thirdly there are questions based on the insights gathered during the interviews with subject matter experts. These questions can also be found throughout the different topics included in the survey. The following question is an example of this:

“There is a clear separation of responsibilities between the departments within our organization”.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

There is a large number of questions included in the survey that is used during the final evaluation. This is partially because the agility of an IT landscape is a complex phenomenon, and many different dimensions are included that are either part of the IT landscape or have an influence on the agility of the IT landscape. To cover this complexity and go into detail based on the three different types of sources used to formulate these questions, it was necessary to make the survey relatively long. Due to the addition of a comment section, the estimated time for taking the complete survey is 36 minutes according to Qualtrics. This would be 29 minutes longer than advices and is reported as a severe issue. If it would be a proven method for increasing the agility of the IT landscape and indirectly also company performance, this duration might not be problematic. However, it is more likely that people will quit filling in the survey halfway through. It will become clear during the evaluation whether people find the survey too long or not.

The goal behind the questions is primarily to understand whether the questioned phenomenon is applicable to the client being evaluated. Respondents can answer the multiple-choice questions on a Likert scale, with each answer having a value from 0 up to 4. Mean scores for each of the questions can then point out whether the phenomenon or situation is present. Based on this, conclusions can then be drawn on the current state of the IT landscape agility. Pointing out where the biggest gaps and opportunities are within the IT landscape and the organization itself.

24.6 Evaluation questions

There is a comment section at the end of the survey, as mentioned in chapter 24.4 on the survey structure. This comment section is supposed to contain statement, stating respondents can suggest changes that would help their organization to increase the agility of their IT landscape. Additional questions have been added to this comment section requesting the respondents to give feedback. The introduction of the survey points out, that this comment section is more important than answering the multiple-choice questions. The purpose of this is to evaluate whether the format and content of the survey fit the purpose of evaluating IT landscape agility. This chapter will describe what questions have been added to the comment sections of both surveys to generate insights about the current format and content.

1. *“If a consultancy firm would be assisting the TU Delft in an IT transformation, would a survey like this be a suitable method for retrieving insights from employees? Please motivate your answer.”*

This question aims at finding out whether a survey format is suitable for a consultancy firm to use during the evaluation of a client. This can confirm that the survey is a desirable tool for clients and would therefore also be desirable for TT&A.

2. *“What are the shortcomings of this survey according to you?”*

Asking respondents to state the shortcomings of the questions helps to understand what difficulties there

are with filling in the survey and what opportunities for improvement are visible. It allows the respondent to give an honest opinion on the quality of the survey and its content. This information can be used for further improvement in future iterations.

3. *“What are the strengths of this survey according to you?”*

Knowing the strengths of the survey helps the designer in convincing its client why this survey should be implemented. Strengths can be used for further development and can be seen as an opportunity, by emphasizing them in future iterations. Additionally, is it important for the designer to know what the strengths are, so next iterations will not change in such a manner that these strengths will change.

4. *“What topics or questions did you miss in this survey which should be included in the survey for better insights in the agility of the IT landscape?”*

To evaluate whether the content matches the purpose of the evaluation and covers all the dimensions that should be evaluated, the respondents are asked whether there are any topics or questions missing in their opinion. Because there are subject matter experts invited to fill in the survey, there is a high likelihood that these experts think that there are certain questions that should be included in the survey.

5. *“How would you like the results from this survey to be communicated to you as an employee?”*

Understanding what kind of insights respondents would like to receive after filling in the survey is an important element for the analysis of the survey results. There are different ways of presenting and communicating these results, therefore, knowing what is desired by a client of Deloitte will help to make the process of evaluation more tailored to the needs of the client.

6. *“The target audience for this survey is employees from the IT department within the TU Delft, a similar survey was sent to employees from other departments. Is there another group of users that should fill in this survey?”*

During the interviews it became clear that it would be useful to include employees from all departments and levels within the organization. Outcomes of the survey would in this way be more representative for the actual population within the client organization. However, the respondents of the evaluation might have a different opinion about who should be part of the target audience. Which is why respondents are asked to state what other users may need to be involved in the evaluation.

7. *“If you have other suggestions to improve this survey or the outcome, we would like you to mention them here:”*

This last question included in the comment section allows the respondents to make suggestions for improving the survey they filled in. There may be surprising suggestions that could improve the survey in ways not thought about before. These can also be suggestions for the order, format or content of the survey which they have failed to mention before.

25 Evaluation results

25.1 Goal

The goal of the evaluation was to determine whether the solution is realizable, whether it adds value the client of this project and whether they want to use it. These three elements are based on the innovation sweet spot developed by IDEO, where innovation is most likely to be successful if it is feasible, viable and desirable all at once.

25.2 Respondents

The final round of evaluation resulted in ten responses, with seven responses from IT employees and three responses from employees in departments other than IT. Among the IT participants there were ICT directors, IT project managers, IT architects and more. From other departments there were participants from human resources, finance and communication management. It became clear that there are more participants from IT departments, which may be since the survey applies to the IT landscape, these employees understand why the evaluation is necessary and the sample size was larger.

25.3 Insights

This chapter gives the reader some examples of the answers collected in the open section of the survey, where respondents were asked to give their feedback on the methodology, content and communication of results. For each of the questions the quotes from respondents are discussed with regards to the implications they have on the survey and its results. These implications will be considered in the last iteration of the survey. The quotes have been anonymized and numbered.

1. If a consultancy firm would be assisting the TU Delft in an IT transformation, would a survey like this be a feasible method for retrieving insights from employees? Please motivate your answer.

Evaluating whether a survey is a suitable feasible for evaluation, helps in validating whether this survey would be desirable for clients of Deloitte. The method for evaluating the agility of the IT landscape is suitable for the goal of evaluation according to some of the respondents. As mentioned by one of the respondents in Q2.2, there are comparable surveys like this.

“Yes, as there are plenty of comparable surveys like this” (Q2.2).

However, not all respondents find the current version of the survey a suitable method for evaluation. The survey might be too detailed and as a result it would take respondents too much time to fill in the complete survey, as mentioned in Q2.3.

“No, this survey is way too long and most employees would not have answers on most questions” (Q2.3).

When a survey is too long, the number of participants who discontinue the survey before they are finished

is more likely to be higher than for short surveys. Simplifying and shortening the survey may change the opinion of this respondent and increase the user acceptance rate.

Additionally, in Q2.3 it is mentioned that most employees would not have the answer to most questions. This could either lead to unrepresentative results when they would answer the question anyway, or questions could be left unanswered. The fact that most employees would not be able to answer all the questions is likely linked to the fact that the survey is very detailed, which is also mentioned in Q2.4. This can on one hand be seen as a positive characteristic, as it might be perceived as thorough.

“Possibly. It’s very detailed” (Q2.4).

However, high level of detail in the questions can also lead to respondents not having the answers to all the questions, such as mentioned in Q2.3. This issue can be solved by e.g. building in a survey logic. When a question cannot be answered by the respondent, the survey will skip questions regarding this topic with a survey logic in place. Implementing a survey logic will shorten the time it takes to complete the survey for respondents with little to no knowledge about specific topics. The survey logic will not decrease the time for the participants who are knowledgeable about each dimension. Experts may need to review the questions and remove less relevant questions to decrease the number of questions.

2. What are the shortcomings of this survey according to you?

Asking respondents what the biggest shortcomings of the surveys are, has a clear purpose. This supports the development of the survey by pointing out what the survey currently lags and what should be improved. There are several shortcomings mentioned by the respondents. One of the respondents mentioned, in Q3.1, that the timing and target group of the survey are important. Which is not a clear shortcoming but rather a suggestion. The respondent indicates that the group of employees is important since not everyone might be able to answer the questions.

“It’s about the timing when to use a survey like this. And the group of employees you ask, are they able to answer the questions” (Q3.1).

Whether not everyone is able to answer the questions is confirmed by the respondents in Q3.2, where a respondent states that there is not one person within the organization that would be able to answer all the questions.

“No one person can answer all these questions. The survey is far too long! I spent 10 minutes on it and didn’t get very far at all” (Q3.2).

This is connected to the insights from quotes Q3.3 and Q3.4, where the respondents mentioned that the

survey is very or too detailed. The level of detail is seen as a problematic characteristic since it causes the survey to be too long, as quoted in Q3.2 and Q3.4. The respondents state that it takes significantly longer than 10-15 minutes. This may indicate that the respondents are only willing to participate when the survey has a duration of 10-15 minutes.

Additionally, one of the participants wonder how the level of detail will help to create actionable insights. Which is something that can be evaluated after the final version of the survey is finished and the analysis is validated.

It's very detailed and how does it help in actionable insights?" (Q3.3)

"Too long (it is 30 min, not 10-15 min), too much detailed questions and inconsistency in Agree vs Somewhat Agree" (Q3.4).

What becomes clear from Q3.4 as well, is the fact that the survey questions are inconsistent. Each of the questions contains multiple-choice answers on a Likert scale. Some questions contain the options strongly agree and agree, whereas others contain the options strongly agree and somewhat agree. This inconsistency should be removed, since the values linked to the answer options are equal.

Lastly, it is stated by one of the respondents in Q3.5 that the moving pictures, which are animations themed around the topic of the questions, are distracting and make it difficult to take the survey seriously. The idea behind the animations is to make the questions more interesting for the respondents, but it might have another effect on some participants. If it does have a distracting effect on respondents, this might negatively influence the outcome of the evaluation. Therefore, it might be wise not to include animations in the survey design or use motionless illustrations.

I personally didn't like all the moving pictures at the top of each page. Very distracting and made it difficult to take seriously" (Q3.5).

3. What do you think the strengths of a survey like this are?

Opinions of respondents on the strengths of the survey are valuable for this project as it allows the designer to convince the client to implement the survey for the evaluation of IT landscape agility. These strengths can be emphasized and further developed in later iterations of the survey. One of the strengths mentioned in Q4.1 is that a survey like this could involve many participants. This would allow the consultant to gather data on all the topics included. Since not one person could answer all the questions, there should be a variety of participants included. This matches the design of the survey, where the target group already consisted of different departments, teams and functions within the client organization.

"Hopefully involving many people in the organization, as I doubt if one person can answer all the questions. Except maybe for a 1 person IT department" (Q4.1).

Interestingly it is also mentioned in Q4.2 that the fact that the survey is very detailed is a strength. The survey is seen as complete and thorough, which was the initial goal of the survey. During several rounds of iterations, questions were added for each of the topics. During these iterations, changes were made to existing questions and questions were added. This means there should be a balance between the survey duration and completeness.

"Complete, thorough, applicable for IT management, architects and product managers" (Q4.2)

4. What topics or questions did you miss in this survey which should be included in the survey for better insights in the agility of the IT landscape?

It can be concluded, based on the opinions about the completeness of the survey, there are no topics or questions missing according to the respondents. When asked what topics and questions are missing, the respondents answered that there are none missing, such as shown in Q5.1 and Q5.2. This could mean that the survey covers all dimensions and characteristics required for the evaluation of IT landscape agility. It could, however, also result from a lack of knowledge about the topic of IT landscape agility. Therefore, the topics and questions may need to be evaluated again by subject matter experts.

"None at all" (Q5.1).

"None" (Q5.2).

5. How would you like the results from this survey to be communicated to you as an employee?

Respondents are asked during the evaluations how they would like the results of the survey to be communicated. This is done to understand what kind of insights they would like to receive after filling in a survey as the one developed for this project. It should be acknowledged that this question lacked clarity, since one of the respondents (Q6.1) pointed out that the results should be communicated through the official communication channels.

"Through the official communication channels" (Q6.1).

Other respondents understood the question and their preference matches the desired outcome mentioned by Deloitte employees. These respondents mention they would like to see what actions should be taken and why, as can be seen in Q6.2, which comes down to the gaps and opportunities in relation to IT landscape agility. Furthermore, in Q6.3, it is mentioned that the results should also mention who was involved and

what their position is within the organization.

“With the actions that need to be taken and the reasons why” (Q6.2).

“I would like to know who else have filled it in, how many people and where in de organization. And off course the results and conclusions” (Q6.3).

6. The target audience for this survey is employees from the IT department within the TU Delft, a similar survey was sent to employees from other departments. Is there another group of users that should fill in this survey?

When it comes to the participants in the evaluation of the IT landscape, it becomes clear again that there should be a wide variety of employees included. Like mentioned in Q7.1, there should also be people from information management teams include for example. The participants were not aware of the other participants invited, because these teams were already invited to fill in the survey. It confirms the framework for evaluation that aims on including multiple participants from each IT related team. The respondents from the IT department do not mention the inclusion of employees outside of the IT department, since it was mentioned in the introduction of the survey that these are already part of the target group.

“People of the information management teams of other departments of the university services. (in a question about the IT department I included these teams, I see them as a part of the IT or digital organization of TU Delft)” (Q7.1).

Besides the employees there are other stakeholders, e.g. users, customers and partners. These stakeholders have been excluded during the artifact development and evaluation phase. However, since many organizations have IT assets used by external parties, it is necessary to include these in the evaluation of the IT landscape as well. Like stated in Q7.2, should the need of users for support on IT assets govern changes made within the IT landscape. This is in line with what was discovered during the literature review in chapter 5 on value creation.

“Users. Their need for support should govern everything” (Q7.2)

Stakeholders can therefore be requested to fill in a short survey on their satisfaction with IT assets. For customers this can, for example be after a purchase or when logging into their personal account. In the case of the TU Delft, which participated in the evaluation of the artifact, these could for example be students. The TU Delft offers many IT facilities to students, by requesting feedback from students on these facilities TU Delft would be able to understand their needs. To evaluate how quickly requested change, through e.g. the self-service portal, is implemented, or to understand how well current solutions are catered to the needs of students.

When including stakeholders like partners and other users, there can be another section in the results dedicated to data from these respondents. Making a distinction between different types of stakeholders within the results will allow consultants and client companies to understand what type of stakeholder experiences the least agility when it comes to the IT landscape. These stakeholders can then be included in further research and strategy formulation.

7. If you have other suggestions to improve this survey or the outcome, we would like you to mention them here:

The last question of the survey requests respondents to mention any suggestions they have for the improvement of the survey. There is only one participant who suggested an improvement, which is quoted in Q8.1.

“Make it shorter, or split it up so I only have to answer things I know about. Don’t tell me it will take 10-15 minutes, when it would probably take hours.” (Q8.1)

The respondent states that the survey should be shorter and split up. This way the respondents only answer questions they know something about. This is in line with the shortcomings mentioned before, since the respondents stated that the survey takes too much time to complete and is too detailed. Expectation management is also important, since the respondent mentions that it takes hours while it was mentioned before that it would only take 10 to 15 minutes. This estimation was made by Qualtrics, which was then used in the invitation for the survey. After writing the invitation, more questions have been added. Therefore, the survey takes longer than mentioned. Because of this evaluation, we now know that the survey takes more time to complete. For the final design, it is therefore important to note that managing expectations of the respondents might influence their willingness to complete the survey.

Key takeaways

51. Level of detail

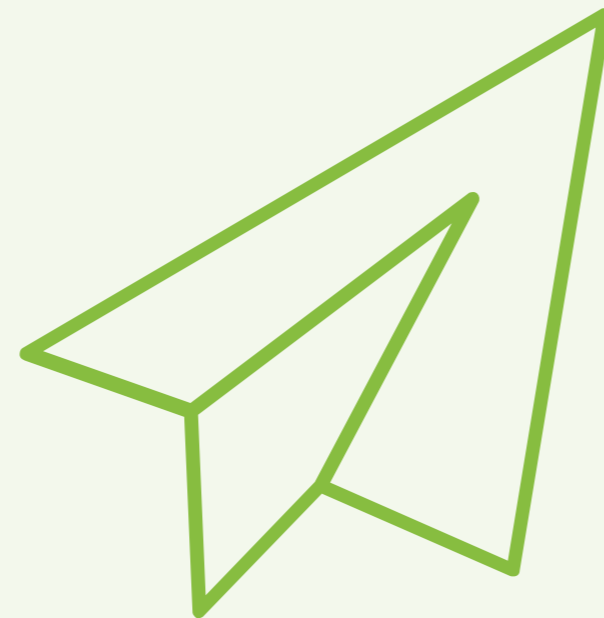
- The level of detail of the survey is too high, which results in many respondents not being able to answer questions.

52. Duration

- The time it takes to answer all the questions is too long, which might be perceived differently when the survey is finished and send out by Deloitte.

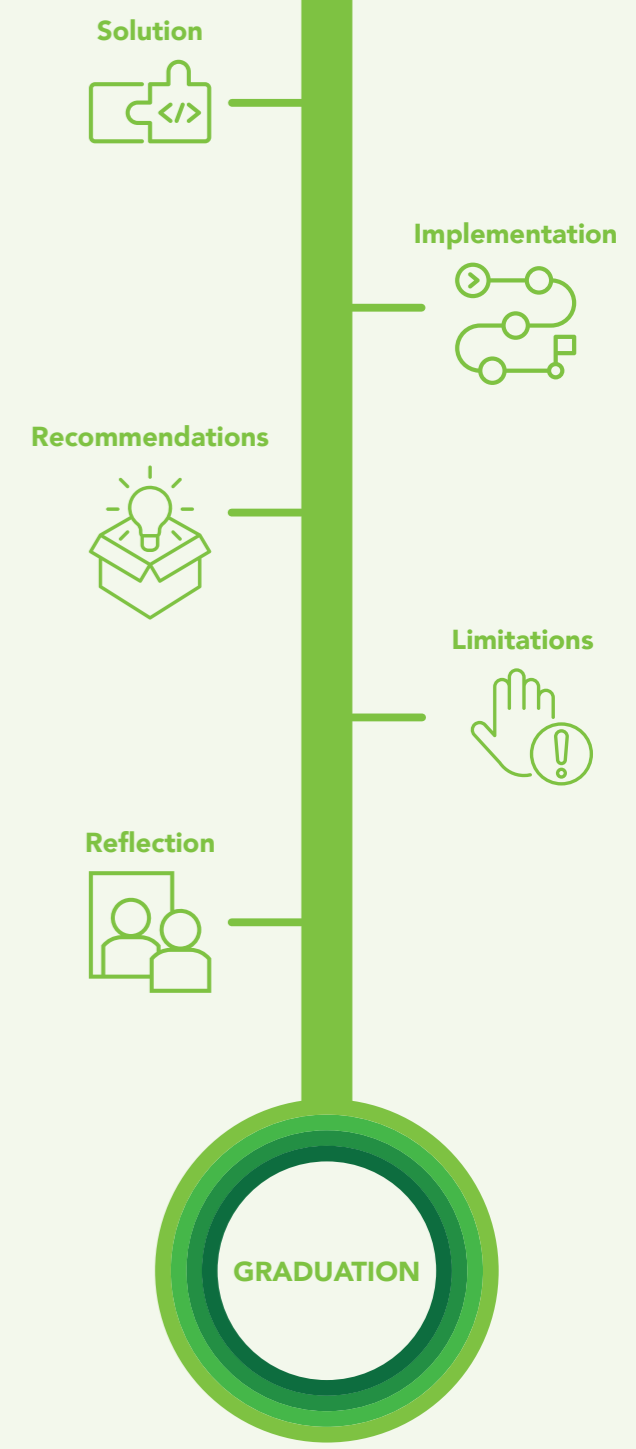
53 Sample

- The sample should include the users and stakeholders of the IT landscape for the evaluation.

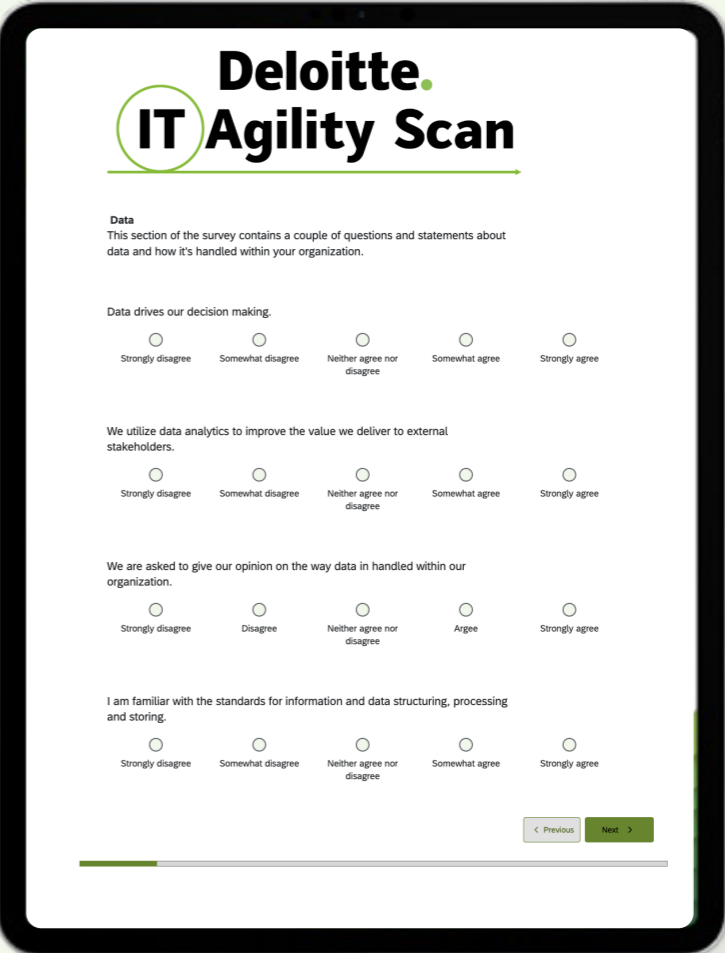


Deliver

The final phase of the double diamond is the deliver phase. In this phase the final interventions to the survey are implemented and presented to the client. This phase belongs to the design cycle of the DSR methodology since this phase also includes the creation of an advise for the implementation of the survey and future roadmap. During this phase the project was finalized by evaluating on the design principles, concluding on the results, describing the limitations of this project and describing the recommendations for the client and future research. The implications of the results for the client and the field of design are discussed and it is discussed whether the results are generalizable. The final step is a critical reflection on the process and a personal reflection.



26 Final solution



26.1 Approach

The final solution has gone through several rounds of evaluation. Feedback was gathered mainly on the method (survey) for evaluation and the topics/questions included. This chapter will discuss different aspects of the final design, with the application of the feedback from the final evaluation. To add value for the implementation of the assessment within Deloitte consulting, this chapter will also discuss several options for the analysis of datasets, presentation of results, advice for the implementation strategy and suggested future roadmap. There was no evaluation or validation of these final modifications, so these are merely an advice to Deloitte that should be validated internally.

26.2 Target groups

As became clear from the interview insights in chapter 14.2.3, the survey should involve all of the disciplines within an organization. According to the interviewees, these disciplines include IT employees and business employees within the client organization. Additionally, during the evaluation of the concept in chapter 25, it was concluded that the evaluation should involve the users who are not included in the employee target groups. These can be users, customers and other stakeholders. Therefore, the final design of the Quick Scan also includes a third target group, the stakeholders. The goal of the survey is to sample a diverse group of respondents that is representative for the composition of the organization and its stakeholders. This chapter will explain the sampling criteria for the final version of the survey.

IT employees

The IT employees were initially seen as the most important target group of the survey since this target group generally implements changes and is therefore mostly responsible for the ability of the IT landscape to respond to change that is sensed at high speed. Within this target group there are several different sub-groups that should be included if present within the client organization. These sub-groups can be e.g. data quality managers, data scientists, software developers, software architects, cloud engineers, UX designers, and IT project managers. These different functions within the IT department of an organization have a different view on the functioning and agility of the IT landscape and should therefore be represented in the sample and the results of the evaluation.

Other employees

Other employees generally include business personnel in departments like e.g. human resources, finance, and supply chain. Nowadays, in many organizations, these employees rely strongly on the functioning of the IT landscape to carry out their job. Changes in processes and value chains supported by these disciplines present internal changes that require changes in the IT landscape. Generally business employees are closer to the external environment and therefore also sense more change. Therefore, the perception of these employees should be considered during the evaluation process and the different disciplines should be included in the sample.

Stakeholders

As mentioned, the stakeholders of an organization can be e.g. customers or partners. This target group is for many organizations essential, since businesses rely on their customers and partners for their business performance. The needs of these stakeholders should govern the changes applied within organization, since they are part of the business environment. Changes in the needs of customers, partners or suppliers represent a share of the external changes the organization is pressured by. The third target group is therefore the stakeholders.

Organizational levels

Besides considering different disciplines within the organization, the evaluation should also consider the hierarchy of the organization. As said in this chapter, the respondents should be representative of the organization. Depending on the organizational structure, the sample can include e.g. C-level management, board of directors, middle management, lower-level management, team leads and team members. The sample should be representative for the number of employees in each of the different hierarchical levels.

Demographics

An organization might operate in different countries and consist of a diverse combination of employees. Demographics that can be considered are e.g. age, gender, education, religion, income and socio-economic status. However, during the first evaluation of the survey it became that not all employees may feel comfortable to share this information when it does not seem important for the results. From the interview results it became clear that the main factor impacting the agility of the IT landscape is the age of the employees and the duration of their employment. Furthermore, the perception of agility can differ between regions, whether it be different countries or different cities within a country. It was decided to include both age, employment duration and location in the sampling criteria.

26.3 Included topics

This section describes the different topics that will be included in the final design of the survey. Initially this research was primarily focused on technological dimensions of IT landscapes including the landscape dimensions as defined in chapter 5 and explained in chapter 6. The final design still includes these dimensions.

However, since the final design consists of multiple surveys for different target groups, the included topics have been reconsidered for the different target groups. Both of the surveys for the IT department and other departments, still include the technological dimensions from chapter 5 and 6 and questions about the IT landscape in general. Additionally, the IT version includes the topic architecture, as elaborated on in the chapter 6 and technological characteristics defined in chapter 7.

During the interviews, observations and focus groups, insights were gathered on several other dimension of the organization that influence the agility of IT landscapes. These topics are included in the surveys for both the IT department and the other departments. Additionally, the survey for other stakeholders touches upon the topics of the IT landscape in general, data, software and infrastructure if applicable for the client organization being evaluated. The topics that are similar for both the IT department and other departments have similar content, but questions are formulated differently. This allows consultants to compare the results of both of the surveys against each other. All of the topics included in the survey have been listed in Table 6 .

Every organization is different, which also applies for the IT landscape within the organization. Since topics are separated over different sections within the survey, it is easy for Deloitte employees to hide certain sections of the surveys for specific client projects or target groups. When a client organization for instance does not develop software in-house, it may not be useful to request respondents to answer questions about architecture.

IT department	Other departments	Stakeholders
IT landscape in general	IT landscape in general	IT landscape in general
Data	Data	Data
Software	Software	Software
Infrastructure	Infrastructure	Infrastructure
Architecture	Processes	
System characteristics	People and teams	
Processes	Leadership	
People and teams	Organization	
Leadership	Governance, risk and compliance	
Organization	Strategy and vision	
Governance, risk and compliance		
Strategy and vision		

Table 6 Dimensions included in each survey

26.4 Question content

For the final version of the survey the questions have been iterated based on the feedback of the respondents during the final round of the evaluation. The method for formulating the questions was similar to the method for previous iterations, based on three different sources:

1. Literature research
2. Expert input
3. Secondary files

Questions aim at understanding to what extent the IT landscape in its current state is able continuously to sense change both internal and external and respond to this change at high speed. The content therefore focuses on the capabilities within the organization and IT landscape, questioning respondents about processes applied and the characteristics within the technological and organizational dimensions.

To cover each of the topics completely, the combination of the questions has been evaluated during the final evaluation. What became clear is that the combination of the questions covers each of the topics but is perceived as too extensive and detailed. Limiting the number of questions for each of the topics was there for necessary, which is why in-depth questions are left out and can be used for investigation, if required. Examples of questions included in the final version of the survey can be found in the next section on the question format.

26.5 Question content employees

IT landscape in general

In this section of the survey questions aim to evaluate how satisfied employees are with the current state of the IT landscape. Questioning whether the IT landscape is tailored to the value streams within the organization and the needs of employees. This section aims to understand whether the IT landscape in general is able to sense the internal and external changes and how effectively and quickly the IT landscape responds to internal and external change. Additionally, to understand what level of agility is required in the IT landscape, this section questions the employees how volatile the internal and external business environment are.

Data

This section allows respondents to answer questions about the processes, characteristics, and agility with regards to data within the organization. It questions the respondents about the data standards, the effectiveness and efficiency of data collection, the relative number of requests for change to data models and data standards, and the ability to adapt these. Additionally, respondents are questioned how well data is analyzed to observe internal and external change and to what extent data drives decision making within the organization.

Software

The section about software and applications within the organization questions respondents about the support of software and applications for processes and value streams within the organization. Questions aim to understand to what extent the organization has defined certain standards for the development and features and to what extent business employees are allowed to implement changes autonomously. This section touches upon the use of software to understand and prioritize new features and functionalities. Respondents are asked what type of hosting model is applied and whether this supports the agility. Lastly, when it comes to the development of software, it aims at understanding how current software allows for continuous deployment, integration and automation.

Infrastructure

Questions about the infrastructure aim at evaluating to what extent the infrastructure supports the organization in responding to internal and external change at high speed. Respondents are asked how frequently change is required to the infrastructure to support changes in value streams, how well the infrastructure is monitored, documented and reviewed. This section touches upon the hosting model and delivery model utilized for the infrastructure and whether processes around the infrastructure are automated. Lastly, the respondents are questioned whether the infrastructure is sufficiently scalable and available.

Architecture

Several types of architectures are covered in this section of the survey, such as the information, data and solution architectures. Aiming to understand if architectural guidelines are clear and documented for all IT landscape dimensions and whether guidelines are based on business requirements to support value streams. Considering what types of architectures are used, how well the architectures are documented, who is in charge of architectural guidelines and how well the governance is executed.

IT landscape characteristics

An important aspect of evaluating the agility of the IT landscape is evaluating the system characteristics on a solution and enterprise level. This section of the survey is focused on the following characteristics: connectivity, dependencies, coupling, complexity, homogeneity, integration, modularity, redundancy, scalability and interoperability. Understanding whether these characteristics are present and to what degree gives an indication for the ease and speed at which change can be implemented. Respondents are also asked whether these are documented and included in architectural guidelines to understand how the organization copes with these characteristics.

Processes

Questions in the processes section of the survey focus on the ways of working and processes applied and the extent to which they support value creation. They aim at evaluating whether the client organization works in short cycles, collects and implements user feedback, creates feedback loops, focuses on planning or on actions, and whether processes are being automated. Additionally, questions focus on the current way of working, the ability to change processes and the relative number of handovers between sensing and responding to change.

People and teams

The people and teams section questions the respondents about the composition and team size, such as whether teams are kept small and multi-disciplinary. The section is focused on finding out if the teams have clear responsibilities, operate autonomously and collaborate sufficiently with other teams. On the topic of people, there are similar questions to find out if individuals have clear responsibilities, can work autonomously and collaborate sufficiently. Additionally, this section evaluates whether value streams rely strongly on experts, IT employees are up to date and trained on state of art technologies and new talent is actively being recruited.

Leadership

This section is focused on finding out if there is sufficient support and guidance from leadership with regards to agility in the IT landscape, IT modernization and IT investments. Questions focus on understanding to what degree management is risk averse and supports the organization in identifying risks and opportunities.

Organization

Questions about the organization are focused on the culture within the organization, organizational structures and alignment. Aiming to understand to what extent there is a culture of change, a clear separation of responsibilities and presence of silos. Questions evaluate whether different departments rely on the shared IT facilities and whether there is sufficient collaboration, communication and alignment present across organizational boundaries.

Governance, compliance and risk management

In this section the questions focus on finding out how risk averse the organization is and how risks are assessed and handled. Additionally, questions are about the compliance guidelines and policies, and how they are treated and documented. They evaluate how governance is applied to control risks and how this impacts the agility of the IT landscape.

Strategy and vision

The last topic, strategy and vision, questions the respondents about the long- and short-term strategy and vision of the organization. Questions help the consultant to understand to what extent the agility of the IT landscape is part of the company and IT strategy, how well the IT strategy and business strategy are aligned, what financial support is cleared for the IT strategy, and whether IT management is involved in the business strategy and vice versa. Additionally, this section questions about the existence of digital and cloud strategies.

26.6 Question content stakeholders

Stakeholders should be able to respond to a shortend version of the survey where the questions only touch upon three topics: IT landscape in general, data and software. The number of questions must be limited for stakeholders to lower the barrier of filling in the survey. It must be clearly communicated that the purpose of the survey is to improve the IT landscape to cater their needs and requirements.

IT landscape in general

In this section of the survey questions aim at understanding how satisfied stakeholders are with the IT facilities provided by the client, questioning if the IT landscape is tailored to their needs as users. This section aims to understand whether the IT landscape in general is able to sense external changes and effectively respond within a reasonable timeframe. Additionally, this section allows the consultant and client to determine what level of agility is required in the IT landscape, by questioning stakeholders how frequent their requirements change.

Data

This section of allows the stakeholders to answer questions about interactions and needs with regards to data. It questions the respondents about the data standards, the effectiveness and efficiency of data collection and sharing by the client. The aim is to understand the satisfaction and perception of agility from a stakeholder perspective.

Software

This section of allows the stakeholders to answer questions about interactions and needs with regards to software. Questions aim is to understand the satisfaction and perception of agility from a stakeholder perspective with regards to the software and applications provided by the client. Stakeholders are e.g. questioned to what extent the organization gathers feedback on the software provided.

Infrastructure

The infrastructure of the organization may be used by its stakeholders, such as the present networks and storage facilities. These are therefore considered in the IT Agility Scan. Questions will help the consultant and client to understand how satisfied stakeholders are with the infrastructure offered by the client organization.

26.7 Question format

The three different surveys for the different target groups contain different sections for each of the dimensions explained in chapter 26.4. For each of the different dimensions, there is a number of questions, which have a multiple-choice format. This format was chosen to comply with the design principle of limited time consumption for the respondents with regards to filling in the survey. For consultants this format supports the design principle with regards to the data analysis and presentation, since this can largely be automated once a standardized format has been defined. Additional to the multiple-choice question there are a few open questions included in the personal information section for the age, employment duration and location. Another exception was made for the question in the process section of the survey, where respondents are asked what way of working is applied within their team. For this question, a few of the possible ways of working are stated as a multiple-choice answer. When the applied way of working differs from the options, the respondent is able to state it in a text box.

The multiple-choice questions contain a question or statement followed by a five-point Likert Scale. It varies per question what answer options are given to the respondent. Examples of the questions included in the final survey are given in this chapter, including the multiple-choice answers accompanying the question. Because there are three separate surveys, there are six examples stated in this chapter, two for each survey.

IT employees

1. How satisfied are you with the functioning of the IT facilities within your organization? Think about the data, software and infrastructure you use.

- Very dissatisfied
- Dissatisfied
- Neither dissatisfied nor satisfied
- Satisfied
- Very satisfied

2. **Teams are able operate autonomously.**

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Other employees

1. Our IT department provides sufficient support on IT facilities within the IT landscape.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

2. Data drives our decision making.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Stakeholders

1. How satisfied are you with the online service provided to you?

- Very dissatisfied
- Dissatisfied
- Neither dissatisfied nor satisfied
- Satisfied
- Very satisfied

2. My needs regarding the digital products and services change frequently.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

26.8 Answer values

There are several options for the values linked to the multiple-choice answers. Since there are five possible answers on the Likert Scale, it was chosen to link the least favorable answer to the value zero and the most favorable answer to the value four.



There were two other options for the values linked to the multiple-choice answers. One of the other options was one up to five, which might be perceived more as a rating system. In the presentation of the results, each of the graphs would start at one, which is less logical when reading graphs. The other option is giving negative values, starting from minus two up to two. This could make the contrast in the results look bigger. However, labels for different departments and teams would have to be placed on different locations relative to the bars amongst different graphs. Consistency is crucial for Deloitte when presenting information to clients, which is why it is advised to use the values from zero up to four. This way there is consistency in the presentation of data and start values of the charts can be set to zero for clarity.

26.9 Survey logic

During the final evaluation of the survey, it became clear that the survey takes up too much time of respondents, because there are too many questions. Additionally, the questions are considered to be too detailed for many of the employees within the IT department and other departments. To mitigate these shortcomings, there is a survey logic in the final survey. Survey logic allows Deloitte to change the behavior of the survey and its content based on the answers given by the respondents. The logic consists of a set of rules that ensure some of the pages and questions can be skipped when a respondent does not have any knowledge of a certain topic or is satisfied about an aspect. An example of this rule is given in Figure 54.

▼ Skip to
End of Block if Strongly disagree Is Selected

I am familiar with the standards for information and data structuring, processing and storing.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Figure 54 Example of question with a rule for survey logic

In the provided example from the survey for employees other than IT, the respondent only has to answer four questions about the use of data within the organization. In the fourth question the respondent has to state whether they are familiar with the data structures applied. If they strongly disagree, they will be redirected to the software section of the survey. This logic can be applied to all of the sections. Results are more valuable and trustworthy when respondents do not answer they do not have any knowledge about.

26.10 Survey flow

Since not everyone is familiar with the topic of IT landscape agility, has an additional introduction page. This page explains to the participant what the aim of the survey is. After explaining what the aim of the survey is, the introduction notes that data is gathered anonymously and that the participant consents with the fact that data is used by Deloitte for analysis. After the consent is given the introduction page will explain what the IT landscape consists of and what the definition of IT Landscape agility is.

Then the IT survey will go through different pages, with each page containing a set of questions for the different dimensions mentioned in Table 6. At the start of each section, the dimension will be explained to clarify to the participant what the questions are about. The participant can then respond to the questions. If a question is not filled in, the respondent will be prompted with a screen that notifies them of the questions that have not been answered yet. When this is purposefully done by the participant, they are able to click on a button that will take them to the next page of the survey. By doing so, the dataset will not be polluted with data from respondents who do not know anything about certain aspects.

26.8 Timing

Apart from comparing results between departments and teams, a comparison can also be made between different points in time. During the interviews it became clear that consultants find it important to evaluate at the start of a project, but also halfway through and at the end of a project. This will identify whether the implemented changes impact the agility of the IT landscape. Preferably, follow-up surveys are sent to the same sample, to improve the comparability of results. It is suggested that surveys are timed based on the project timeline, align with milestones defined in the roadmap of the transformation.

Risks and opportunities

There are some risks and opportunities involved in this process. A risk e.g. could be that the outcome of the survey could show that suggested changes have not made the expected impact, suggesting that the work of the consultants led to unsatisfactory results. However, a business opportunity can arise from the results if they prove the success and indicate a new opportunity or gap. Seeing that the IT landscape agility is impacted but not optimized, can result in continuation of engagements.

26.9 Data analysis

This chapter will discuss possible methods for analyzing data gathered through the survey and optional methods for presenting the results in different types of charts. Charts do not represent real data, while data used for these examples stems from automated test responses, generated through a function in Qualtrics.

26.9.1 Question analysis

The goal of the survey is to understand what the agility is of the IT landscape, based on the input of the respondents in the survey. Descriptive analysis focuses on summarizing and presenting key features of a dataset to identify patterns, trends, and significant insights. This includes calculating the following measures of central tendency which are representative data points for the data gathered:

- **Mean:** The average value obtained by summing all data points and dividing by the number of observations.
- **Mode:** The most frequent occurring value in a dataset.
- **Median:** The middle value of a dataset sorted in ascending or descending order.

It is advised to initially do a descriptive analysis to determine the mean 'score' for each of the questions within the different dimensions. Calculating and presenting these representative data points will indicate whether employees and other stakeholders in general agree or disagree with certain statements about the agility of the IT landscape. It is suggested to use bar charts to communicate the mean values, or the number of answers given for each score, as these are the most suitable type of chart for displaying the magnitude of specific variables (Divecha et al., 2023). These bar charts would in this scenario indicate that the employees from the IT department are less satisfied with the speed of adaption than employees from other departments, but the users are the least satisfied with the speed of adaption. Which could be an indication of low agility for the IT landscape. Figure 55 shows an example of the bar charts representing data from a descriptive analysis.



Figure 55 Example of the bar charts representing data from a descriptive analysis

26.9.2 Dimension analysis

Additional to doing a descriptive analysis for each of the questions, it is suggested to execute a descriptive analysis for each of the dimensions of IT landscape agility. This will result in mean values for the following dimensions:

- IT landscape in general
- Data
- Software
- Hardware
- Architecture
- System characteristics
- People and teams
- Leadership
- Organization
- Governance, risk and compliance
- Vision and strategy

Having a mean value for the different aspects of the IT landscape will determine which of the dimensions are creating the largest gap and indicate where the biggest opportunities for improving the agility of the IT landscape are. There is ample knowledge within Deloitte on strategies for increasing the agility of the IT landscape over these different dimensions. If an organization scores low on a specific dimension, consultants can propose a certain strategy or initiate additional investigation for this dimension.

Visualization of overall mean values of the different dimensions can be done using a web chart. This shows the different values side by side and emphasizes where the lowest scores are, allowing for quick interpretation of the results. As low time consumption was one of the design principles, quick interpretation of results is also essential. Additionally, when doing multiple measurements, reference lines can be used in the web chart to annotate what the previous mean score was. This type of web chart can be found in Figure 56.



Figure 56 Example of a webchart for different dimensions

26.9.3 Demographics

Age

Personal information from participants is gathered as a final step of the survey. With this information data can be checked on correlations between age, location, department, function and other variables from questions or dimensions. Analyzing the age of the employees can give an indication of the agility of the IT landscape or perception thereof. Older employees may be less flexible and innovative, so if there would be a left skew in the age distribution this could potentially affect the agility of the IT landscape negatively. By evaluating the correlations between the mean scores and demographic variables, it can become clear whether this is the case within the client organization. Figure 57 shows two exemplary charts for the age distribution of test respondents presented in a point chart and line chart.

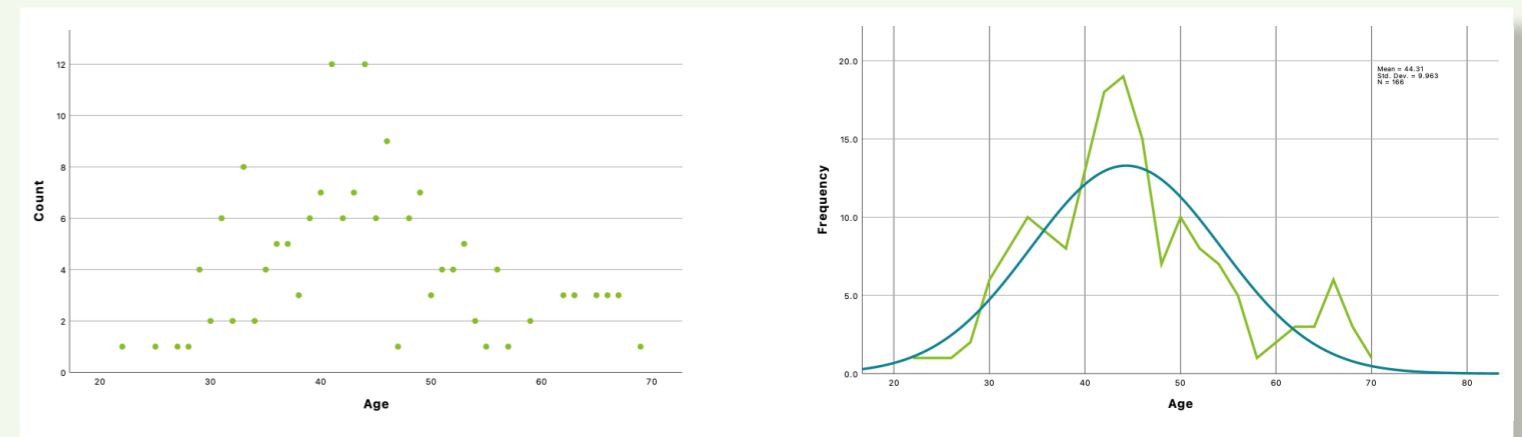


Figure 57 Example of age distribution charts

Locations, departments, teams and functions

It became clear during the explore phase that different departments should be included in the evaluation. Therefore, the participants are asked to fill in the department, team and function they are currently working in. By displaying the different departments in a pie chart like in Figure 58. the consultants and clients can quickly evaluate what the distribution of different departments, teams and functions is among the respondents. It is suggested that a pie chart is used to illustrate the ratio between respondents, as a pie chart is most suitable for displaying proportions (Divecha et al., 2023). This type of pie chart would also be most suitable for the presentation of the data on the locations of respondents.

When visualizing the results, a distinction can be made between data from IT employees, other respondents and other stakeholders. When creating bar charts for the results of each question, bars can then be assigned to different teams or functions, such as represented in Figure 59. This will help consultants to determine whether different teams, or employees in different functions, have a different opinion or experience with certain aspects of the IT landscape.

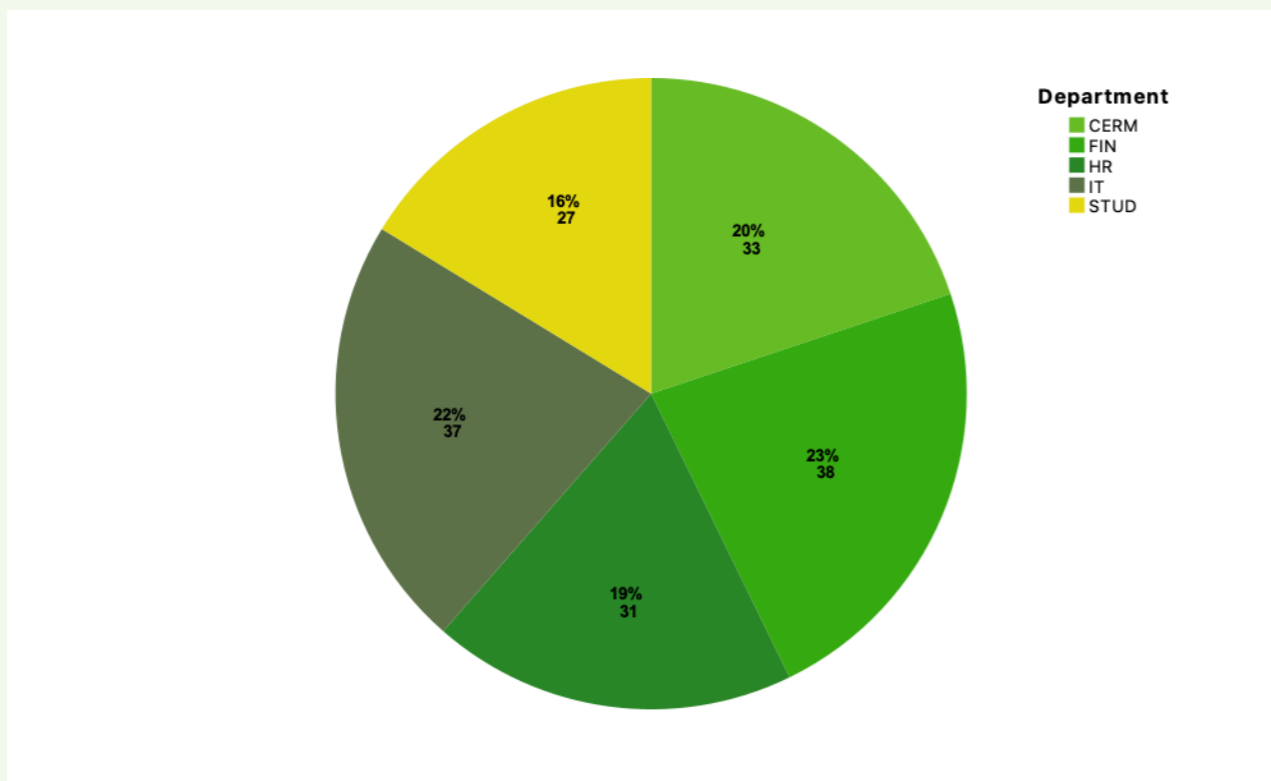


Figure 57 Example of age distribution charts

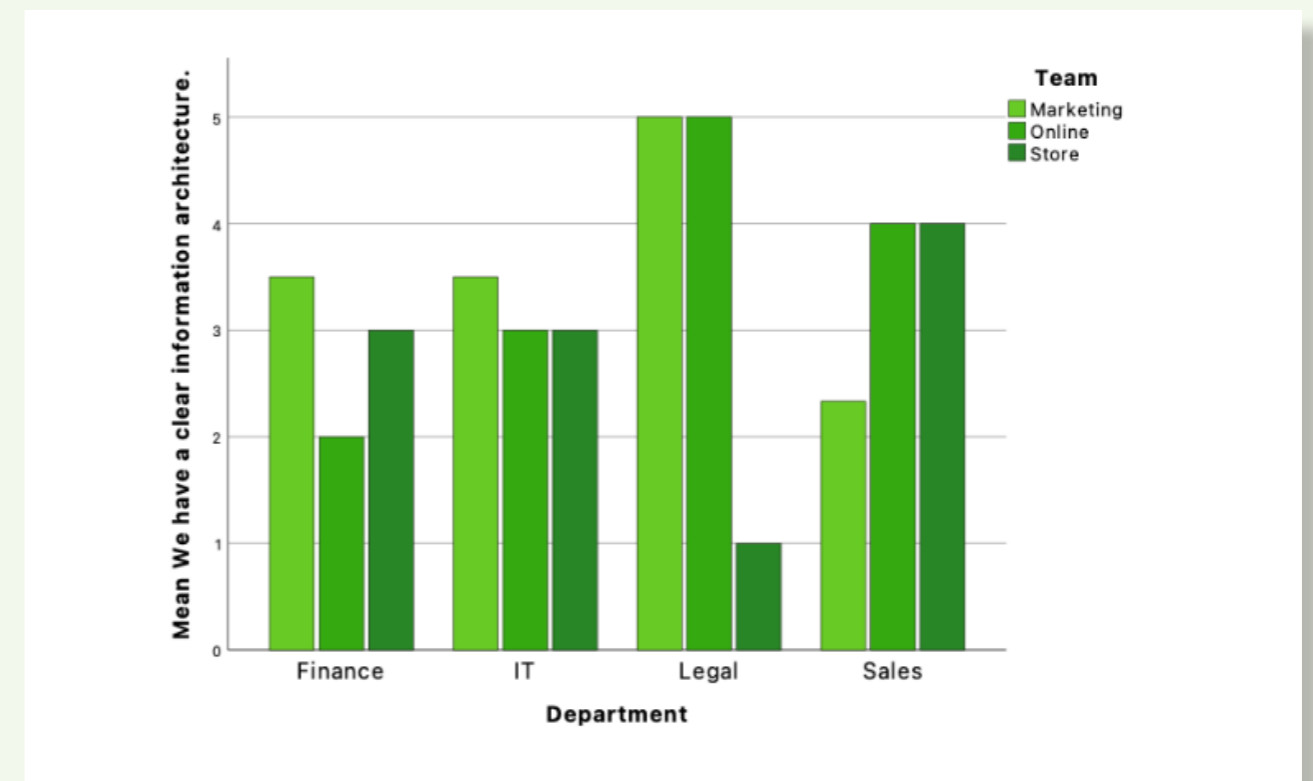


Figure 58 Example of different departments and teams in bar chart

26.9.4 Additional chart information

Reference line and mean value

When looking at a bar chart, such as presented in Figure 59, we see different mean values for different departments represented by different bars. To see what the overall mean score for a specific question is based on data from the complete department, a reference line and mean value can be added to the chart. This can give the consultant a good indication which teams differ most from the average results, presenting a gap and opportunity for further investigation and optimization.

Titles and legend

Data will be presented to clients by consultants, so it is essential everyone is able to interpret the results of the survey. Therefore, each chart should include a title mentioning the question and the type of analysis. The Axis titles describe the value presented on each of axis. Additionally, viewers need to understand what answers different values are based on. This can be done by a legend on the side of each of the graphs. Figure 59 shows an example of how the legend could be utilized in the presentation of survey data.

Respondent count

Each of the bars in the bar charts represents a different team or function. To understand on what number of respondents the results are based, without having to go back to the pie chart containing this information, the number of respondents is annotated on the different bars within the chart.

Colors

Colors can be used for different purposes in the presentation of the data from the survey. There can be distinctions made between different departments, teams and functions by different colored bars, such as done in Figure 58. Colors can also be used to highlight the bars that differ most from the mean score. Colors can also be used to highlight the difference in scores between consecutive evaluations. Additionally, different colors can be used for the charts that are most important, these can be the charts that have the lowest overall mean, for example. It should be validated with users what type of distinction through colors is most effective in communicating the results.

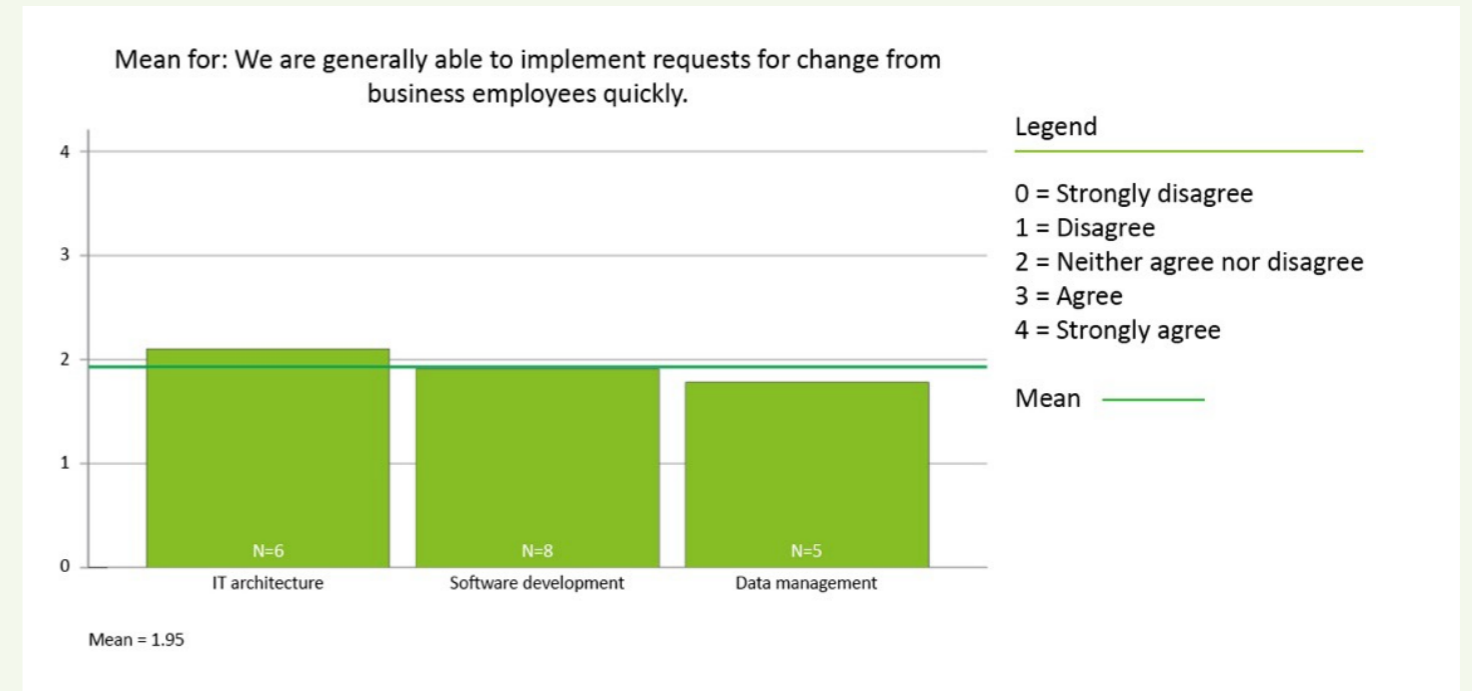


Figure 59 Bar chart including reference line, respondent count and legend

26.10 Ownership

There should be a limited number of consultants in charge of the development and distribution of the survey. This is done to create a sense of ownership among a selected group of people. The ownership should be placed with consultants who are part of TT&A and the Tech Agility Guild, because TT&A should become involved in every IT transformation within Deloitte and the Tech Agility Guild specializes in IT agility.

The survey needs to be optimized before it can be applied during client projects and the IT sector is constantly changing, so the survey will have to be adapted continuously from the moment that it is onboarded within Deloitte (see chapter 26.11). Having dedicated owners of the solution will ensure that experts are appointed and involved in the process of optimization. Additionally, this will help in controlling the versions of the survey to prevent proliferation of versions on multiple locations.

26.11 Expert input

For each of the different dimensions included in the survey there are different subject matter experts within Deloitte, TT&A and the Tech Agility Guild. For the questions, analysis and interpretation of the results it is essential that different subject matter experts will be involved during the onboarding process for the survey. Their involvement will support the optimization process, creation of a standardized method for analyzing the survey data and development of a knowledge base around the survey for the interpretation of data. The first step that is advised is to organize co-creations session for each of the dimensions, in which multiple subject matter experts are invited to collaborate on the content creation. Additionally, there should be one or more co-creation sessions for the analysis and interpretation of the results to create and iterate on a standardized way of working. These co-creations should be repeated until the product owners are satisfied with the content and guidelines. Because of the continuous evolving IT realm, the involvement of subject matter experts should be repeated over time. The product owners should be able to judge when it is time for another iteration.

26.12 Knowledge base

The knowledge base should be located within the intranet of Deloitte, specifically in the repository of TT&A. This will help to guide other teams to TT&A when they are searching for an IT related evaluation tool, and this is the most convenient location for members of TT&A.

The repository should contain the surveys for the different target groups. In this repository there should be a handout explaining this research and the evaluation tool, a first version of this handout is created and explained in chapter 26.12. The handout will have to be extended, with more information on the different dimensions, analysis and interpretation of results. Since there are specific subject matter experts, these should be referenced within this handout. This will help consultants to get in touch with and connect clients to the experts. Lastly, the repository should contain articles and documentation useful for the creation of strategies based on the outcomes of the evaluation.

26.13 Brand identity

To make the survey and handout more attractive and coherent with the brand identity of Deloitte, there was a brand identity created for the survey and handout. The idea behind this brand identity is to make the evaluation tool more recognizable for consultants and clients as a Deloitte product. This brand identity should therefore be used in all assets of the evaluation tool and its results.

Naming

It is not always clear for people what the term IT landscape for, therefore it was decided to rebrand the IT landscape agility evaluation to: Deloitte IT Agility Scan. When consultants will search for the term IT Agility they should be redirected to the IT Agility Scan. It makes sense to brand it as an IT scan as the evaluation framework considers other dimensions than the IT landscape as well. The word Scan is distilled from the Quick Scan. Since consultants are familiar with the purpose and format of quick scans, they will be understand what the format of the IT Agility Scan is.

Color palette

There are five colors used for the IT Agility Scan and presentation of results. These are based on the color palette used by Deloitte in all of their presentation materials. This creates coherence with other products, reports and presentations from Deloitte and makes it easily recognizable as a Deloitte tool. Among these five colors there are four green colors and one blue color for contrast purposes. The colors are presented in Figure 60.

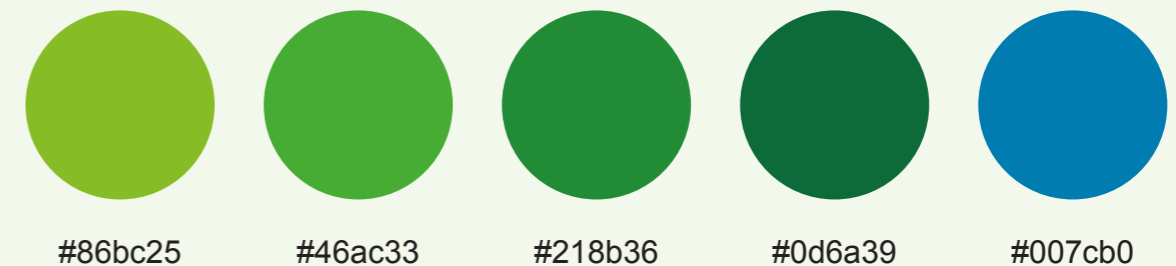


Figure 60 color codes for the IT Agility Scan, handout and data presentation

Logo

For the logo of the IT Agility Scan, the name is combined with a looped arrow that is often used to indicate agility since it represents an iteration or feedback loop. The circle of the looped arrow circles the IT section of the name to emphasize the fact that the solution is focused on the evaluation of IT facilities. The color of the looped arrow is the primary color of Deloitte, as can be seen in the dot in the Deloitte logo. The font of the logo is the same font as the one used for the Deloitte logo: Mediator Narrow Extra Bold. The logo is presented in Figure 61. The IT Agility Scan itself, the handout and the presentation of the results will include a color wave based on the four shades of green. Shadows have been added to the waves to add some depth to the layout. The goal of this graphic design is to create one coherent identity for all of the materials regarding the IT Agility Scan. The color waves can be found in the top left corner and bottom right corner in Figure 61.

Deloitte. IT Agility Scan

Data

This section of the survey contains a couple of questions and statements about data and how it's handled within your organization.

Data drives our decision making.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree

We utilize data analytics to improve the value we deliver to external stakeholders.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree

We are asked to give our opinion on the way data is handled within our organization.

Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

I am familiar with the standards for information and data structuring, processing and storing.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree

< Previous Next >

Figure 61 IT Agility Scan logo and color waves

26.14 Handout

Communicating the outcomes of this graduation project to TT&A will be done using a handout. After it is reviewed by TT&A, this handout can be shared with other teams and offerings within Deloitte. There will be two formats of this handout, digital and physical. The digital version of the handout will accompany the Deloitte IT Agility Scan to make it self-explanatory and can be stored in the intranet in the same folder as the survey itself. The physical version of the handout is created to be placed within the office. There are several coffee corners in The Edge in Amsterdam. Since there is a culture of drinking coffees with colleagues to catch up and talk about client engagements, spreading the IT Agility Scan throughout the office will allow it to become a conversation starter on the topic of IT Landscape agility and the evaluation itself.

The handout can support the design principles of creating a shared definition of IT landscape agility within Deloitte, making TT&A the connecting party in every IT transformation and connecting experts to teams and clients. The last two design principles can be stimulated by adding references in the handout, referring to TT&A and the experts will provide input on the content of the IT Agility Scan, an example of this page is illustrated in Figure 62. The handout contains the following contents:

- Executive summary
- Definition of IT landscape
- Dimensions
- Question format
- Evaluation process
 - Target groups
 - Sample size
 - Timing
 - Analysis
- Implementation advice
- Future roadmap
- Recommendations
 - Ownership
 - Expert input
 - Knowledge base
 - Implementation
- Contact details

The first version of the handout will be the starting point of the implementation strategy. The first version of the handout it therefore added to this report in Appendix O.



Contact details

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Figure 62 Place holder for subject matter experts in the handout

26.15 Implementation strategy

An implementation strategy was created for introducing the IT Agility Scan at Deloitte. The AIDA framework has been used to create the implementation strategy and onboarding process for employees within TT&A and the Tech Agility Guild. The AIDA framework is applied, because it is framework proven to be effective in marketing, guiding individuals through the steps that lead to a certain action. AIDA stands for Attention, Interest, Desire and Action. There are three effects that form the behavioral sequence of the framework, first the cognitive effect, then the affective and lastly the conative effect.

During the attention phase, the proposed user should become aware of the IT Agility Scan. By spreading this handout at different coffee corners and sharing the digital version by e-mail. The second phase will spark the interest of employees, the IT Agility scan will be presented during monthly meetings and capability meetings. It will become clear why clients need the IT Agility Scan. During the desire phase, it will become clear how this method will make your job easier. By allowing you to quickly evaluate your client. During this phase consultants will collaborate on improving the content of the IT Agility Scan and define a standardized method for analysis. In the last phase it is time for action. By slowly starting to apply the IT Agility Scan during client engagements. Starting with a pilot run to make sure all the kinks have been removed.

The implementation strategy has been modified multiple times to align with the findings from the observations and conversations with the client. At a glance it might seem like a linear strategy that follows chronological steps, however, in reality it might be necessary to repeat steps and iterate the activities in each step. Figure 63 presents the proposed implementation strategy for the IT Agility Scan. It must be acknowledged that this implementation strategy was not validated with the client of this project, therefore this framework is merely an advice and should be iterated before use.


	 Attention	 Interest	 Desire	 Action
Timeframe	2 weeks	1 month	3 months	1 year
Target group	TT&A Tech agility guild	TT&A Tech agility guild	TT&A Tech agility guild	TT&A Tech agility guild Clients
Goals	<ul style="list-style-type: none"> Show Deloitte how agility in an IT landscape will improve every transformation 	<ul style="list-style-type: none"> Show Deloitte employees why they clients need to evaluate the IT landscape agility of their client Create a shared understanding of the concept and definition of IT landscape agility 	<ul style="list-style-type: none"> Show Deloitte employees why the IT Agility Scan will improve the quality of their work Show how the impact of the IT Agility Scan for clients 	<ul style="list-style-type: none"> First introduction of the IT Agility Scan during a client project. First analysis and presentation of results based on company data
Activities	<ul style="list-style-type: none"> Spread the hand-out throughout the office at the coffee corners Share the digital version of the handout in an email to TS&T 	<ul style="list-style-type: none"> Introduce the concept of the IT Agility Scan within the Tech Agility Guild Introduce the concept during monthly TT&A meeting 	<ul style="list-style-type: none"> Iterate on the content of the IT agility Scan together with subject matter experts. Define the data analysis steps in a co-creation session. Testing the IT agility scan within Deloitte 	<ul style="list-style-type: none"> Start using the IT agility scan on the first clients Iterate on the methods for evaluation and analysis based on client feedback.
Description	During this phase the employees of TT&A and the Tech Agility guild should become aware of the existence of the IT Agility Scan.	During this phase the employees of TT&A and the Tech Agility Guild are actively involved in a presentation of the IT Agility Scan to spark their interest in the topic and solution.	During this phase the employees are actively involved in the ideation process for further development to create a desire to work with the IT Agility Scan.	During this phase the participants get a call for action to start actively implementing the IT Agility Scan in their processes.

Figure 63 Implementation strategy for the IT Agility Scan

26.16 Future roadmap

By thinking ahead, it can be ensured that the quality and content of the IT Agility Scan will continuously be improved. Besides the content being improved, it is important to push the development of and use of technology to adapt the format of the evaluation. A future roadmap was created taking into account current trends in technology and showing the development of the IT Landscape agility based on these trends. It considers the users during each of the phases, the platforms required and the risks that should be considered.

Based on the trends from annual trend reports from Deloitte, there are a few trends that are going to influence the job of a consultant, but also the tools used. The coming years, there will be a surge of artificial intelligence, hyper automation, IT agility and the metaverse. Based on these trends, it is determined the IT Agility Scan can evolve from a survey to a holistic analysis in 2027 and finally become an automated analysis tool in 2029. The first steps will be integrating company data in the analysis and determine objective performance indicators and KPIs that can be connected to the different dimensions. This will make the evaluation holistic. The last phase in the roadmap entails configuring ML and AI to support the consultant in gathering, processing and presenting data.

The IT Agility Scan will initially be used within Deloitte consulting in the Netherlands, starting within TS&T. When the tool has been improved, within a couple of years it will be used throughout the complete ET&P offering portfolio. This is the point where Deloitte has to bundle forces with global partners to start the automation process and spread use of the tool to Deloitte Global by 2029.

Important partners in this process will be the current partner SAP, since they have a large body of knowledge and technology for both artificial intelligence and automation. Reporting and internal communication can then still be done through Office 365.

During this transformation, it is important to consider the risks of the first evaluations failing. When the IT Agility Scan spreads within the ET&P offering portfolio there needs to be control of the versions, to make sure there is not an abundance of versions spreading throughout Deloitte. During the last phase, the biggest risk will be the lack of control because of automation and the implementation of artificial intelligence.

The final version of the roadmap can be found in Figure 64.

26.17 Resource allocation

Realizing the use of the IT Agility Scan cannot be completed with solely the framework, survey, implementation strategy and handout provided in this report. Deloitte needs the motivation, skills, vision, strategy and resources to fulfill the implementation. It became apparent during the observations, focus groups and interviews that the motivation and skills are present within TT&A, TS&T and Deloitte. There is ample knowledge and experience to further develop the IT Agility Scan towards a viable product. The vision of Deloitte itself is to make an impact that matters, during this project a vision was created for the IT Agility Scan to support this general vision. A strategy for the survey is provided for the implementation based on the AIDA model in chapter 26.15 and a high-over future roadmap in 26.16. The only thing left to describe is the resources needed to support this vision and strategy. The following resources have been determined based on the strategy and vision:

- Time of Deloitte employees
- Money
- Information and data from experts on agility dimensions
- Software (survey platform, data analysis platform and Microsoft Office 365)
- Deloitte intranet
- Time from clients

Time of employees is required for collaboration on the content of the IT Agility Scan, defining the analysis process and presentation format and presenting the IT Agility Scan to employees. Since every hour of a consultant needs to be accounted for and not many hours are dedicated to internal work, this may be the most difficult resource to obtain. Monetary resources are required to fund the hours of consultants working on the development of the IT Agility Scan and the software. Although the software is already present within Deloitte. For the development of the content, analysis, interpretation and presentation format it is important that there is additional knowledge input from the consultants and literature sphere. Software is needed to create the survey, for the analysis and presentation of results. The current version is created in Qualtrics, which is available within Deloitte. Data analysis can be done in Microsoft Excel, SPSS or another quantitative analysis application. PowerPoint will be used for the communication of the results since this is customary within Deloitte. Since the IT Agility Scan should be available to everyone within Deloitte, it should be located in the intranet and in Teams. Lastly, one of the more important resources is time from clients. Once the content has gone through a final iteration and a standardized data analysis and interpretation have been defined, it should be tested with clients. Since Deloitte has a strong vision of making an impact that matters, the initial use cases should be with a non-profit organization. By providing the service to a non-profit organization for free there will be a win-win collaboration.

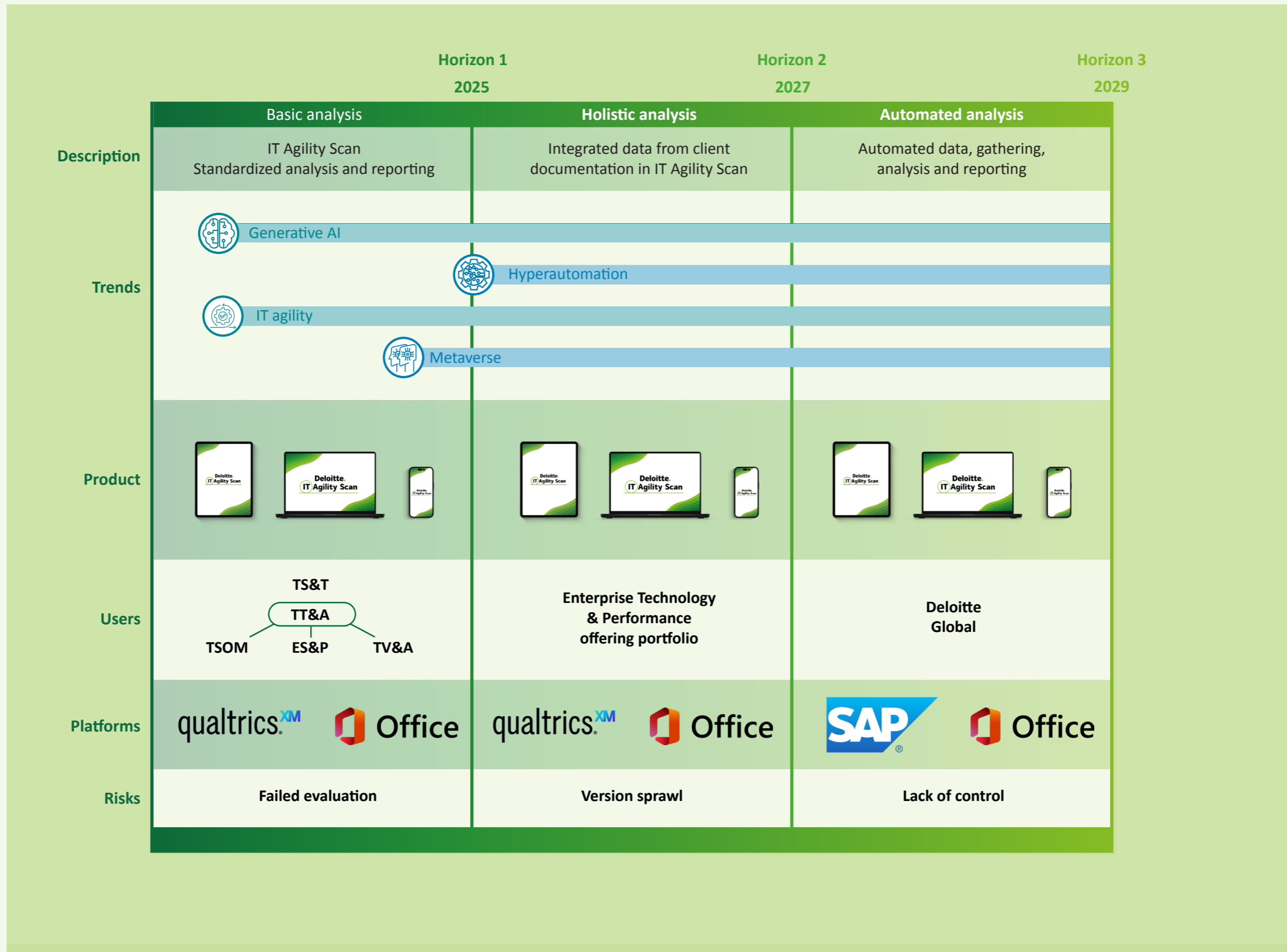


Figure 64 Future roadmap for the IT Agility Scan

27 Reflecting on the design principles

In this chapter we reflect on the first, second and third priority design principles. A distinction is made between principles that have been achieved, partially achieved or not achieved. All of the first and some of the second priority design principles have been achieved. The other second order priority have partially been achieved. None of the third order priority principles have been achieved since these need additional effort from the client.

Achieved

Identify gaps and opportunities

By questioning employees and stakeholders about several different dimensions in the IT landscape using a Likert Scale, the outcome of the IT Agility Scan will highlight what elements dimensions of the IT landscape are underperforming with regards to the agility. The evaluation identifies gaps and opportunities in the landscape, organization and between departments and teams.

IT landscape dimensions

The IT Agility Scan evaluates all of the technological dimensions determined during the literature research in chapter 7. Touching upon the data, software, infrastructure, architectures and additionally touches upon the technological system characteristics.

Complete breadth of organization

The complete breadth of the organization refers to the inclusion of people outside of the IT departments in the evaluation process. This is done by including a group of employees on the sample that is representative for the organization. Additionally, the final version involves stakeholders other than employees.

Clear ownership

It has been described in the solution, handout and implementation strategy that TT&A will become the owner. The implementation strategy describes how there will be dedicated employees within TT&A who will be in charge of version control and the process of development. Clear ownership is therefore achieved by the results of this project.

Self-explanatory

By creating a handout for the IT Agility scan which will accompany the IT Agility Scan in the intranet, the solution is self-explanatory. There will be no need for the product owners to explain the content or use of the tool to other consultants. If the implementation strategy is followed and a standardized format for analysis is created in combination with a knowledge base for the interpretation, the complete process of evaluation will be self-explanatory.

Collaborative content creation

During the project where multiple subject matter experts were involved in giving input for the evaluation framework and content of the IT Agility Scan. The handout and implementation strategy point out how the experts should continuously be involved in creating new content for the evaluation.

Connecting clients with experts

By creating a placeholder in the handout for each of the dimensions of IT landscape agility, it becomes easy for teams to find the right expert on each of the topics. This will allow consultants to involve the right subject matter expert when their input on a project engagement is required.

Increase knowledge sharing

During the project, many meetings were held on the topic of IT landscape agility and its evaluation. The process of knowledge sharing was already triggered during this period of time. The implementation strategy and handout form an incentive for additional knowledge sharing on these topics.

Partially achieved

Low time consumption

The solution provides an efficient method for consultants to gather data from clients. Whether the interpretation of results will be efficient remains questionable. Although, through the creation of a standardized method as suggested in the handout this will be more efficient than current qualitative methods.

Conversation starter

During the evaluation it became clear that some employees are curious about the outcomes. This curiosity suggests that the IT Agility Scan will be a conversation starter for some respondents. Whether the handout and survey will be a conversation starter in the future has yet to be determined.

Continuous improvement

The roadmap for implementation and future roadmap does describe the actions that need to be taken for continuous improvement now and in the near future. Whether this will be executed depends strongly on the actions of TT&A, the Tech Agility Guild and Deloitte.

Not achieved

Early involvement of TT&A

It became clear that there is a need for an evaluation tool and if it will be used, it could result in early inclusion of Deloitte in project timelines. Because the IT Agility Scan will be located in the TT&A section of the intranet, this will make them the first point of contact if there are questions about the evaluation. The solution does support the design principle, but it has not been achieved yet.

Current vs. desired state

This design principle was not achieved because it focuses mainly on the current state of the IT landscape to find out what should be improved, instead evaluating what would be the desired state of the IT landscape.

Identify impact

No weights have yet been identified for each of the dimensions or questions. There is a possibility to do so, but this is currently not integrated in the IT Agility Scan. This design principle is important for the analysis and transformation strategy, so this should be further investigated.

Categorization of technologies

It became clear that categorizing technologies is possible, but also that the type or category does not indicate the agility it provides. The agility provided by specific technologies are context dependent and therefore not considered in the IT Agility Scan.

Relations

During the explore phase it became apparent that there are certain relations between different dimensions and their influence on agility, these are currently not valued in the evaluation, but can be in the future.

28 Limitations

It is essential to understand what the limitations are of this project, since these are of influence on the outcome survey. Especially for a large consulting firm like Deloitte, where reputation is key, and risks need to be mitigated, limitations need to be considered before new assets are implemented. Therefore this section will explain what the limitations are of the literature research, expert input, design principles, final solution, and validation.

28.1 Literature research

During the literature research it became clear that IT landscape agility is an ambiguous concept. In the existing literature the concept is covered in articles on information system agility, IT adaptability, infrastructure flexibility, technology agility and information technology system agility or IT agility. Different interpretations and perspectives on the IT landscape or IT system are used within the existing literature. This is why some of the theories used might not completely apply to the scoping of the IT landscape used during this research, since system boundaries between the sources differed.

The focus of the literature research was on the technological aspects of the IT landscape within organizations, since the scope was initially set to solely include technology dimensions. In hindsight, the literature research could have been reviewed more extensively through a people, process and organizational lens. This would have added value to the rigor of this research. It would have been valuable if a more thorough literature review was done after the expert interviews.

Since the state of art information technology and literature sphere on information technology changes at an accelerated speed, some of the literature used in this research might be considered as outdated. However, it varies strongly per topic and dimension whether the knowledge is outdated, and information is still valid. With limited experience in the realm of information technology, this was difficult to determine this during the literature research.

28.2 Expert input

When it comes to the interviews, observations and focus groups it can be concluded that there are some limitations with regards to the inclusion of a diverse group of experts. To cover more of the organizational dimensions of IT landscape agility it would have been valuable to involve participants outside of the Enterprise Technology and Performance offering portfolio.

It would have increased rigor and decreased biases if a larger sample size would have been applied during the expert interviews. Generating more insights would have led to more demarcated clusters and themes, and a more detailed view on IT landscape agility.

During the explore phase of this project the samples consisted of business analysts, junior consultants, senior consultants and managers. It would have been valuable for the results to include more partners, directors

and industry leads in the process of data gathering. These employees have the highest level of experience, their input might have resulted in more in-depth insights on specific topics. Due to limited availability, it was difficult to plan a suitable time slot and appointments were frequently canceled.

During the evaluation of the survey, there was a slight unbalanced distribution of respondents from IT departments and other departments. Additionally, there was a limited number of respondents in the first two evaluation rounds. By increasing the number and balancing the sample, the evaluation may have probed better insights.

28.3 Design principles

The design principles were formulated by the designer based on the outcome of the focus groups and expert interviews. After the creation they have been reviewed by two consultants from TT&A, which generated a limited amount of input on the validity of the design principles. Due to time constraints, it was decided not to organize a co-creation session in which the design principles could be iterated. In hindsight it would have been more relevant for the application domain and environment if this co-creation session would have been applied for reviewing and adapting the design principles. Additionally the design principles could have been formulated and linked to certain parameters based on which the design could then be evaluated. Making it more measurable.

28.4 Final solution

During the use of the IT Agility Scan, employees and stakeholders are requested to give an opinion on the current state. It might be the case that people with a negative view on the current IT landscape will participate in the survey, rather than people with a positive view. Due to dissatisfaction, people will be more motivated to give their opinion. This may be valuable for pointing out where the biggest gaps and opportunities within the IT landscape are, but it might not result in a representative view on the current state of the agility of the IT landscape.

The complexity of the evaluation of IT landscape agility have been covered largely within the dimensions and questions, but not completely. There are some topics that have been investigated more than others, which may have resulted in an uneven distribution of questions for each of the dimensions. Additionally, the survey does not thoroughly evaluate the different technologies that can be applied within an IT landscape. The agility of different technologies is context dependent and therefore difficult to categorize and value.

Based on the design principles it can be concluded that the outcome of this project has not yet stimulated the early involvement of TT&A in IT transformations. Since the solution has not been implemented yet, it was not possible to evaluate whether the IT Agility Scan will be able to stimulate this. The outcome does not compare the current state and desired state, based on the satisfaction of employees. Insights are gathered on what is desired by employees and stakeholders, but it does not identify the desired state of the IT

landscape. Furthermore, the outcomes do not comply with the design principles of identifying impact and relations. Evaluating the impact and relations did not within the timeframe of this project and appeared to be too complex.

The research and report could have elaborated more on the analysis of data and interpretation of results of the IT Agility Scan. During this research it became clear that within the timeframe it was only manageable to superficially touch upon these topics. More expert input would have been required to draw conclusions on the most suitable methods for analysis, interpretation and reporting. Furthermore, it should have elaborated more on the implications of findings from the survey on the agility of the IT landscape and how these would improve the creation of strategies for clients.

The survey logic and survey for stakeholders were not completed due to time constraints, it would have been valuable for the client if this iteration would have been finished and shared. It would require additional input from experts, to determine what would be the most suitable questions to apply the survey logic to, in order for it to improve the survey flow and time consumption.

Since the implementation strategy, tactical roadmap and handout are merely a suggestion to Deloitte for the onboarding of the IT Agility Scan, based on the observations and interpretations of the designer. It cannot be concluded that the implementation and development are actually the most suitable strategy for TT&A and Deloitte. These should have been validated with the client of this project to be able to determine whether they are actually viable, feasible and desirable.

28.5 Validation and evaluation

Validation of the final solution could have been more rigorous. Circumstances resulted in the absence of a final validation round with consultants from TT&A. Inclusion of Deloitte in the last phase of this research would have been essential to reflect on the decisions for the modifications made to the format, content, analysis and implementation of the IT Agility Scan. The validation that was executed during the project, after the creation of the first concept, included a sufficient number of employees but could have involved employees from other disciplines and at a later stage in the process when more of the outlines of the design were clear.

During the evaluation of the format and content only employees from one client organization of Deloitte were involved. By involving other stakeholders than employees and multiple client organizations, the evaluation would have been more rigorous, and results would have been more generalizable.

29 Recommendations

Based on the results and limitations of this project, there are several recommendations that can be made for future research, the solution, and the validation of the solution. It is advised to take these recommendations into account before implementing and utilizing the IT Agility Scan within a client context.

29.1 Literature research on IT landscape agility

The first recommendation is to further investigate the topics of IT landscape agility over the organizational dimensions. This will help to improve both the content and interpretation of data on people, teams, processes, organization, leadership, compliance, risk, governance and vision and strategy. Considering the technological dimensions, there is more in-depth research required on the dimensions of data, software and infrastructure to increase both the rigor and relevance of the content. There is an extensive knowledge base on information technology in relation to agility, which should be further investigated. This will also help Deloitte in creating a knowledge base around the IT Agility Scan, in particular when the articles applied are stored in the intranet accompanying the evaluation.

29.2 Expert input

Additional expert input is required to further improve the content, analysis and interpretation of results. By evaluating the agility of the IT landscape, Deloitte will have an indication of the current state of the client with regards to their IT landscape agility. Understanding what the impact of this current state is on the operations and business performance of a client and formulating a strategy to guide the client towards a more agile IT landscape, requires input from subject matter experts. These experts can identify which dimensions impact the agility the most and what relations are present between dimensions. Additionally, these experts can determine whether it is possible to categorize the different technologies based on their influence on the agility.

29.3 Business case

One of the most important elements of the vision for the IT Agility Scan was to enable consultants and empower them with the tools and knowledge to improve the value delivered to clients. Adoption of this framework for evaluation would have been even more viable if there was a business case that shows the monetary benefits of the adopting the solution. A cost-benefit and financial analysis showing the ROI of the IT Agility Scan is recommended, since this would lead to an increased backing of directors and partners, which is important in a top-down organization such as Deloitte.

29.4 Solution

As discussed in the implementation strategy there should be further iterations on the content of the survey. This should be done to improve the questions for each of the dimensions.

Additionally it is recommended to reduce the number of questions by taking out detailed questions and applying the survey logic in each of the sections. This problem can also be solved by adjusting the target group to employees of whom it is known beforehand that they will be able to provide input on the detailed topics. For the final solution it is recommended that experts on consumers and other stakeholders are involved for the creation of the stakeholder survey.

It is recommended to create a standardized method for data analysis and presentation. By defining what analysis should be executed for what variables, will increase the speed of analysis. Additionally, it is recommended to define how the results can be interpreted, so it is clear for every consultant what the implications of certain outcomes are. It is suggested that for the different dimensions there are object performance measures and key performance indicators defined. When it becomes clear based on the outcomes of the IT Agility Scan that a certain aspect of the IT landscape or organization under performs, these OPMs and KPIs can help to keep track of change.

It is recommended that the suggested implementation strategy and future roadmap are validated and iterated together with the employees of TT&A and ET&P to ensure the viability, feasibility and desirability of these strategies. The first use of the IT Agility Scan should be a pilot executed internally to see whether the evaluation and presentation of results are effective. It is recommended to take the time and do follow up evaluations during an actual transformation. Since the reputation of Deloitte is crucial and risks have to be mitigated, it is not recommended to rush the implementation.

Since the solution considers several dimensions, it is recommended to determine what weight should be attached to these dimensions. By doing a descriptive analysis it becomes clear what dimension scores lower according to the employees and stakeholders. But it does not become clear what dimension should be prioritized.

The solution should consider relations between dimensions. By mapping different relations, it would become clear what dimensions are dependent on each other. When these dependencies do exist, changing one dimensions would not lead to the desired result if not combined with change in the other dimension.

29.5 Future research

It is recommended for future research what to investigate what the implications of the evaluation framework are for the agility of the IT landscape. Existing literature touches upon the influence of different the dimensions and evaluation of IT agility and other agilities on business performances. But it lacks evidence of the effects of an evaluation of all dimensions combined on the agility of an IT landscape. Further research and documentation on the topic of IT landscape agility and the evaluation thereof are deemed necessary.

Additionally, evidence was found that relations exist between different dimensions and weights can be

defined for each of the dimensions, however, it is still not clear how these different relations and weights can be mapped and evaluated. Future research is needed to demonstrate what specific influence the relations will have on the agility of the IT landscape. A weighted criteria methodology could be applied in future research to investigate what weight each dimension has in relation to the agility of the IT landscape.

30 Conclusion

In this chapter the project and report are concluded by describing and reflecting on the results, to give the reader an overview of what was accomplished, what the implications are and what good have been done differently.

30.1 Results

To conclude the results of this project we will look back at the goals of the project and the outcomes. The goal of this design project was to develop a solution for Deloitte consultants and clients to evaluate the agility of IT landscapes. In order to accomplish this goal, there were four research questions defined at the start of this project aiming to determine the definition of IT landscape agility, determine what system dimensions, system characteristic and different technologies should be considered and to formulate the most desirable process for evaluation.

From the literature research in chapters 5 up to 11, it became clear that IT landscape agility can be defined as the ability of an IT landscape to sense and respond to internal and external change continuously. Regarding the dimensions of the IT landscape, it was concluded that the evaluation should consider the dimensions data, software and infrastructure, since looking at an IT landscape through a technology lens would be most manageable within the scope of this project. Additionally, during the literature research it became clear that there are a number of technological system characteristics that should be evaluated for the agility of the IT landscape: modularity, scalability, redundancy, connectivity, coupling, homogeneity, speed and autonomy. Based on these insights, the first iteration of the framework for evaluation was developed.

Based on expert input through interviews, observations and focus groups it was discovered that it would be necessary to rescope. Looking through a technology lens would not create a holistic view on the agility of an IT landscape. Evaluating an IT landscape should be done based the three innovation lenses: people, process and technology. It was found that besides the earlier defined technological dimensions and system characteristics, it is essential to include organizational dimensions such as people, teams, processes, organizational structures, leadership, governance, risk and compliance and strategy and vision. These insights combined with the insights from the literature research in a second framework for the evaluation of IT landscape agility.

During the expert interviews and focus groups insights were gathered on the goal, format and requirements for a solution that would be based on this framework. Design principles, a future vision and vision statement were formulated that guided the design process and helped to increase the viability, feasibility and desirability of the design. These insights laid the groundworks for three concepts, of which the quick scan was chosen by consultants as the most desirable concept.

The quick scan was detailed and validated with consultants from different disciplines. The concept is considered as viable, feasible and desirable. After developing an artifact of the quick scan, the contents and format were evaluated and iterated together with a client company during multiple rounds feedback.

This process led to the final solution which was rebranded to the IT Agility Scan. The IT Agility Scan is the fundament for an evaluation tool that can be used by TT&A and other teams at Deloitte in the future. Encompassed by recommendations for further development and a suggested implementation strategy the IT Agility scan will enable consultants to evaluate the current agility of IT landscapes and guide them in stimulating the IT landscape agility of their clients by identifying the biggest gaps and opportunities. The IT Agility scan provides them with the knowledge and guidelines to be an IT consultant who can guide clients through transformations towards future-proof and agile IT landscapes

30.2 Discussion

The discussion chapter of this thesis will conclude the project and reflect on the process of the project, by critically evaluating the methods used and the quality of the application. Additionally, this chapter will discuss what the relevance of this research is for the client and the field of design and whether the findings can be generalized.

30.2.1 Reflecting on my process

Looking back at the process that led to the results presented in this report, it can be concluded that this project is not a design project similar to those executed during the master Strategic Product Design at the University of Technology in Delft. From the initial project brief it became clear that this project would lean more towards a research project than a strategic design project. Despite that, this project was still able to emphasize the strategic value of design by showing the benefits for TT&A and Deloitte of using design methodologies to develop a framework, solution and implementation strategy.

Initially the scope of this project was very broadly defined to monitoring digital transformations. During the initial weeks at Deloitte and meetings with supervisors it became clear that rescoping was essential to make the project manageable within the given timeframe of 20 weeks. After multiple iterations the scope became evaluating IT landscape agility based on the technological components of the IT landscape. In hindsight it became clear that an evaluation would not be holistic enough without the inclusion organizational dimensions. As the research progressed the scope was therefore converged to include these. This has had a negative effect on my ability to cope with the complexity of the topic within the given timeframe.

The literature research relatively thorough, because this was needed for an understanding of both IT and agility as it was the foundation of the initial framework. It was not determined yet that the organizational dimensions would be included, which is why the literature research focuses mostly on the technological dimensions of IT landscape agility. If this had become clear at the start of the project, it would have been decided to cover all of the dimension, but less thoroughly. The fact that the initial research was so extensive also led to the inclusion of a large number of resources, which surpasses the purpose of this project. The qualitative methodologies for gathering data by mixing methods such as interviews, observations and focus groups were effective, partially because of the co-creative character this added to the development of the framework and IT Agility Scan. By organizing multiple rounds of evaluation and iteration with a client

company the iterative character of the design process was achieved. Reflecting on the DSR methodology we can say that there was sufficient movement between the relevance, design and rigor cycle, although moving back and forward more frequently could have resulted in an outcome with more relevance for the application domain and more rigor.

Because of the extensive amount of research and insights gathered from experts, it has been a challenge to report concisely. Some of the chapters elaborate on details that may not be included the final solution but will support the client of this project in understanding the different dimensions and system characteristics. If less focus would have been put on the initial literature research, there would have been more time to organize co-creation sessions to define a standardized format for the interpretation and presentation of data. In reflection this may have been more valuable for the client and their clients. A lesson was learned from this.

During this process it became clear that it is very important to narrow down the scope and settle for the fact that the researcher or designer does not have to know everything before gathering input from experts. As a strategic designer you are a generalist who connects people with in-depth knowledge, by approaching a problem with a helicopter view instead of diving into details. This is essential for time management and dealing with complexity.

30.2.2 Relevance for TT&A and Deloitte

During this project it became apparent that there has been a growing interest in the topic of agility in relation to IT. With TT&A being focused on IT transformation and acceleration they proved this interest by being involved in this project and it became noticeable that 'the ball started rolling'. Consultants started actively working on finding a methodology for the evaluation of IT agility. Therefore, the insights gathered during the research phase of this project and the setup of the IT Agility Scan are very relevant for TT&A and Deloitte. Since the IT Agility Scan would need further improvements before it can be implemented, the relevance will likely support this process. However, this process does still rely on the willingness and time of consultants to take the final steps in making finishing the IT Agility Scan to make it completely relevant.

30.2.3 Relevance for the field of design

This project illustrates the relevance of applying design methodologies technology-oriented business of IT consulting. It shows the ability of designers to dive deep into an unfamiliar context and combine knowledge from several experts to solve the challenges faced by their client. During the project it became clear that applying design methodologies to come up with creative and novel ideas sparks the enthusiasm of the people around the designer, motivating colleagues to put in extra effort to support the design process.

30.2.4 Generalizability

Since the expert input came from several experts working in different industries, it became clear that the findings in this report are applicable to most contexts. There were findings during this project that are generalizable throughout the application domain and rigor cycle.

Every organization nowadays must be able to quickly adapt to changing internal and external conditions. Since most operations, products and services, and (after) sales processes rely on IT to function, IT agility is relevant for all organizations. The amount of agility required depends on the volatility of the internal and external environment. The ability to create this agility in the IT landscape is dependent on many factors that covered by technical and organizational dimensions.

It became clear that certain technologies and architectures can have specific characteristics that make the technology or architecture itself agile, because of their scalability and customizability. However, it depends strongly on the context it is applied to, whether this creates higher agility for the IT landscape and organization.

Lastly is generalizable that it can be valuable for any organization to evaluate the agility of their IT landscape, to understand how well it can be adapted to internal and external changes. Organizations differ strongly e.g. in size, operating environment and types of employees and users. Taking this into account, it can be concluded that all of the dimensions considered during this project are generalizable for all organizations, which are: IT landscape in general, data, software, infrastructure, architecture, system characteristics, people, teams, leadership, processes, organizational structures, governance, compliance, risk management and strategy and vision. The specific questions included in the final solution may not be generalizable for every context since there are a lot of variables that differ per organization.

30.3 Personal reflection

Looking back at my time at Deloitte I have really enjoyed working with the enthusiastic colleagues at the office in Amsterdam. I was very eager to learn more about IT and what it takes to be a good consultant. At times it was challenging to adapt to the way of thinking of my client, as there were no designers in the team. Trying to convince a client that there is value in applying design methodologies was difficult at times, but I managed to do so eventually.

The start of this project was not the easiest, since it was difficult to frame the problem and scope it down to a manageable design challenge and research question. Eventually I managed by involving the client in this process and requesting feedback from my supervisors. This rough start was accompanied by my supervisor at my client company not being available for months because of personal circumstances, followed by a supervisor leaving the company for another job. Having to pivot to new supervisors slowed down my process initially, having to introduce them to the project, getting them up to speed and aligning on my approach.

Eventually I used the fresh energy and ideas of my new company supervisors to my advantage, which improved the outcomes of my project. By having weekly meetings with my company supervisors, I managed to gather sufficient feedback and improve the quality of my work. By going to events, attending meetings and drinking coffee with colleagues I was able to network effectively and obtain the participation in my project that was essential.

I think I could have involved my supervisors from the University of Technology in Delft more in my process, by meeting more frequently. This would have made it easier for them to catch up on my progress and understand my line of thought. However, between my other responsibilities, I have managed to meet up with my university supervisors as frequently as possible, during the of this project. During these meetings I was able to generate feedback on the progress I made and discuss the effect of applying different methodologies, which has been very valuable for the outcome of this project.

My time management during project was not ideal, the desire to make the outcome very extensive in combination with other responsibilities led to some overtime. I have learned a lot from start to finish about the planning of a project and making realistic estimations about the time needed to complete tasks. Looking back at the start of this project, I should have defined my scope earlier on and should have moved from the explore phase to the define phase more quickly. Additionally, it is important to keep in mind that going for good instead of perfect sometimes leads to better outcomes.

All in all, this project was a great journey full of lessons that I will take with me for the rest of my professional career. I have improved my communication, networking and planning skills and learned a lot about information technology and agility. I would like to take this opportunity to thank Deloitte for giving me this chance and my university supervisors for all of the support they have given me during my graduation project.

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Appendix A - Project brief

DESIGN FOR OUR future

6622

TU Delft

IDE Master Graduation

Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT
Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME
Save this form according to the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd.mm.yyyy". Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1!

family name Kroon Your master programme (only select the options that apply to you):
 initials G.S.P. given name Guus IDE master(s): IPD Dfi SPD
 student number 4363353 2nd non-IDE master: _____
 street & no. _____ individual programme: _____ (give date of approval)
 zipcode & city _____ honours programme: Honours Programme Master
 country _____ specialisation / annotation: Medisign
 phone _____ Tech. in Sustainable Design
 email _____ Entrepreneurship

SUPERVISORY TEAM **
Fill in the required data for the supervisory team members. Please check the instructions on the right!

** chair René van Egmond dept. / section: Department of Human-Centred Design (HCD)
 ** mentor Ufuk Gür dept. / section: Department of Design, Organization and Strategy (DOS)
 2nd mentor Franka van Velthoven
 organisation: Deloitte
 city: Amsterdam country: Netherlands

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v.
 Second mentor only applies in case the assignment is hosted by an external organisation.
 Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

comments (optional)

Procedural Checks - IDE Master Graduation

TU Delft

APPROVAL PROJECT BRIEF
To be filled in by the chair of the supervisory team.

chair dr. A. van Egmond date 12-4-23 signature [Signature]

CHECK STUDY PROGRESS
To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair. The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: 27 EC YES all 1st year master courses passed
 Of which, taking the conditional requirements into account, can be part of the exam programme 27 EC NO missing 1st year master courses are:
 List of electives obtained before the third semester without approval of the BoE

name Robin den Braber date 18-04-2023 signature [Signature]

FORMAL APPROVAL GRADUATION PROJECT
To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **. Next, please assess, (dis)approve and sign this Project Brief, by using the criteria below.

• Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)? Content: APPROVED NOT APPROVED
 • Is the level of the project challenging enough for a MSc IDE graduating student? Procedure: APPROVED NOT APPROVED
 • Is the project expected to be doable within 100 working days/20 weeks?
 • Does the composition of the supervisory team comply with the regulations and fit the assignment?
 comments

name Monique von Morgen date - KE 2/5/2023 signature MvM

Initials & Name G.S.P. Kroon Student number 4363353
 Title of Project Tracking and guiding technology agility in digital transformations

Tracking and guiding technology agility in digital transformations project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 06 - 03 - 2023 end date 28 - 07 - 2023

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

Deloitte is one of the largest service providers in the fields of accounting, consultancy, financial advising, risk advising, and tax advising. With over 244.000 employees worldwide in over 150 countries, and around 7.500 employees in 14 offices throughout the Netherlands. Working in multidisciplinary teams Deloitte is capable of providing a broad vision on their clients' issues and providing insights into opportunities for their businesses.

This project will focus on Deloitte Consulting with a core focus on the technology transformation and acceleration department. Companies are led through digital transformations with a "integrated and adaptive approach to transforming businesses from the inside". With the goal to build creative solutions to some of your most difficult problems by embracing new technology, shaped by industry insights, and working in an agile manner. Deloitte claims to value the preservation of the human element. People and technologies collaborate to create every great idea or groundbreaking advancement. And by combining the two, they can imagine what is possible and deliver real results that will assist companies in running their future. As a consultancy the team provides assistance from problem definition up to and including execution.

The consultancy branch is interested in discovering the success factors and barriers behind digital transformations. As a consultancy firm Deloitte is working with many clients, these stakeholders come to Deloitte for an advise and when needed implementation of a solution. A great part of this is giving advice and guidance in the digital transformations with the implementation of new technologies. Therefore they are keen to find out what success factors and barriers are and how these influence technology delivery. This could on one hand help Deloitte to strategize digital transformations more properly, and on the other hand it would be beneficial for clients if there transformation could be more tailored towards these success factors and take into account the risks of barriers slowing the transformation down.

An adaptive approach is not only key to the digital transformations. In general, "firms see a disruptive business landscape, whether stemming from new technologies, competitive conditions, regulatory changer or cultural integration and development, they need to adjust their strategy, structure and processes to eschew obsolescence" [1]. Therefor this project will focus on measuring and guiding technology agility in digital transformations with the goal to increase organizational agility and select the optimized technology paths based on changing influential factors. The scope of this project is the service provided to clients.

The resource I will require most from Deloitte is time with consultants to carry out interviews or collaborate on the input of this research. Because of the fact that Deloitte is a big corporate company, it will be essential to plan timely in order to get in touch with the right experts within the given time.

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space available for images / figures on next page

introduction (continued), space for images

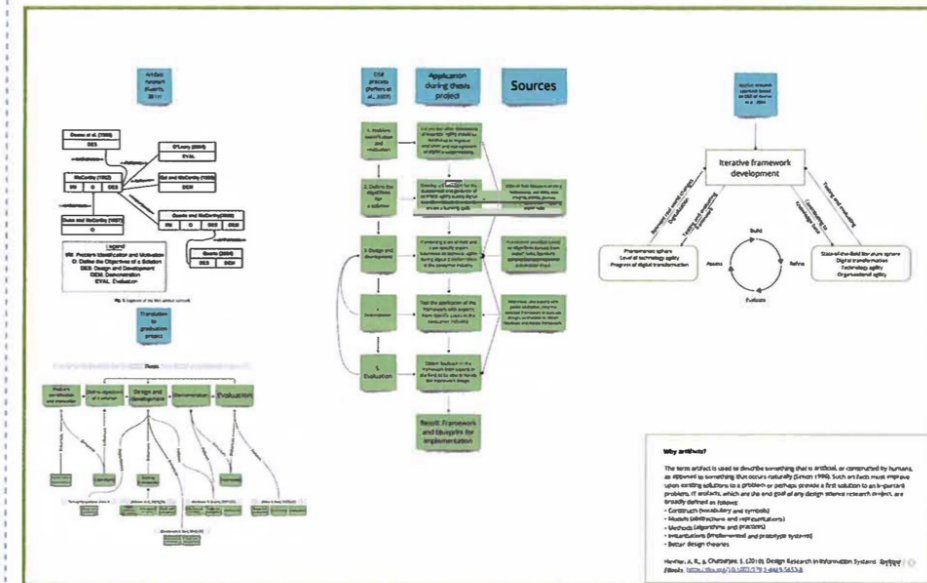
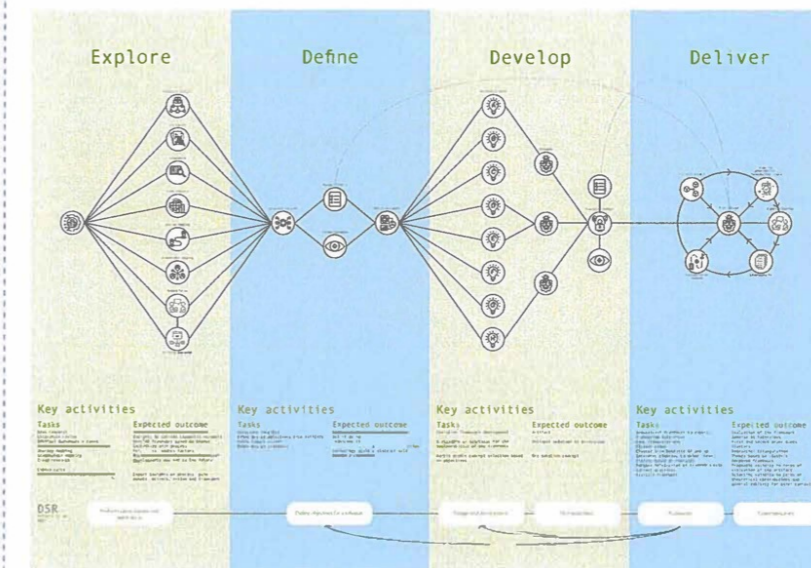


image / figure 1: DSR



Project overview

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project

According to [1] The monitoring of change, which includes the collection of feedback from people involved in the change, the identification of gaps and problems and the implementation of corrective actions, is a key activity, in change management, to avoid failure. [2] Incorporates a step of monitoring change and suggests surveying individuals who benefit from change as a means of evaluating change in progress. [3] Also envisions a change monitoring activity and suggests using a lean six-sigma approach. However, most retrieved digital transformation models (DTMs) do not include any change-monitoring activities, despite change management literature stating that it is critical to understand how and to what extent an introduced change is improving the organization's performance and to eventually implement corrective actions. The absence of activities dedicated to change monitoring is one of the main limits of extant DTMs. A large part of execution of digital transformations is managing and measuring. It's clear to me that currently there is no clear overview of how to measure tech agility related key performance indicators and objectives and key results during digital transformations, and the digital transformation capability of Deloitte's Technology Transformation and Acceleration is trying to develop an asset for this. During talks it became clear that currently there is no standardized method for measuring technology agility, while it is essential as it influences the organizational agility and firm performance [4].

1. Bellantuono, N., Nuzzi, A., Pontrandolfo, P., & Scozzi, B. (2021). Digital Transformation Models for the I4.0 Transition: Lessons from the Change Management Literature. Sustainability, 13(23), 12941.
2. Grand, T. L., & Deneckere, R. (2019). COOC: An Agile Change Management Method. HAL (Le Centre Pour La Communication Scientifique Directe).
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4. Dunlop-Hinkler, D., Parente, R., Marion, T. J., & Friar, J. H. (2011b). The role of technology agility on bu

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

I will follow a design thinking process as defined by the Brown combined with the DSR methodology (Herbert, 1996, Hevner, et al., 2004, Peffer et al., 2007). The goal here is to first understand the problem, then develop a framework that describes technological agility and possible ways to measure this. Interviews will be used to evaluate the framework. Based on the insights, the framework can iteratively be optimized.

Getting novel insights into the success factors and barriers of digital transformations are the basis for the goal is to create a framework for tech agility monitoring. Which should allow Deloitte to provide an optimized service to clients during digital transformation journeys, creating competitive advantage over other consultancy firms. Deloitte should be able to monitor and manage change and if possible generate new value based on the use of this framework. This should help clients and stakeholders to keep track of ongoing technological change.

To explain how Deloitte will be able to use the monitoring framework it will be supported by a service blueprint and strategy for the implementation of the tool. I will be researching the success factors and barriers to a digital transformation by doing a critical study on literature combined with an analysis of the current processes, trends, stakeholders and existing frameworks. Qualitative research in the form of expert interviews linked to specific cases will allow me to generate novel insights and feedback on the framework. Journey mapping is used to create insights into the digital transformation journeys and discover in what part of the journey it would be most critical to monitor and communicate progress. The validation is two-folded, on one hand pragmatic validity in terms of evaluation of the artifact and on the other hand scientific validity in terms of theoretical contributions and generalizability for other contexts.

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.


start date 6 - 3 - 2023 28 - 7 - 2023 end date



If we zoom out, the planning follows the Double Diamond (Design Council, 2007) and the design science research method (Hevner et al. 2004). There are multiple phases in the planning, starting with the discover phase. In the discover phase we diverge by doing research, consisting of literature research, secondary data and explorative talks with experts to create an understanding of the problems they are facing during their day-to-day consulting job. In the second phase I will converge, structuring insights and defining a specific problem statement, design goal, vision and criteria. During the develop phase I will diverge by ideating on possible solutions. In the deliver phase these ideas/concepts/frameworks will be tested on determined criteria, further detailed and presented.

To ensure that the final results will be tailored to the client's requirements, I will go through at least two rounds of iterations. These iterations will also follow the structure of the double diamond, where I rediscover based on interviews or co-creation and redefine the new criteria. Likewise, I will go through cycles of adapting the concept, strategy and blueprint to these new requirements.

Appendix B - Project overview



Personal Project Brief - IDE Master Graduation

MOTIVATION AND PERSONAL AMBITIONS
Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge on a specific subject, broadening your competences or experimenting with a specific tool and/or methodology. ... Stick to no more than five ambitions

After graduating from my bachelor in Industrial Design Engineering at the Technical University of Delft I decided that I wanted to focus more on the strategic value of design. Being able to use design skills and tools to create strategic value and competitive advantage for businesses and stakeholders is the reason I started a master in Strategic Product Design. Adding not only a new level of knowledge, but also experience in working with different types of clients on different types of projects.

Why Deloitte?
Experiencing a company managing multiple clients, operating at global scale and working together with experts in the field of consulting would be a great chance for me to grow professionally. Working in teams with experts makes for the opportunity to learn. This is the reason why Deloitte is such an interesting client for me during my graduation.

Why this project?
During the last decade, we have all experienced how IT has become a big influence on our lives and businesses. The future of IT is still being explored and this is what makes it such an interesting field to operate in. I will not try to convince you of the fact that I am an IT expert, but I am most certainly eager to learn. Being a designer means it is more interesting to work in a multi-disciplinary team in a field you are only partially familiar with. My ability to quickly immerse myself in new topics and information makes for an interesting thesis project that is on the edge of design and IT. Like the field of Information Technology, design works in a very agile way, working in iterative processes. Combining this with academic research could lead to impactful outcomes for both Deloitte and its clients.

Nowadays, many organizations are engaging in efforts of digitalization, internally, externally or both. Motivated to increase efficiency, lower cost or creating new value streams most of the times it's done out of strategic interest. Strategic decisions are often data-driven, which is exactly the reason for my ambition to better understand what current and future developments are noticeable and of importance in the field of digital transformations. Another ambition of me during this project, is to understand what it entails to drive change in a large corporate organization through first hand experience.

FINAL COMMENTS
In case your project brief needs final comments, please add any information you think is relevant.

Let's connect and make an impact!

IDE TU Delft - E&SA Department /// Graduation project brief & study overview /// 2018-01 v30 Page 7 of 7
Initials & Name G.S.P. Kroon Student number 4363353
Title of Project Tracking and guiding technology agility in digital transformations

Explore

In the explore phase the goal is to empathize with the problem owner and build an understanding of the context of the problem. This means talking with experts on current digital transformation processes, the tools, and capabilities they own and the problems they face with evaluating IT landscape agility during IT transformations. As a result, the problem can be identified and motivation for solving the problem is understood, based on the insights drawn from these talks and secondary documents, a direction is chosen for further research. This will determine the direction for the literature review to build a theoretical foundation about the chosen topic. The literature will form the foundation for the rigor cycle of the design science research process. Semi-structured interviews will be used to create the relevance cycle, to understand the application domain of the framework.

Define

During the define phase, the goal is to converge by structuring, analyzing, and synthesizing insights gathered during the explore phase. Structuring insights from the literature review, expert talks and observations will allow me to develop a design challenge and requirements for possible solutions. It is the combination of insights from the application domain and the theoretical foundation that enable to distill a direction for the design cycle of the design science research process, where the framework will be designed.

Develop

During the develop phase an initial framework will be developed, that aims to be a solution to the design challenge and complies with the requirements defined during the define phase. This can be seen as the design cycle of the design science research process, as the framework is designed, and the framework is used during interviews as a probe for elicitation to evaluate. The interviews will be recorded, transcribed, and coded. Multiple rounds of clustering results in insights for new requirements of the framework for evaluating and stimulating IT landscape agility. To support the framework, there will be ideation on the implementation of the framework within Deloitte. The DRS methodology is characterized by iteration, which is why the evaluation and stimulation framework and roadmap for implementation is evaluated again and co-creation will be done to gather insights and iterate on the implementation roadmap.

Deliver

During this last phase the goal is to detail the final framework and implementation strategy. Finally, I will be able to evaluate its use by Deloitte by analyzing the desirability, feasibility and viability. Validity is evaluated during this phase based on the extent to which the framework represents relevant aspects of reality, the extent to which it satisfies functional needs and the extent to which it is theoretically grounded.

Figure 2 displays the general outlines of this project and the activities that will be executed to get to the desired result of a solution for Deloitte consultants and clients to evaluate the agility of their IT landscape.

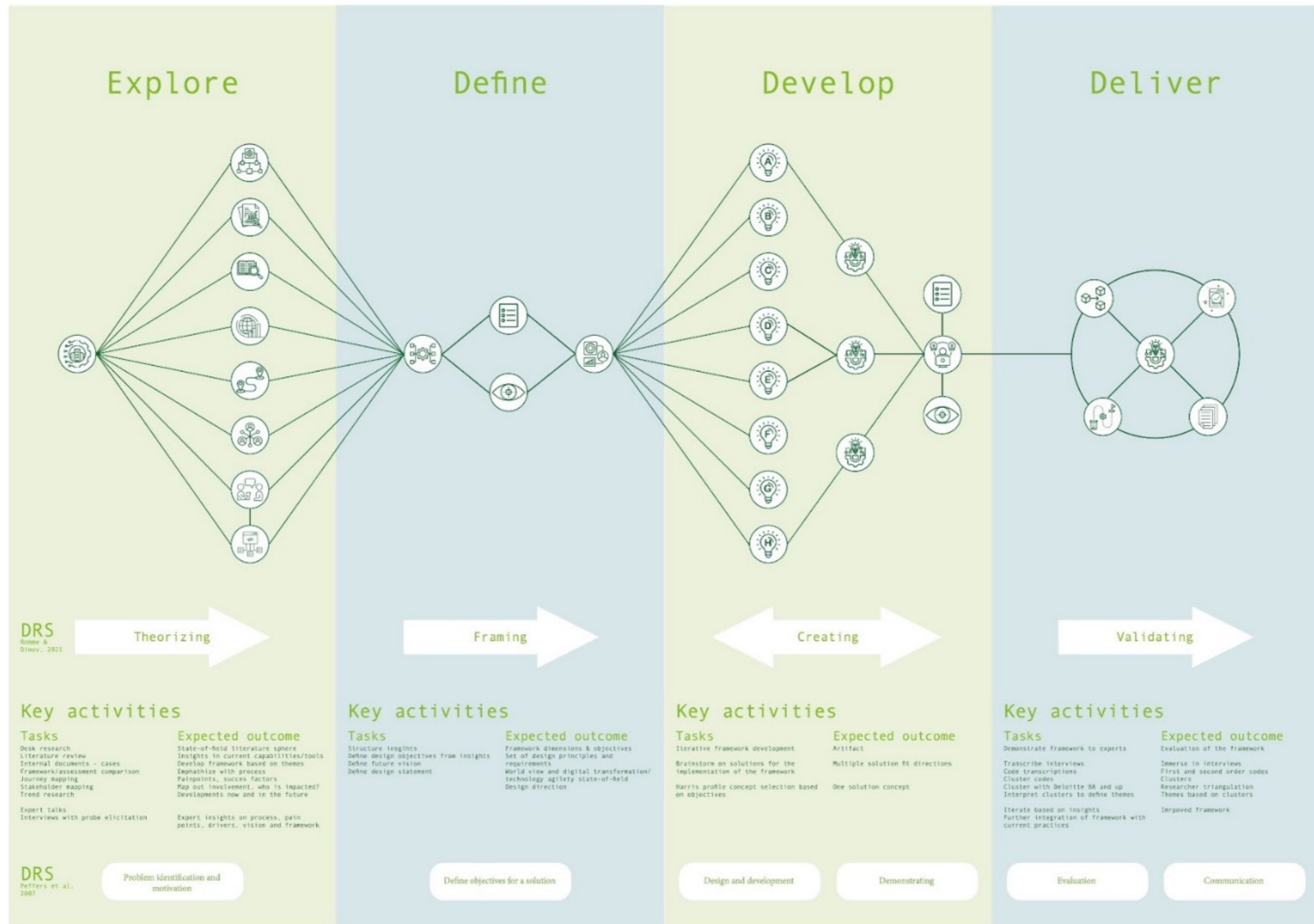


Figure 2. Project overview, combination of double diamond and DRS. (see Appendix A)

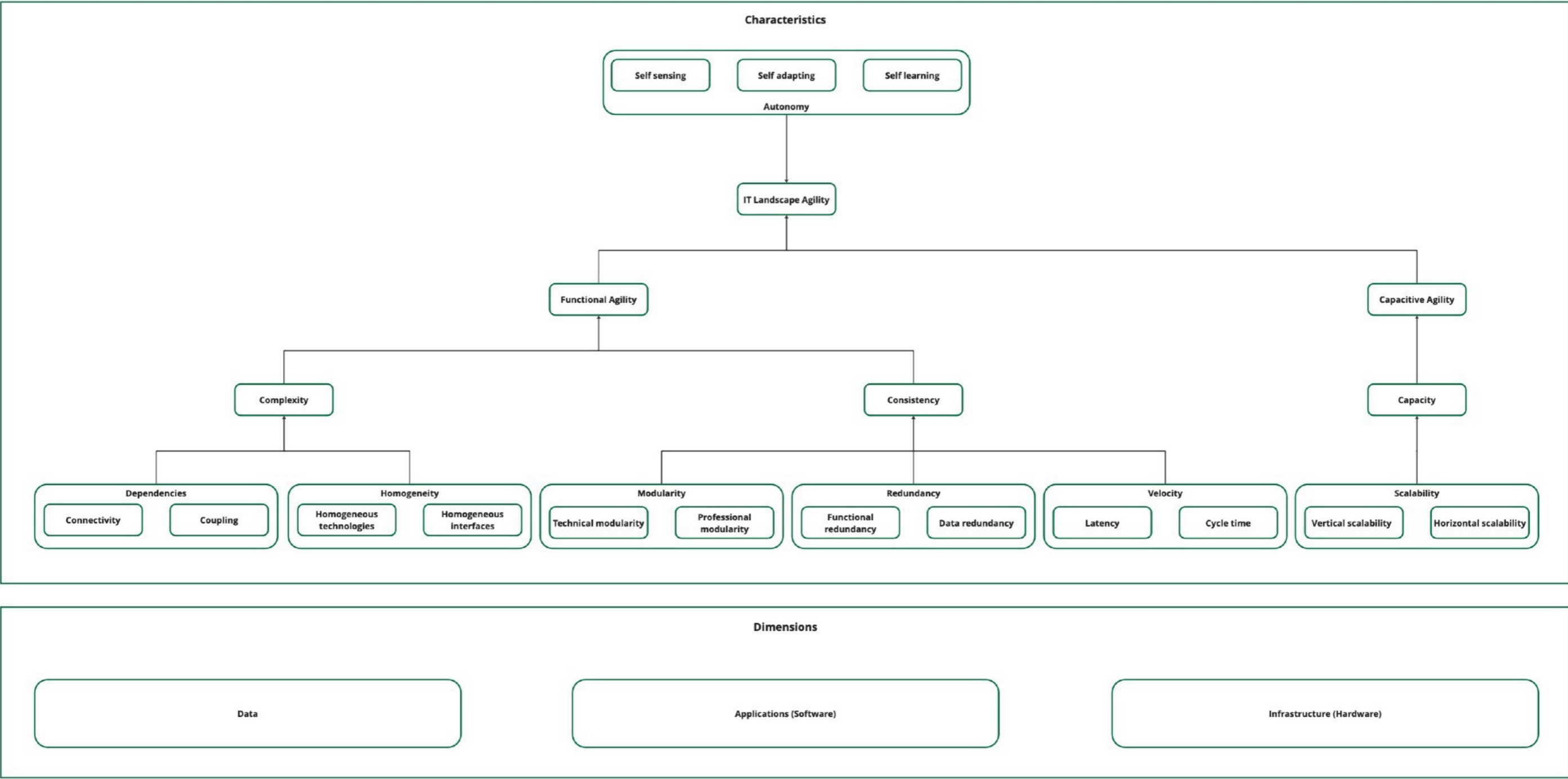
Appendix C: coupling types

Category	Sub-category	Coupling type	Description
Structural coupling	Procedural language coupling & object-oriented language coupling (Interaction coupling)	Content coupling	Direct access or modification of the contents of one module by another. For instance, a statement or branch to a local label within module B may be changed by module A. To encourage modularization and maintainability of the software system, this form of coupling should be reduced because it shows a high interdependence between the modules. (Fregnan et al., 2019)
		Common coupling	When two modules can read from and write to the same global record because they have access to the same global data, this is known as common coupling. This kind of coupling means that the modules depend on the same set of information, which might make the system more complex and difficult to manage. In order to improve modularity and lessen potential conflicts or dependencies between modules, it is generally advised to promote data independence and minimize common coupling by encapsulating data into modules. (Karnikeyan & Geetha, 2012)
		Control coupling	When one module actively directs the logic or execution flow of another module, this is known as control coupling. Control coupling is absent, however, if the first module only sends data without directly influencing the second module's actions or decisions. (Aloysius & Arockiam, 2012)
		External coupling	When two modules communicate with each other and share data using an external object, such as a file, this is known as external coupling. Coupling of this kind facilitates communication and cooperation between the units. To minimize dependencies and potential issues with accessing, synchronizing, and maintaining consistency of the external object, it is essential to handle external coupling wisely. (Fregnan et al., 2019)
		Stamp coupling	When a module delivers a data structure as an argument to another module, but the receiving module does not use all the parts of

			the data structure, stamp coupling is present. (Fregnan et al., 2019)
		Message coupling	Modules can communicate with each other directly or through a middle communication layer. In this type of coupling, modules communicate with one another by exchanging messages that include requests or information. This type of coupling allows for loose coupling with encapsulated data, stimulating modularization. (W. Li, 1998)
		Data coupling	Data coupling occurs between two modules when they exchange arguments that consist of homogeneous data items, such as simple arguments or data structures, in which all elements are used by the calling module. (Aloysius & Arockiam, 2012)
	Object-oriented language coupling (Component coupling)	Hidden coupling	When the return value of one method invocation is instantly used as an input parameter in another method invocation, hidden coupling occurs. It causes issues because the linkage is implicit. If there is hidden coupling, a developer must walk through all methods of all classes to find the location where a change in this coupling will have an effect and where the change should be propagated to. (Schrefl, 2014)
		Scattered coupling	When one class is used as a domain in the definition of a local variable but is not included in the class specification, the two classes are scattered coupled. (Schrefl, 2014)
		Specified coupling	When one class is a component of the other and is included in the specification, the coupling is specified. It can be easier to find the coupling and there is no need to search through the complete implementation as with hidden coupling or scattered coupling. (Schrefl, 2014)
	Object-oriented language coupling (Inheritance coupling)	Modification coupling	Modification coupling exists when one class is a direct or indirect subclass of the other and the information is changed or deleted. This is the worst type of inheritance coupling (Schrefl, 2014).
		Refinement coupling	This type of inheritance coupling is better than modification coupling since the inherited

			information may on be changed according to predefined rules (Schrefl, 2014).
		Extension coupling	This is the best kind of inheritance coupling as it only adds information to the existing classes rather than changing them or refining them. (Schrefl, 2014)
Dynamic coupling		Import coupling	When for instance a library is imported for use within a program, this is referred to as import coupling. For instance, in C++ and Java, #include and import declarations are utilized. (Educative, 2023)
		Export coupling	Export coupling is like import coupling, but the direction is the other way around. Where a library is export for use within a program. (Fregnan et al., 2019)
Semantic coupling			The semantic coupling of two software artifacts is a measure of how closely they are coupled based on the semantic information encoded in the objects. Natural language processing and machine learning are two information retrieval approaches that can be used to extract this information. For example, if two Java classes utilize the same method, this is called a high degree of semantic coupling. This is because two classes are semantically connected and rely on the same functionality. (Fregnan et al., 2019)
Logical coupling			The logical coupling of two software artifacts is a measure of how closely they are coupled based on their modification history. This indicates that two artifacts are deemed logically connected if they have frequently been modified jointly in the past. (Fregnan et al., 2019)

Appendix D: Framework first iteration



Appendix F: Interview introduction

Thesis topic: “Evaluation of IT landscape agility”

The technical perspective

Problem statement: Nowadays it is essential for organizations to transform existing IT capabilities in order to facilitate new business initiatives. Businesses must be agile in the current digital era to deliver the most value to customers and stakeholders, mitigating the risk of becoming obsolete. Since businesses rely more on IT capabilities to deliver this value, IT landscapes need to be able to support changing business requirements by being agile. Therefore this study aims to address the following research question:

“How to evaluate the agility of an IT landscape?”

Research objectives:

- Identify how the different constructs of the IT landscape impact the agility of the IT landscape
- Identify system characteristics that determine the agility of the IT landscape

Theoretical framing: IT landscape agility is defined in this study as the ability of the IT landscape to sense and respond to internal and external changes with high speed.

The evaluation of the agility can be done based on three different dimensions, namely the constructs that form the IT landscape:

1. The information architecture (data)
2. The IT architecture (software)
3. The infrastructure (hardware)

Methodology: This research uses a qualitative approach in which semi-structured interviews are conducted. To gather insights on what characteristics and elements should be evaluated to determine the agility of the IT landscape, the interviews will involve subject matter experts from different teams and offerings within Deloitte who have been involved in landscape transformations. The interviews will be recorded through Teams, and inductive analysis based on transcribing, coding, and clustering will allow for the definition of a set of evaluation criteria.

What’s in it for you: After a thorough literature research and analysis of interview data, I will develop a framework that assists consultants in evaluating IT landscapes for agility transformations. This framework will be shared with you when the research is completed.

Thank you for the consideration of contributing to my research!

Kind regards,
Guus Kroon

Appendix G: Interview guide version 2

Introductie

Bedankt dat je hebt toegezegd om deel te nemen aan dit interview over de agility van IT-landschappen. Zoals aangegeven zal ik de interviews opnemen via Microsoft Teams om deze naderhand te kunnen transcriberen voor de analyse. Ga je hiermee akkoord?

Korte introductie participant

Zou je mij kort kunnen vertellen waar binnen Deloitte en klant projecten jouw focus en expertise ligt?

Onderwerp

Organisaties willen het vermogen om snel te kunnen reageren op verandering verhogen. Hierbij is het sterk van belang dat hun IT-landschap de mogelijkheid biedt om snel aangepast te kunnen worden en de veranderingen binnen en buiten de organisatie kan ondersteunen of zelfs sturen. Het gaat in de kern dus echt om de bewegelijkheid van het IT-landschap zelf. Mijn definitie van IT-landschap agility is dan ook: het vermogen van een IT-landschap om interne en externe veranderingen te kunnen waarnemen en hier snel op te reageren.

Drie verschillende constructen:

Zoals aangegeven bekijken we verschillende aspecten van IT-landschappen vanuit een technologisch perspectief om te kijken waar de mensen en processen binnen organisaties op aan moeten sturen en om te achterhalen hoe Deloitte hierin kan ondersteunen. Om het landschap te kunnen evalueren delen we het op in drie lagen:

- Data
- Applications/software
- Infrastructuur (hardware en systeemsoftware)

Op basis hiervan ga ik een aantal vragen stellen om te achterhalen welke eigenschappen van een landschap van belang zijn te evalueren, welke metrics hieraan gekoppeld kunnen worden en welke actoren hierbij betrokken moeten worden. Maar om te beginnen ga ik een aantal vragen stellen over waarom en hoe transformaties in eerste instantie gestart worden.

Target setting

1. Wat willen organisaties bereiken als ze hun IT-landschap transformeren voor meer agility? Hoe breng je in kaart wat er voor de klant daadwerkelijk het gewenste resultaat van een agility transformatie is?
2. Welke factoren zou je evalueren om te bepalen of het landschap meer agile wordt? Zijn er bepaalde KPIs of OKRs die je hiervoor gebruikt? Dat kan zijn time-to-market, nps, etc.
3. Hoe bepaal je voor of met de klant wat het juiste niveau van agility is? (Hoe formulier je een target state?)

System characteristics

Nu gaan we wat verder in op het de technische aspecten van het IT-landschap, op basis van de data, software en infrastructuur lagen. Dit doen we om erachter te komen welke systeemeigenschappen in kaart gebracht moeten worden gebracht om een beeld te krijgen van de agility van het IT-landschap en welke specifieke archetypen en technologieën in een landschap zorgen voor een hoge of juist lage agility.

IT-landscape

Een IT-landschap kan worden gezien als een systeem. Dit systeem kan worden geanalyseerd op basis van bepaalde eigenschappen of dimensies. Zo kan er bijvoorbeeld worden gezegd dat een landschap minder snel kan reageren op veranderingen als het complexer is.

1. Welke kenmerken/eigenschappen beïnvloeden de agility van het IT-landschap?
2. Hoe breng je deze kenmerken in kaart? Welke methodes, data en sources kan je hiervoor gebruiken?

Data

Ook op data/informatie niveau zijn er bepaalde eigenschappen waar bijvoorbeeld de data architectuur aan moet voldoen om de juiste agility te bieden.

1. Welke kenmerken/eigenschappen van data beïnvloeden de agility van het IT-landschap?
2. Hoe breng je deze eigenschappen in kaart? Welke methodes, data en sources kan je hiervoor gebruiken?

Applicaties/software

Ook op applicatie niveau zijn er bepaalde eigenschappen waar bijvoorbeeld de applicatie architectuur aan moet voldoen om de juiste agility te bieden.

1. Welke kenmerken/eigenschappen van applicaties en software beïnvloeden de agility van het IT-landschap?
2. Hoe breng je deze eigenschappen in kaart? Welke methodes, data en sources kan je hiervoor gebruiken?

Infrastructuur

Dan zijn er als laatste op infrastructuur niveau ook bepaalde eigenschappen waar de infrastructuur binnen het landschap aan moet voldoen om de juiste agility te bieden.

1. Welke kenmerken van infrastructuur beïnvloeden de agility van het IT-landschap?
2. Hoe breng je deze eigenschappen in kaart? Welke methodes, data en sources kan je hiervoor gebruiken?

Technology and architecture archetypes

Een IT-landschap bestaat uit een combinatie van verschillende technologische componenten. Hoe deze componenten geplaatst en verbonden zijn binnen een landschap en met externe actoren wordt bepaald door de architectuur. Om inzicht te krijgen in de verschillende archetypen op het gebied van architectuur en technologieën heb ik de volgende vragen:

1. Hoe wordt de agility van het IT-landschap beïnvloed door de architectuur? Kan je specifieke archetypen benoemen die linkt aan ofwel een lage ofwel een hoge agility?
2. Welke methodes en data gebruik je om dit voor een klant in kaart te brengen?
3. Welke specifieke technologie archetypen zou je koppelen aan een lage agility en welke aan een hoge agility?
4. Hoe breng je deze in kaart?

Barriers and enablers

Binnen organisaties zijn er waarschijnlijk oorzaken aan te wijzen voor het feit dat het landschap nog niet agile is, of dat de transformatie naar een meer agile landschap moeizaam verloopt. Daarom is het van belang een beeld te vormen van de factoren die de transformatie naar agility mogelijk maken of juist blokkeren. Dus de enablers en barrières voor het creëren van een agile IT-landschap.

Barriers

1. Wat zijn de grootste barrières voor organisaties om een agile IT-landschap te realiseren?
2. Hoe breng je de verschillende barrières binnen een organisatie in kaart?
3. Hoe kan de organisatie omgaan met deze barrières?

Enablers

1. Wat zijn de grootste enablers voor het creëren van een agile IT-landschap?
2. Hoe breng je in kaart of deze enablers aanwezig zijn binnen een organisatie?

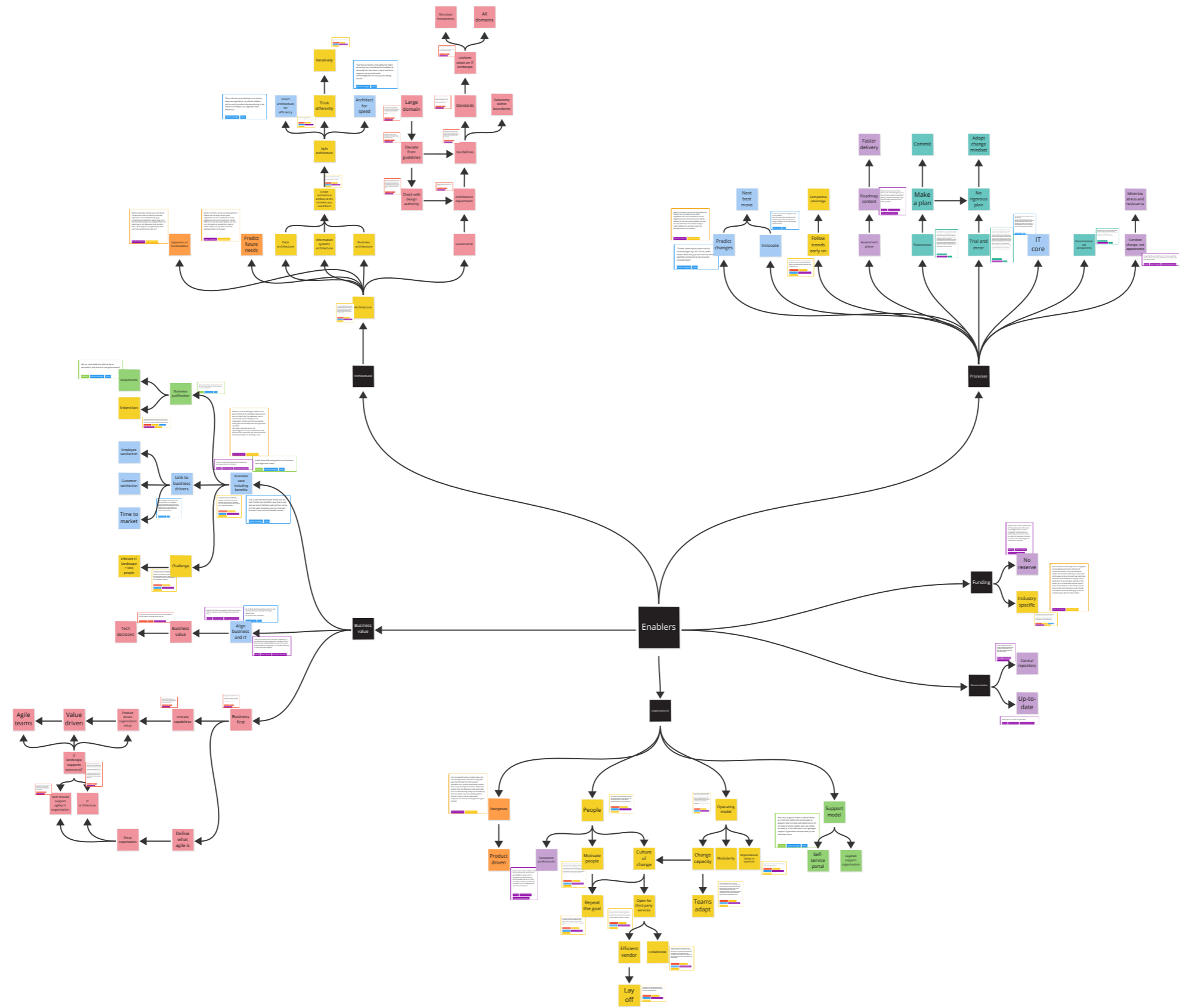
Assessment

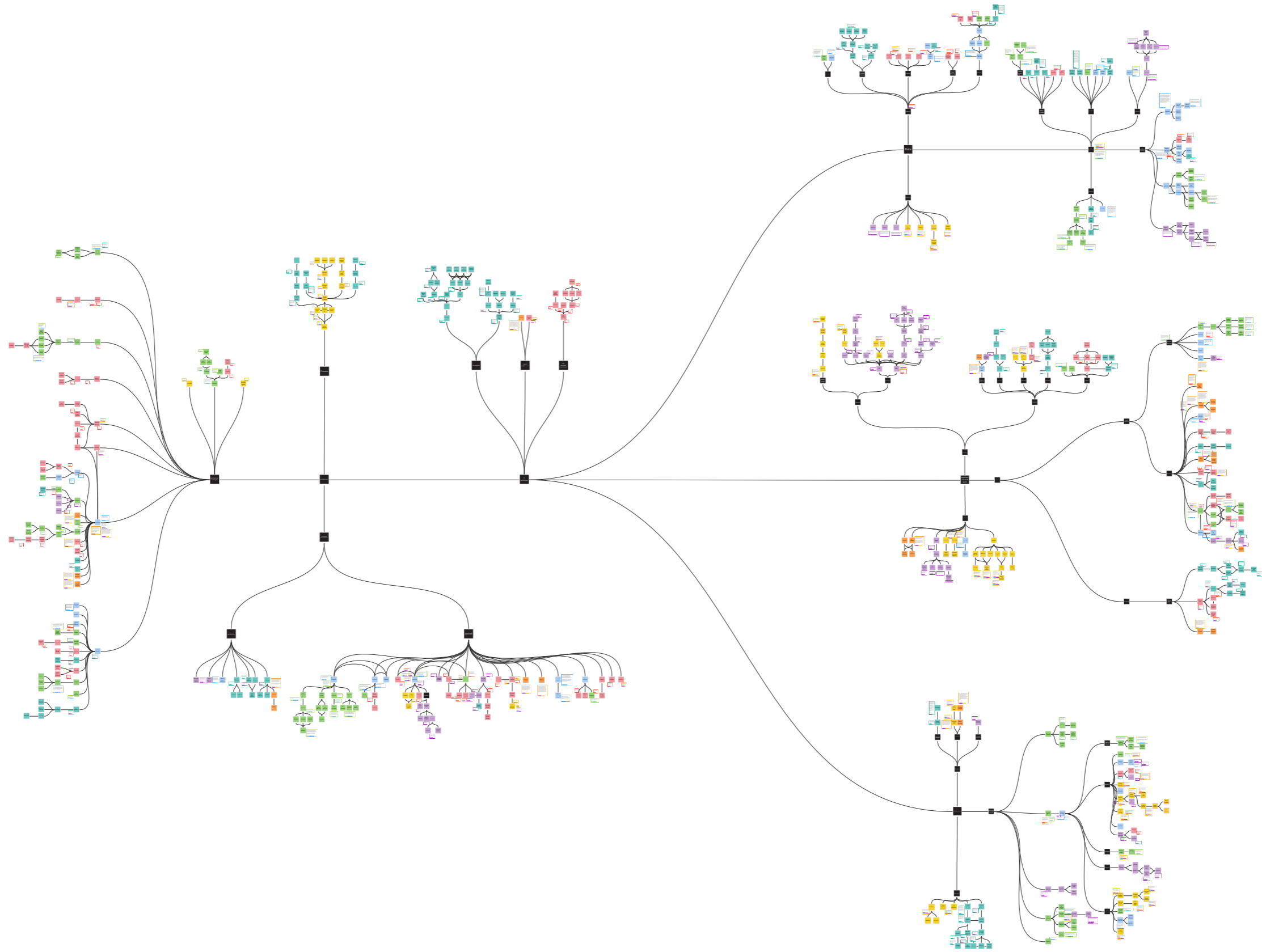
Op basis van de inzichten die uit de interviews is er zal er een evaluatie framework worden opgesteld. Aan de hand van dit framework kan een assessment worden opgesteld. Stel deze assessment ontwikkeld worden:

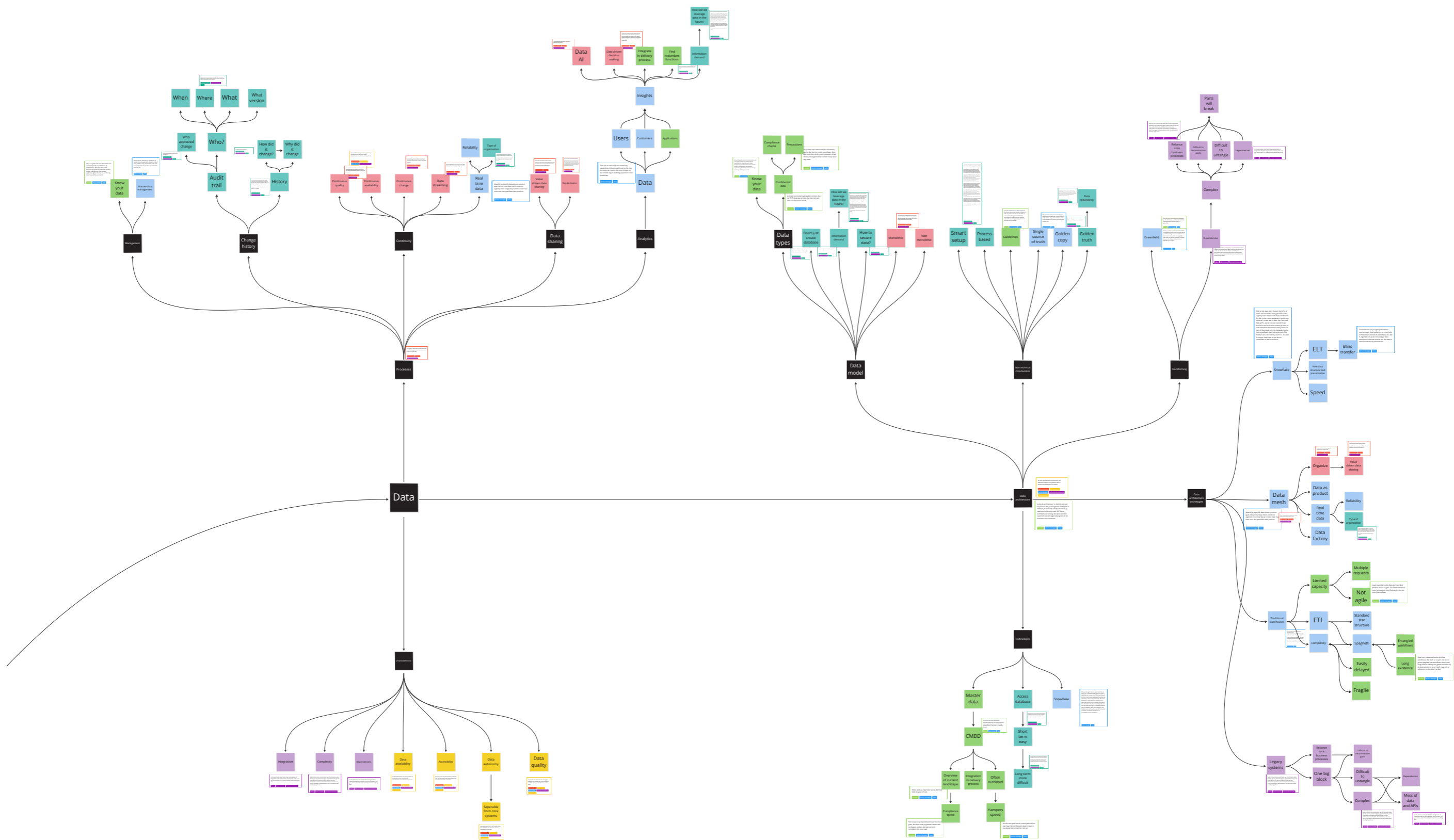
1. Wat zou voor jou de gewenste vorm zijn van een IT-landschap assessment? Hoe zou je het toepassen?
2. Aan welke voorwaarden zou een assessment over, van, voor IT-landschap agility voldoen?
3. Welke stakeholders zouden er vanuit de klant betrokken moeten zijn bij de evaluatie van het IT-landschap?

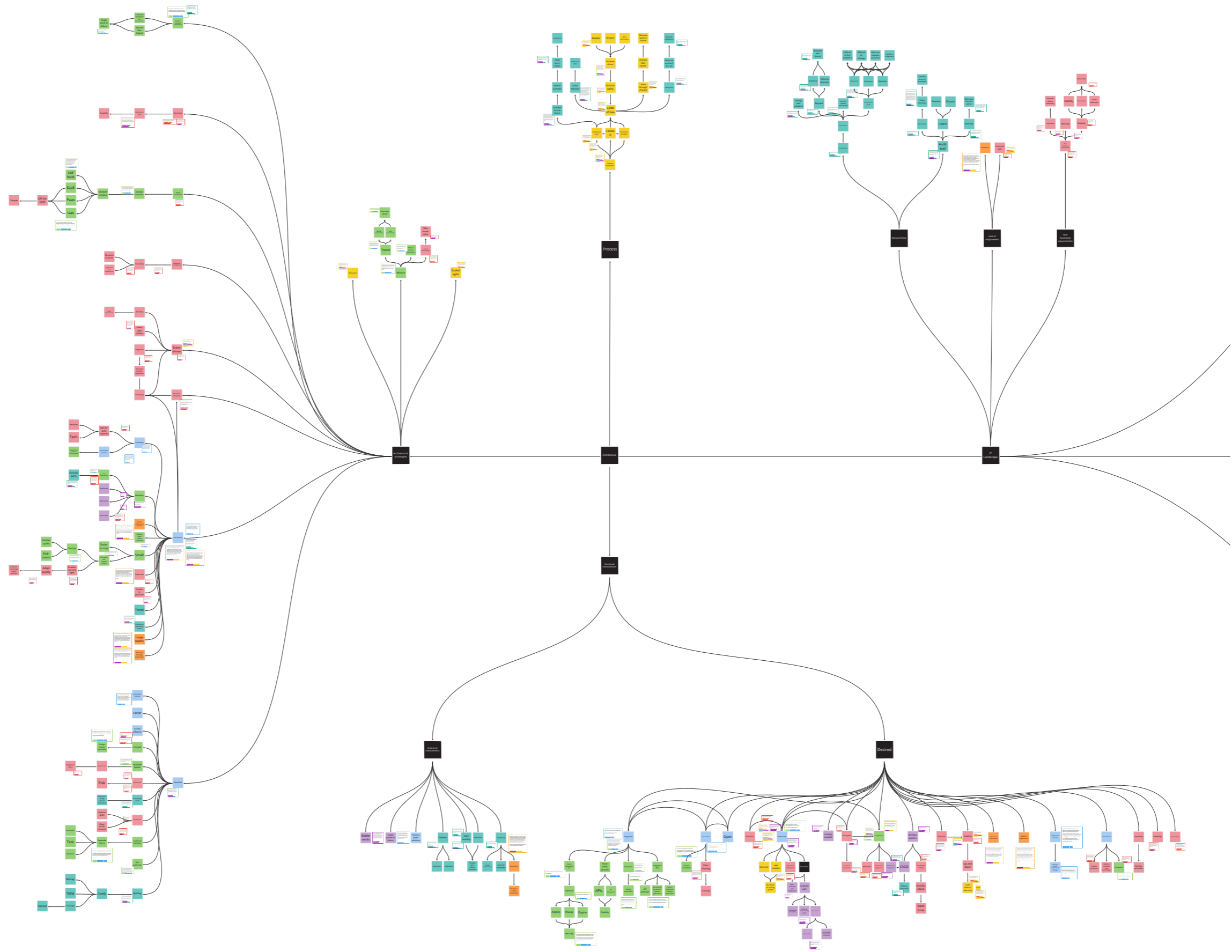
Worst practice to best practice (Optioneel als er tijd is voor anekdotes)

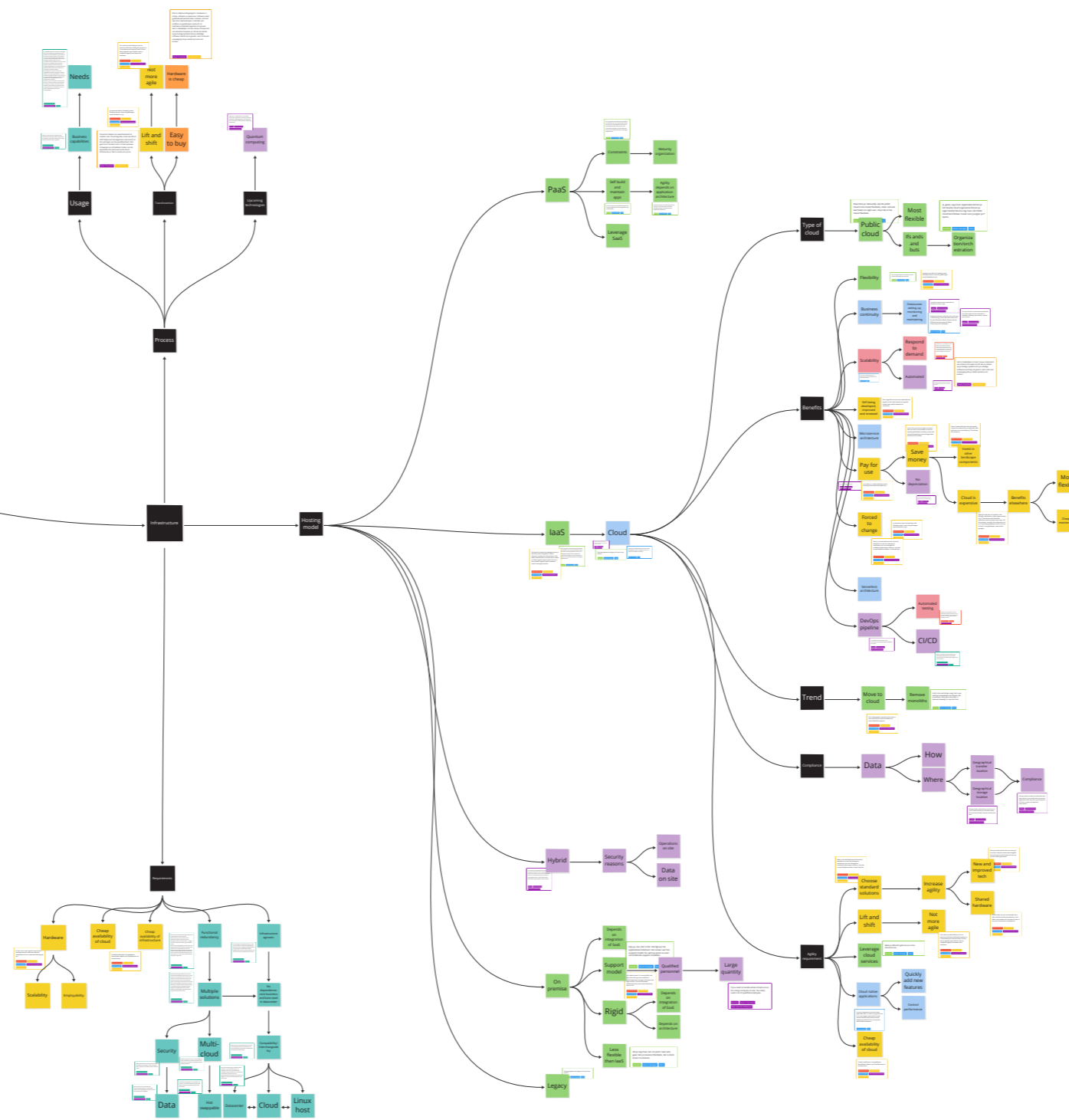
1. Als je een voorbeeld zou moeten noemen van een worst practice, een landschap dat totaal niet agile is, hoe ziet zo'n landschap eruit (welke kenmerken zou je toeschrijven aan zo'n landschap)?
2. Als je een voorbeeld zou moeten noemen van een best-practice landschap, een landschap wat heel agile is, hoe ziet dat landschap eruit (welke kenmerken zou je toeschrijven aan zo'n landschap)?

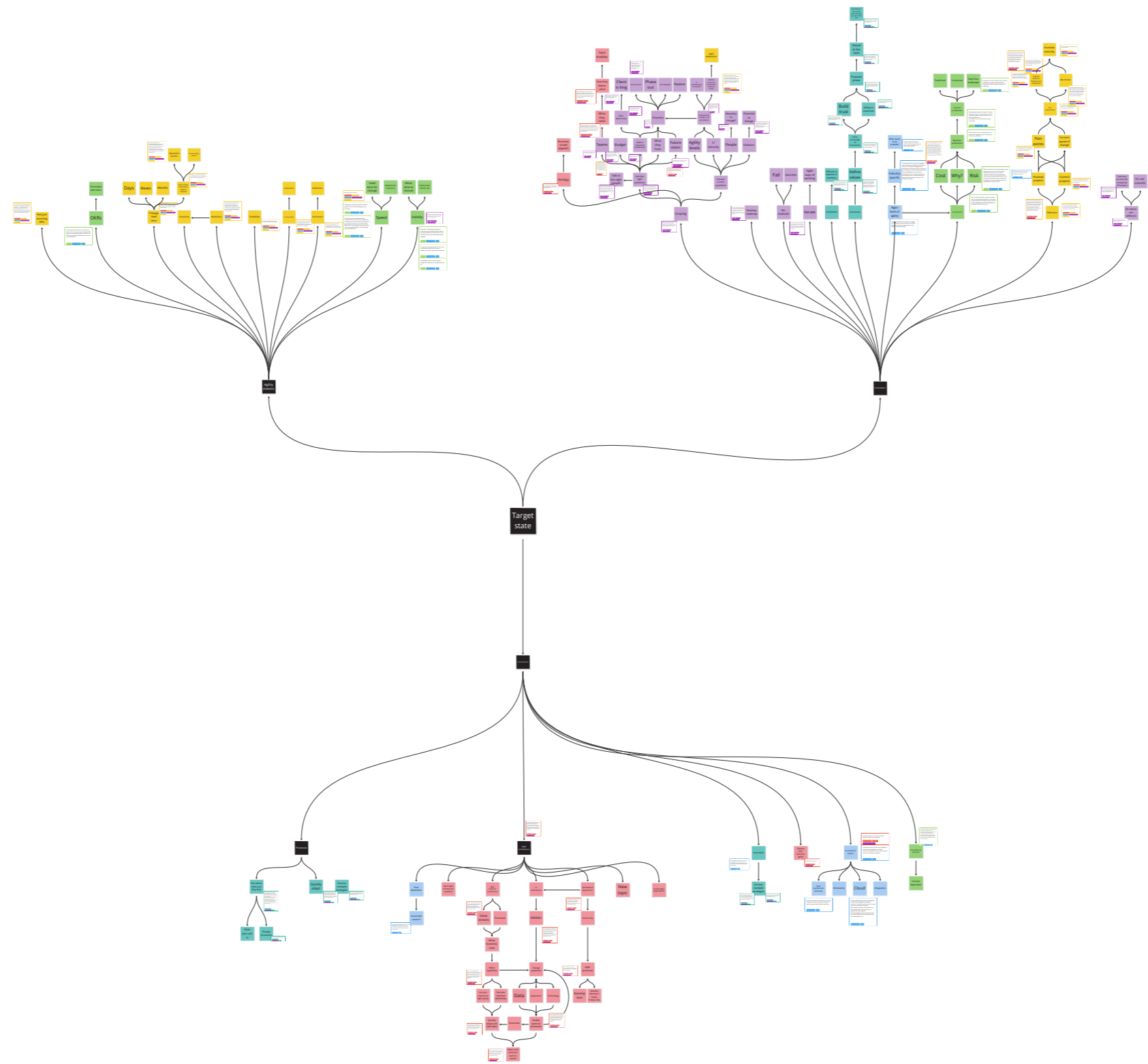


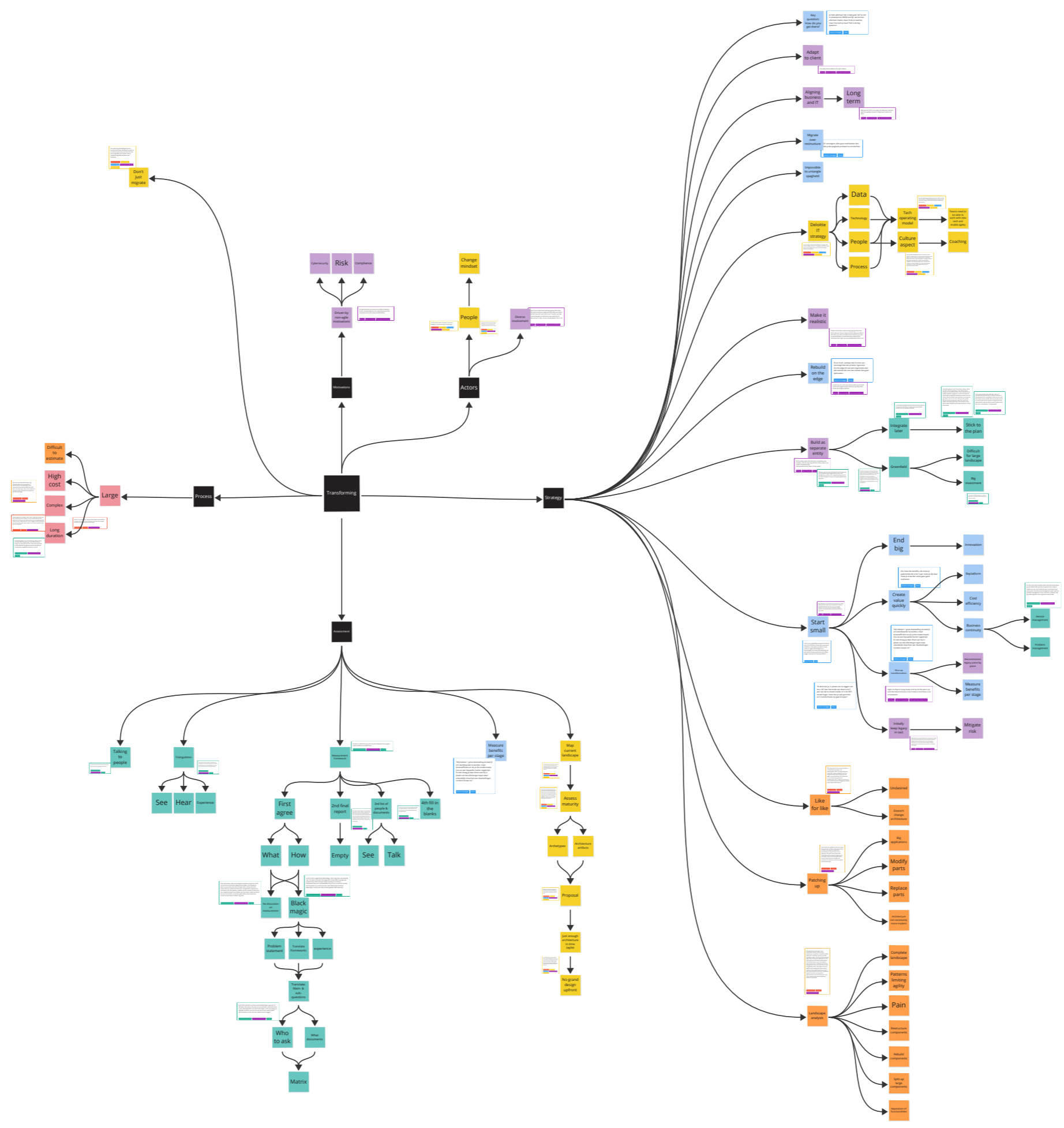




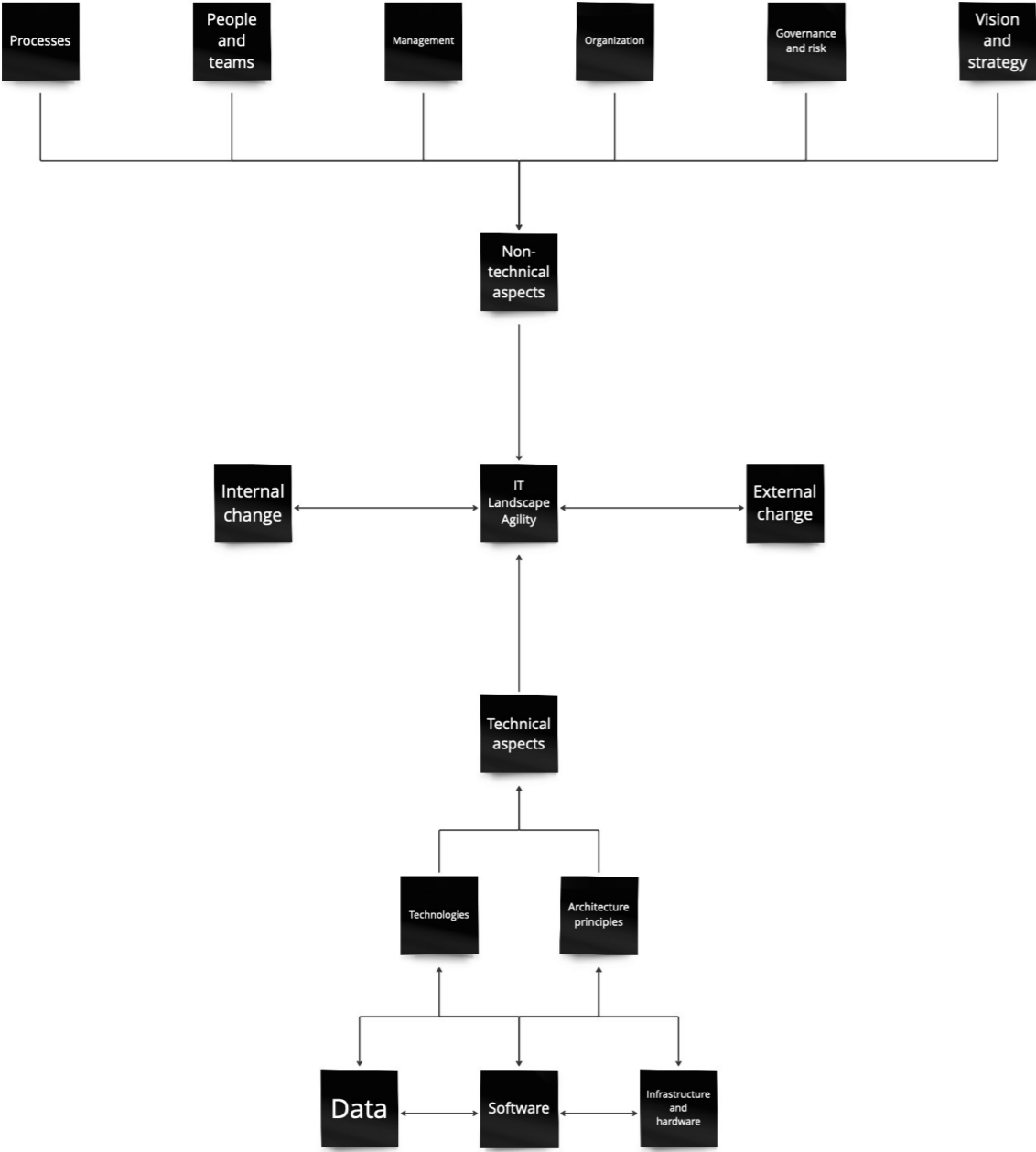




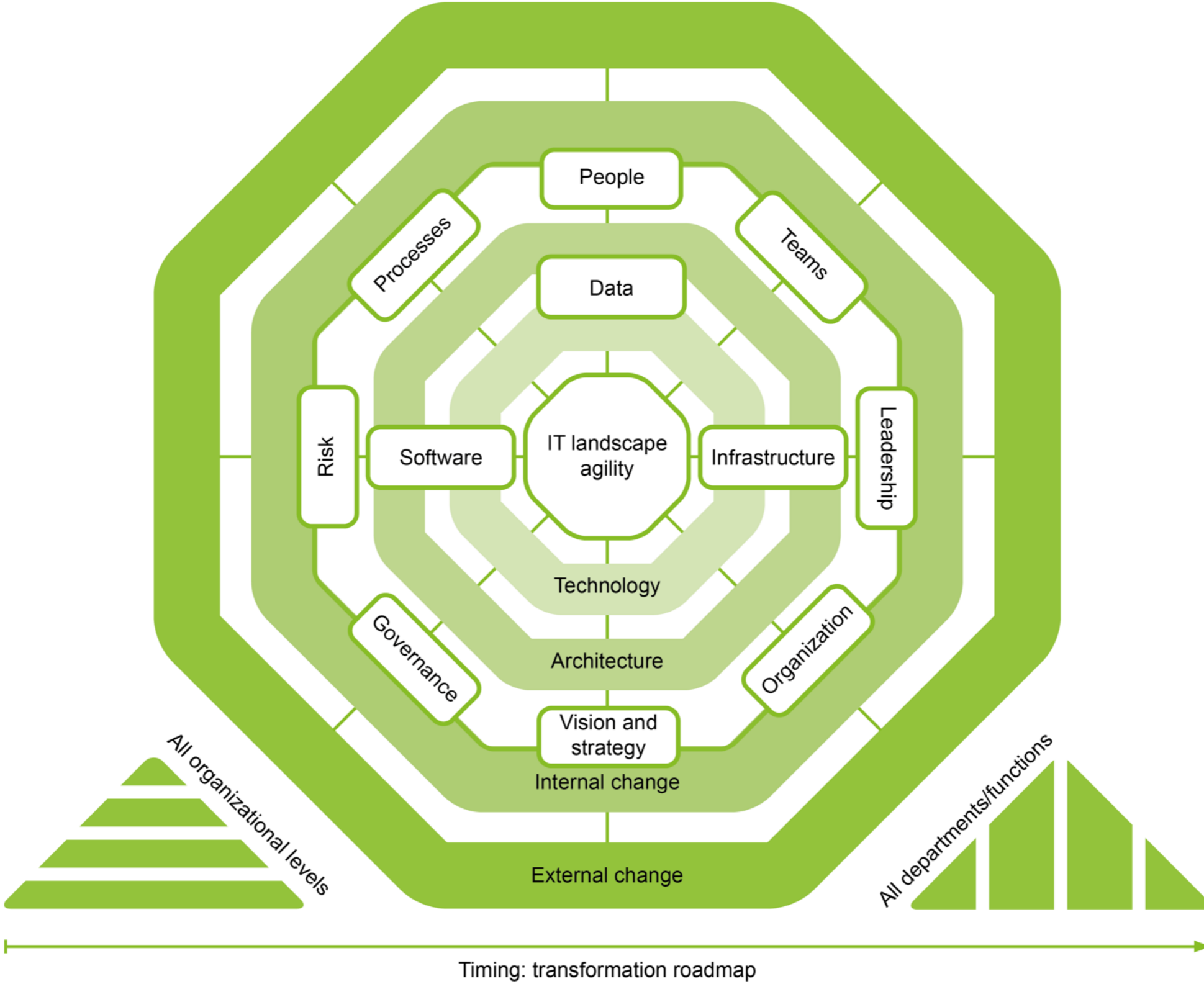




Appendix J: Framework second iteration

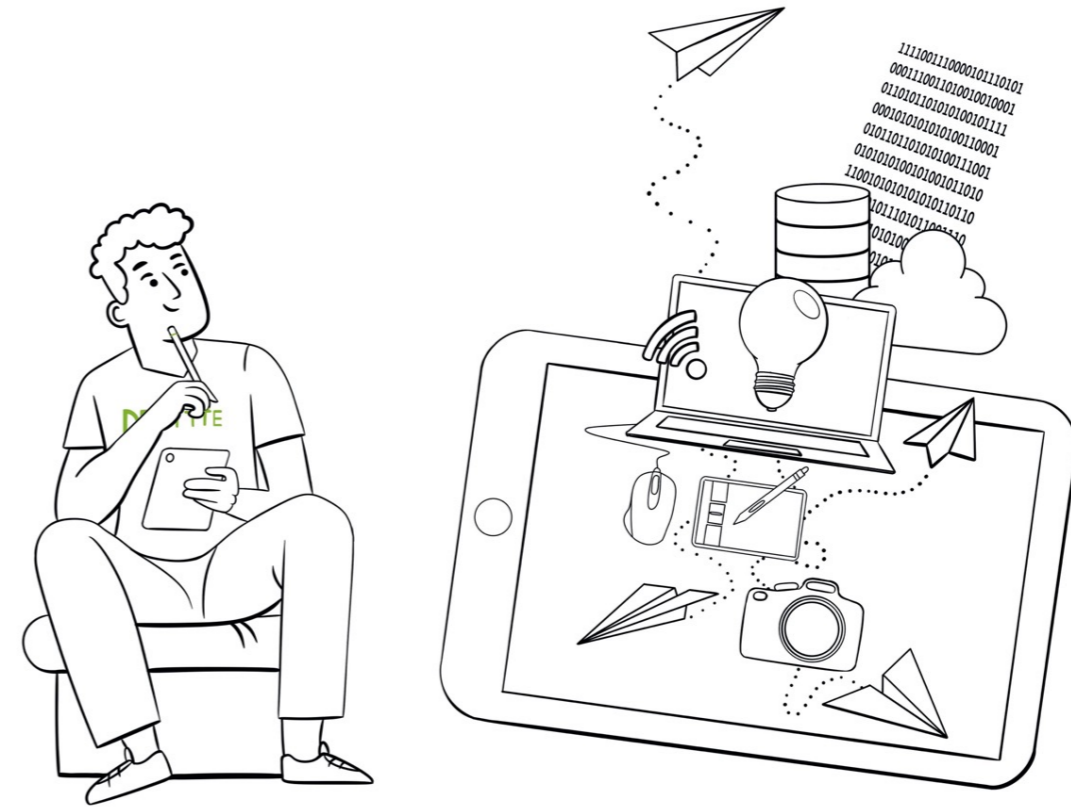
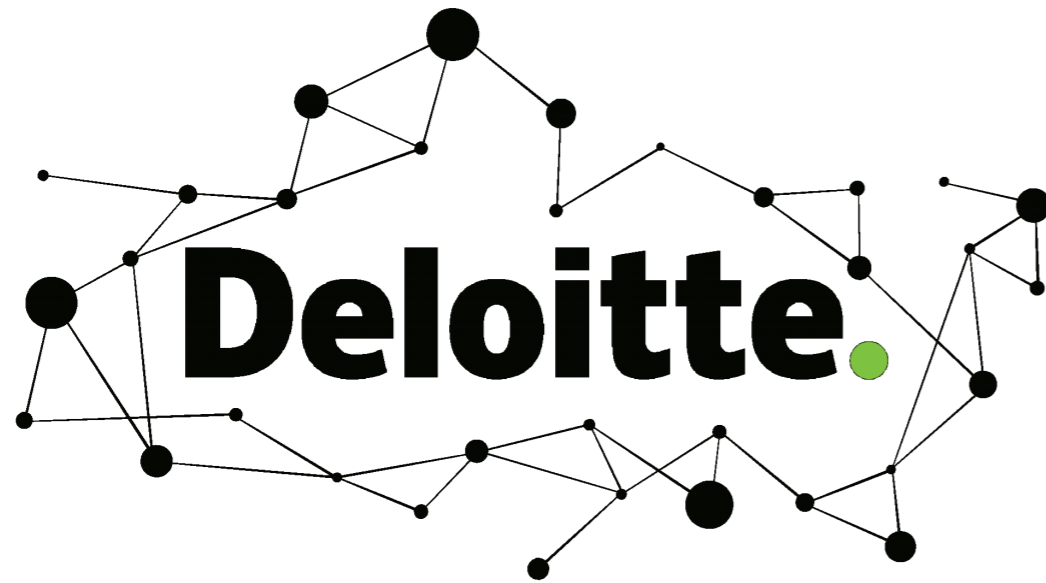


Appendix K: Framework final iteration



Appendix L: Survey first iteration

Introduction



Welcome to the IT Landscape monitor! In this survey we are going to take a closer look at the agility of the IT landscape of your organization. The IT landscape includes all active IT assets within your organization, ranging from hardware to data. Please bear in mind that this monitor is still under development.

The purpose of this survey is to discover the agility of the IT landscape within your organization. We would like you to give an honest opinion on the current state. The results of this survey will

be used for further optimization. Filling in the survey will only take you about ten minutes. We would kindly like to request you to give a clarification for some of the answers given.

To start of the survey, we would you to fill in some personal information. Data gathered in this survey will be treated with confidentiality and results can't be traced back to the participants.

Please enter your age:

Age

A horizontal slider with a blue circle marker is positioned above a numerical scale from 0 to 100 in increments of 10. Below the scale is a text input field.

Please select your gender identity:

Please enter your current position

Click to fill in your department

Click to fill in your team

Click to fill in your function

How many years have you been working for us:

Years of experience:

	Department	Team	Function
	<input type="text"/>	<input type="text"/>	<input type="text"/>

The first part of the survey is about your experience with the IT assets within your company. When you come across a question that should not be in this survey, we would like you to choose the option "not applicable". In this way the survey can be optimized further.



IT landscape in General

IT Landscape in general



How satisfied are you with the functionalities of the current IT assets within your organization? (think about the software and hardware you use)

How effective are our current IT assets at supporting innovation and competitive advantage?

How satisfied are you with the speed at which your current IT landscape can incorporate new requirements and needs from within our organization?

How satisfied are you with the speed at which your current IT landscape can incorporate new business requirements?

How satisfied are you with the support for the current IT assets?

How satisfied are you with the current management of IT assets?

Our IT assets support our organization in quickly adapting to changing internal and environmental needs

Architecture

Architecture

This section of the survey will require you to answer a few questions about the architecture of your current IT landscape. Please note when your answers only apply to a specific section of the IT landscape.



We have a clear set of architectural guidelines when it comes to our IT assets.

It is clear who is in charge of the architectural guidelines.

It is easy to bypass our architecture principles when developing new solutions.

The importance of adhering to architecture principles is communicated effectively.

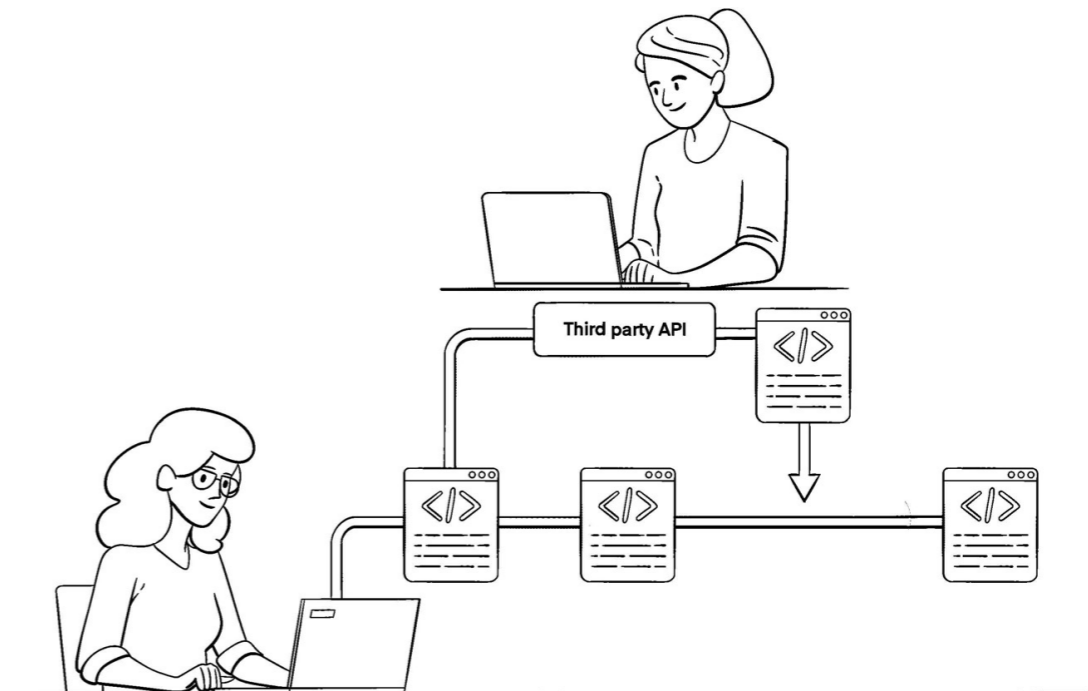
There is a clear overview of our architecture principles.

Current architecture principles make implementing change more easy.

Data

Data

This section of the survey contains a couple of questions and statements about data and how it's handled within your organization.



How well does data support your organization to sense change in your operating environment?

How well does data support processes within your organization?

The current data model can quickly be adapted to changing processes.

Business requests for changes to our current datamodel can quickly be implemented.

Data drives our decision making.

We leverage data to analyze our current IT assets.

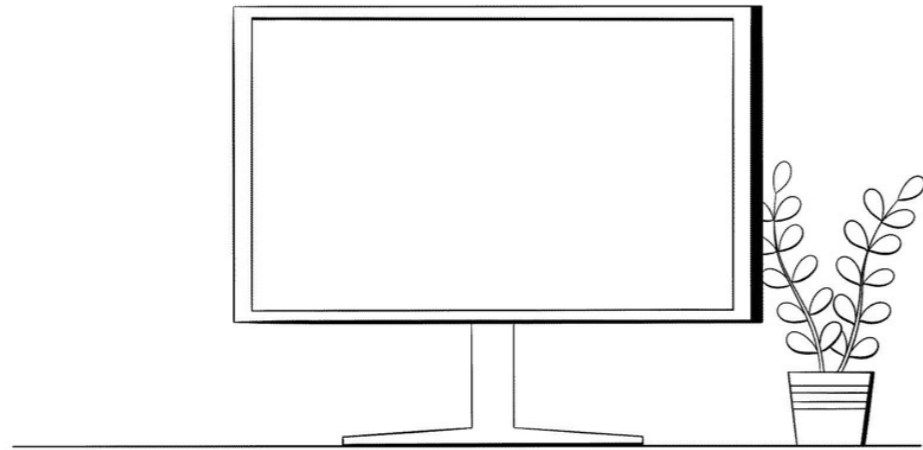
We have a clear data architecture,

We have a clear information architecture.

Software

Software

This section of the survey will require you to answer a few questions and statements about the software of your current IT landscape. Please note when your answers only apply to a specific section of the IT landscape.



How well does your software support your organization to sense change in your operating environment?

How well does the software support processes within your organization?

The current software applications can quickly be adapted to changing processes.

Requests for change to our current software can quickly be implemented.

Our current applications don't limit our ability to implement new (business) functions.

We have clear architectural guidelines for our software.

Infra and hardware

Infrastructure and hardware

This section of the survey will require you to answer a few questions and statements about the infrastructure and hardware

of your current IT landscape. Please note when your answers only apply to a specific section of the IT landscape.

How well does your infrastructure support your organization to sense change in your operating environment?

How well does your infrastructure support your organization to sense change in your operating environment?

Our current infrastructure can quickly be adapted to changing processes.

Business requests for changes to our current infrastructure can quickly be implemented.

Our current infrastructure doesn't limit our ability to implement new (business) functions.

Processes

Processes

This section of the survey will require you to answer a few questions and statements about the processes within your organization. Please note when your answers only apply to a specific section of the IT landscape.

We work in short cycles.

We create feedback loops.

From request for change to implementation there are many handovers.

We generally follow the following way of working.

Deployment can be done continuously.

Different business and IT functions can connect easily.

Deployment can be done simultaneously.

We tend to have many experiment every day.

People and teams

People and teams

This section of the survey will require you to answer a few questions and statements about the people and teams within your organization. Please note when your answers only apply to a specific section of the IT landscape.

People within our organization are able to adapt to new IT assets quickly.

We rely strongly on 'subject matter experts'.

Teams are small in size.

Teams are multi-disciplinary.

Individuals and teams have a clear scope and goal.

Individuals can operate autonomously.

Teams can operate autonomously.

Management

Management

This section of the survey will require you to answer a few questions and statements about management within your organization. Please note when your answers only apply to a specific section of the IT landscape.

Management recognizes a need for an agile IT landscape.

Management prioritizes modernization of legacy IT.

Management supports and initiates investing in new IT functions.

Management is risk averse.

Management guides decision making on IT assets.

Organization

Organization

This section of the survey will require you to answer a few questions and statements about the organization of our

company. Please note when your answers only apply to a specific section of the IT landscape.

Business and IT are completely aligned within our organization.

There is a culture of change within our organization.

There is a clear separation of responsibilities between business functions.

Different business functions rely on the same IT assets.

There is acceptance of third party services.

Governance and risk

Risk and governance

This section of the survey will require you to answer a few questions and statements about the risk and governance within our company. Please note when your answers only apply to a specific section of the IT landscape.

Our organization is risk averse.

Risk and compliance limit our ability to implement change.

There are clear compliance guidelines.

Implementing new technologies raise many compliance

questions.

Strategy and vision

Risk and governance

This section of the survey will require you to answer a few questions and statements about the risk and governance within our company. Please note when your answers only apply to a specific section of the IT landscape.

There is a clear long-term vision to increase agility of our IT assets.

Our IT landscape and processes are part of our company strategy.

We tend to think everything thoroughly before developing.

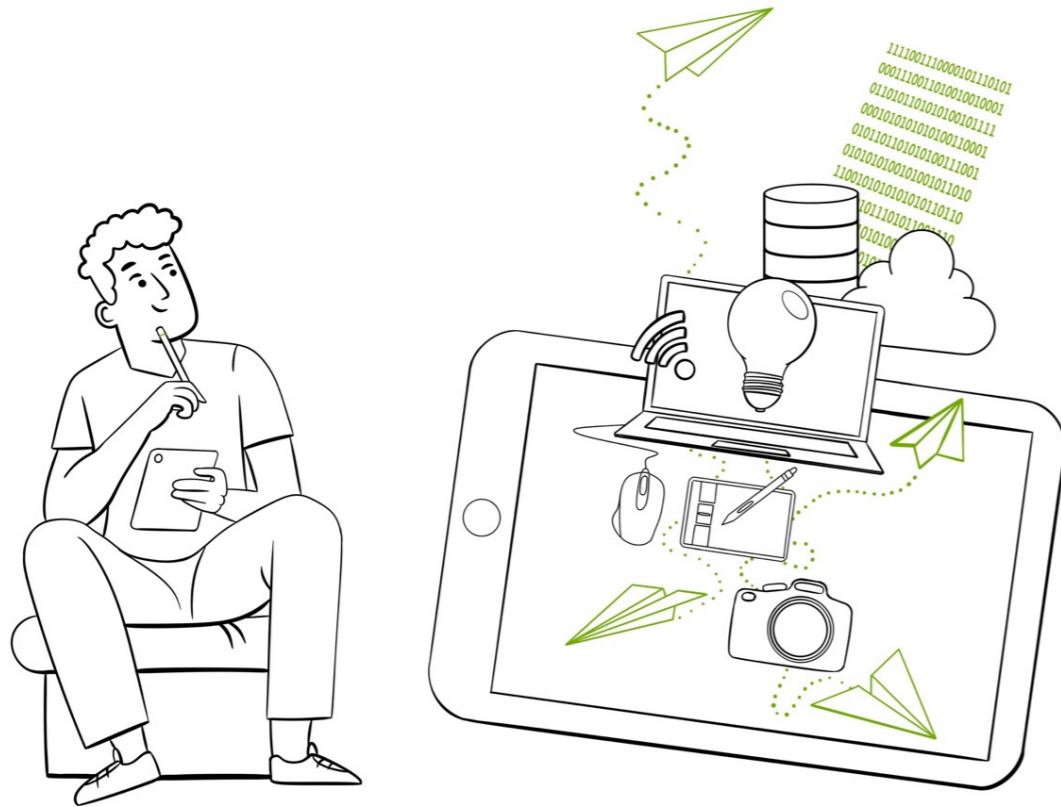
Adapting IT assets is a priority within our overall strategy.

Our IT strategy is aligned with our overall strategy.

Appendix M: Last iteration survey - IT department

Introduction

IT landscape agility survey



Welcome to the IT Landscape agility survey! In this survey we are going to take a closer look at the agility of the IT landscape of your organization. The IT landscape includes all active IT assets

within your organization, ranging from infrastructure to data. The purpose of this survey is to analyze the agility of the IT landscape within your organization.

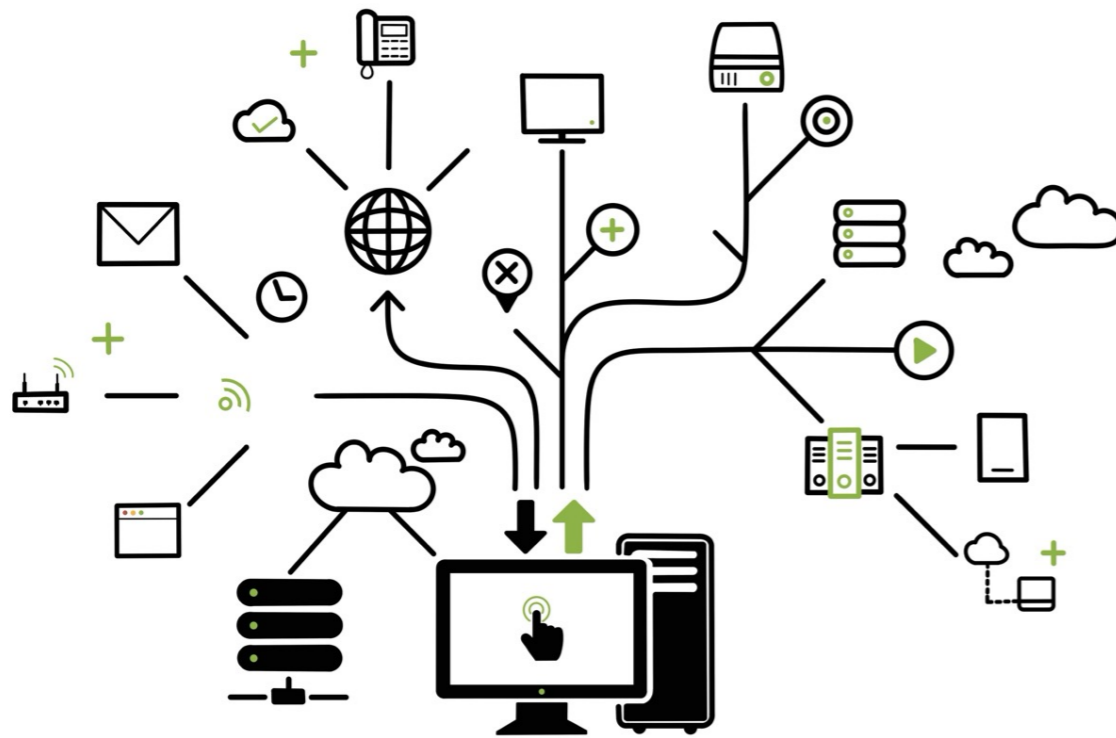
We would like you to give an honest opinion on the current state. The results of this survey will be used for recommendations on further optimization. Filling in the survey will take about ten minutes.

It is important to understand that this survey is part of a graduation project for Strategic Product Design at the TU Delft, please bear in mind that this survey is still under development. Data collected throughout this survey is handled with care and confidentiality is guarded. By filling out the survey you give consent that data collected will be used in the result section of the graduation project.

Since this survey is still under development, there is a comment section at the end of the survey. This section is, in this stage of the graduation project, more essential than the actual responses on the survey. When you come across a question during the survey that should not be included, we would kindly ask you to select the option "not applicable".

Topic clarification

IT Landscape agility explanation



For this research the IT landscape is defined as the combination of all tangible and non-tangible information technology components, which includes the hardware, software and data. These components form information systems, which are under the influence of internal and external factors.

The agility of an IT landscape is for this research described as

"the ability of an IT landscape to quickly sense and adapt to internal and external changes". This adaptatoon can both be executed through human interference or automatically.

The agility of an IT landscape is influenced by multiple factors, such different types of technologies and architectures, but also by the processes and people interacting with the information technologies.

IT landscape in General

IT Landscape in general

The survey will touch upon several aspects of the IT landscape. The first part is about your experience with the IT facilities within your company.



How satisfied are you with the functionalities of the current IT assets within your organization? (think about data, software and hardware you use)

Extremely dissatisfied Somewhat dissatisfied Neither satisfied nor dissatisfied Somewhat satisfied Extremely satisfied Not applicable

Employees often have requests for change when it comes to IT assets.

Strongly agree Not applicable

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree

Stakeholders (users who aren't employees) often have requests that require changes in our IT landscape.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

How satisfied are you with the speed at which the current IT landscape can incorporate new requirements?

Extremely dissatisfied Somewhat dissatisfied Neither satisfied nor dissatisfied Somewhat satisfied Extremely satisfied Not applicable

How effective are current IT assets in supporting the organization to innovate?

Very ineffective Somewhat ineffective Neither effective nor ineffective Somewhat effective Very effective Not applicable

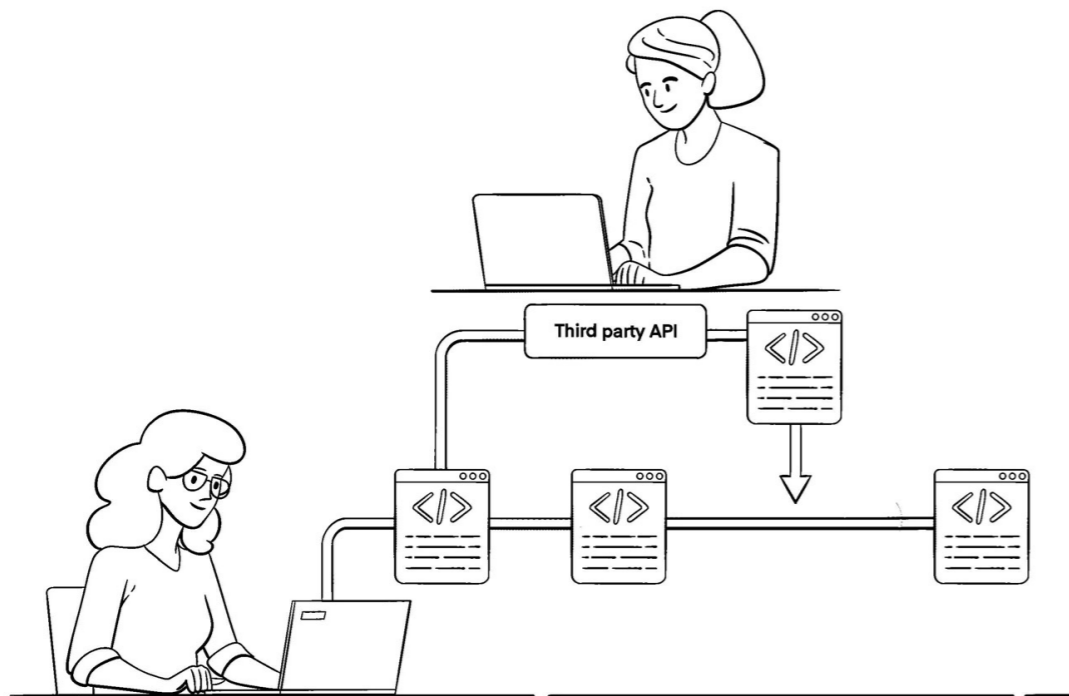
How well is the support provided on IT assets within the IT landscape?

Very poor Poor Acceptable Good Very good Not applicable

Data

Data

This section of the survey contains a couple of questions and statements about data and how it's handled within your organization.



There are often requests for change that require us to adapt our data model.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

The current data model can quickly be adapted to changing needs.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

How well is data analyzed to observe internal change?

Very insufficient Somewhat insufficient Neither sufficient nor insufficient Somewhat sufficient Very sufficient Not applicable

How well is data analyzed to observe external change? (for example in change in the operating environment of your organization)

Very insufficient Somewhat insufficient Neither sufficient nor insufficient Somewhat sufficient Very sufficient Not applicable

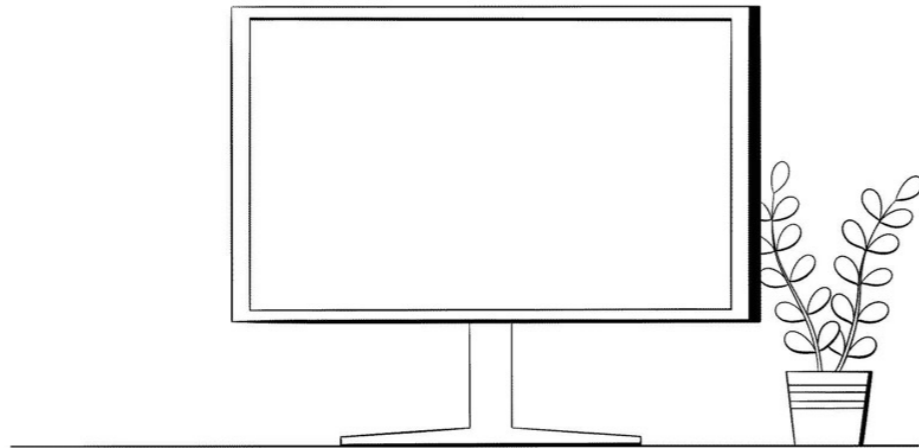
Data drives our decision making.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Software

Software

This section of the survey will require you to answer a few questions and statements about the software of your current IT landscape. Please note when your answers only apply to a specific section of the IT landscape.



We constantly improve our software applications to support processes within our organization.

Strongly disagree Disagree Neither disagree nor agree Agree Strongly agree Not applicable

Software can quickly be adapted to changing business processes.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

All of our applications allow us to constantly innovate by implementing new functionalities.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Our applications can be modified by employees who do not work in the IT department. (for example with low-code or no-code solutions)

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

We analyze how well our applications perform.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

The quantity of applications in our IT landscape limits our ability to implement change.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

There are applications in our IT landscape that can only be modified by employees with specific knowledge.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

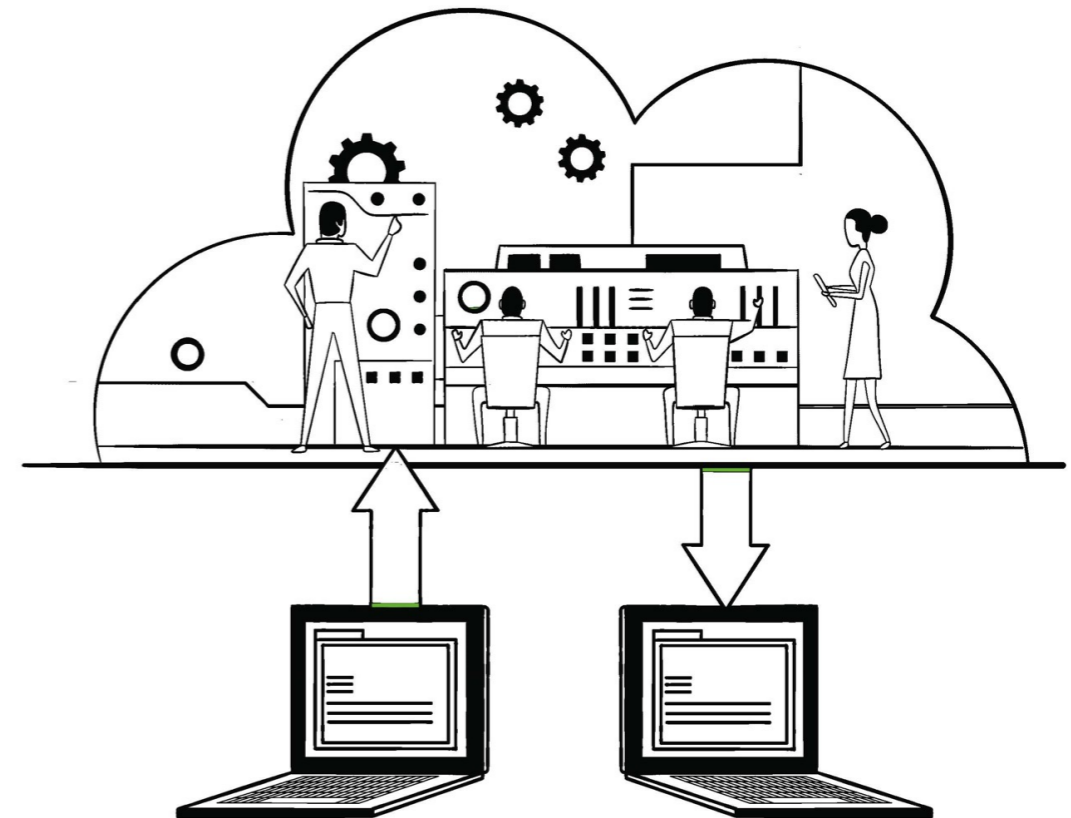
We mostly utilize software-as-a-service (SaaS) for our applications.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Infra and hardware

Infrastructure and hardware

This section of the survey will require you to answer a few questions and statements about the infrastructure and hardware of your current IT landscape. Please note when your answers only apply to a specific section of the IT landscape.



We often get requests for change that require us to modify our IT

infrastructure.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Our current infrastructure (including the hardware) can quickly be adapted based on requests for change.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

When implementing new functionalities in our IT landscape, our hardware and infrastructure are a limiting factor.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

We continuously analyze the performance of our hardware and IT infrastructure.

Strongly disagree Disagree Neither disagree nor agree Agree Strongly agree Not applicable

There are infrastructure elements that can only be modified by IT

employees with specific knowledge.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

We mostly utilize infrastructure-as-a-service for our infrastructure.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

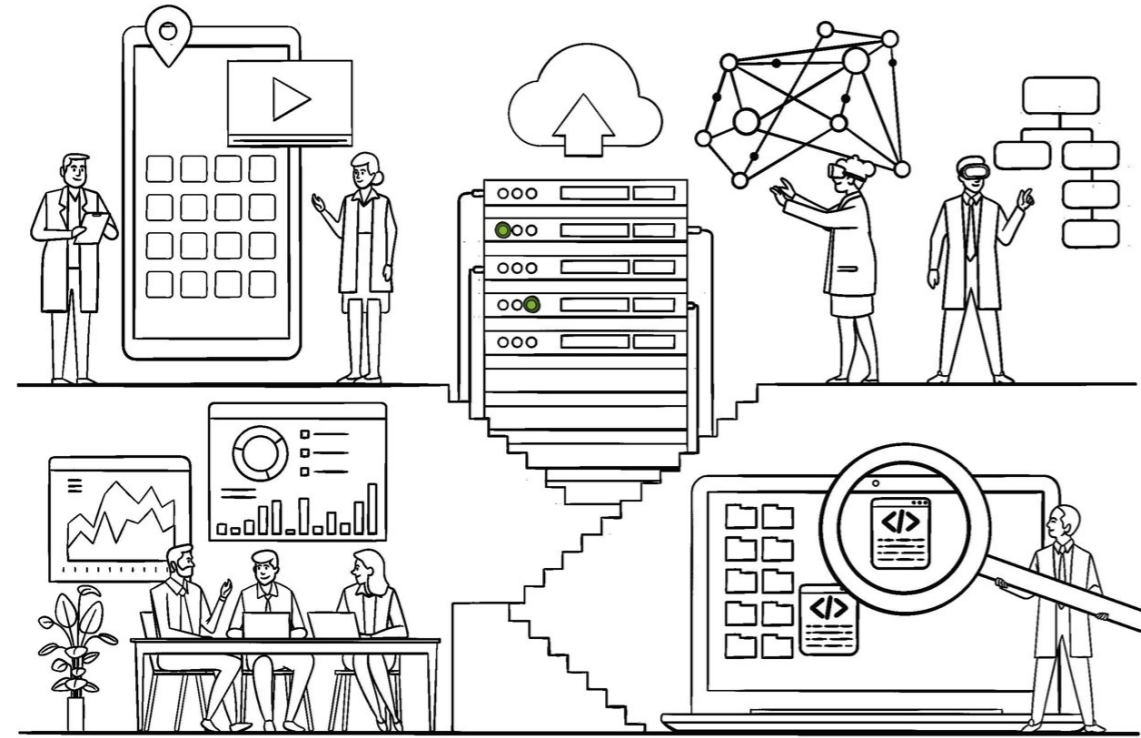
We mostly utilize platform-as-a-service for our platforms.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Architecture

Architecture

This section of the survey will require you to answer a few questions about the architecture of your current IT landscape. Please note when your answers only apply to a specific section of the IT landscape.



We have a clear information architecture.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

We have a clear data architecture.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

We have a clear set of architecture principles for software.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

We have a clear set of architecture principles for our infrastructure.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

We have a clear set of architectural guidelines for our IT landscape.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Current architecture principles accelerate change within the IT landscape.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

I would consider the architecture of the IT landscape as agile.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

It is clear who is in charge of the architectural guidelines.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

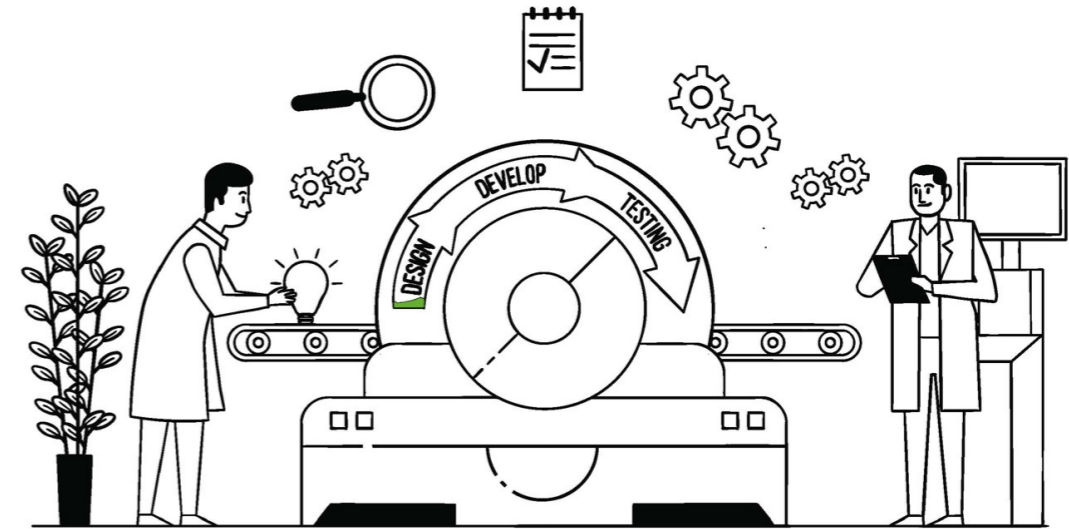
It is communicated sufficiently why it is important to stick to architecture principles.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

It is easy to bypass our architecture principles when necessary.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Processes



Processes

This section of the survey will require you to answer a few questions and statements about the processes within your organization. Please note when your answers only apply to a specific section of the IT landscape.

We tend to think everything thoroughly through before developing

new functionalities.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

We work in short cycles.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

We create feedback loops.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

How well does the IT department communicate with other departments about the development of new functionalities?

Very poor Poor Neither good nor poor Good Very good Not applicable

From request for change to implementation there are many handovers.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Deployment can be done continuously.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Deployment can be done simultaneously.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

We generally follow the following way of working:

Agile way of working DevOps Waterfall Other

If "Other" was selected in the previous question, please fill in here what way of working is followed:

We can quickly change the process we follow when it comes to working on IT assets.

Strongly agree Not applicable

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree

People and teams

People and teams

This section of the survey will require you to answer a few questions and statements about the people and teams within your organization. Please note when your answers only apply to a specific section of the IT landscape.

We work in relatively small teams.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Our teams are multi-disciplinary.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Teams have clear responsibilities.

Strongly agree Not applicable

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree

Teams can operate autonomously.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

We rely strongly on 'subject matter experts'.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Individuals can operate autonomously.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Individuals have clear responsibilities.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

IT employees are generally up-to-date on the latest

developments within the IT industry.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Management

Management

This section of the survey will require you to answer a few questions and statements about management within your organization. Please note when your answers only apply to a specific section of the IT landscape.

IT management recognizes the need for an agile IT landscape.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

IT management guides decision making on changes in our IT landscape.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

IT management prioritizes the modernization of legacy IT.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Management (CVB) supports investing in IT assets to increase agility.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Management (CVB) is risk averse.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Organization

Organization

This section of the survey will require you to answer a few questions and statements about the organization of our company. Please note when your answers only apply to a specific section of the IT landscape.

There is a culture of change within our organization.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

There is a clear separation of responsibilities between departments.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Different business functions rely on the same IT facilities.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Our IT department is aligned with other departments within our organization.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

We have silos within our organization that make communication between departments more difficult.

Strongly agree Not applicable

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Governance and risk

Risk and governance

This section of the survey will require you to answer a few questions and statements about the risk and governance within our company. Please note when your answers only apply to a specific section of the IT landscape.

There are clear compliance guidelines when it comes to information technologies.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Compliance guidelines slow down change within our IT landscape.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Risk management limits our ability to implement change.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

It is clear who to contact when it comes to questions about risk and governance of information technology.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Our organization has acceptance for the integration of third party services.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

We rely on third party services and vendors for the functioning of our IT landscape.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Strategy and vision

Vision and strategy

This section of the survey will require you to answer a few questions and statements about the vision and strategy of our company. Please note when your answers only apply to a specific section of the IT landscape.

There is a clear long-term vision to increase the agility of our IT landscape.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Agility of the IT landscape is part of our company's overall strategy.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

The IT strategy is aligned with the overall strategy of our organization.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Comments

If you want to suggest changes necessary to increase the agility of the IT landscape, you may mention them here:



The purpose of this section is to evaluate the survey in its current state. Please give your unvarnished opinion on the aspects that should be improved.

If a consultancy firm would be assisting the TU Delft in an IT transformation, would a survey like this be a suitable method for retrieving insights from employees? Please motivate your answer.



What are the shortcomings of this survey according to you?



What do you think the strengths of a survey like this are?



What topics or questions did you miss in this survey which should be included in the survey for better insights in the agility of the IT landscape?



How would you like the results from this survey to be communicated to you as an employee?



The target audience for this survey is employees from the IT department within the TU Delft, a similar survey was sent to employees from other departments. Is there another group of users that should fill in this survey?



If you have other suggestions to improve this survey or the outcome we would like you to mention them here:



Personal information

To finish the survey we would kindly like to request you to fill in your personal information. Data gathered in this survey will be treated with confidentiality and results can't be traced back to the participants.

Please enter your age:

Age 10 20 30 40 50 60 70 80 90 100

Please select your gender identity:

Please enter your current position

Click to fill in your department

Click to fill in your team

Click to fill in your function

How many years of experience do you have within our organization?

Years of experience (numerical values):

	Department	Team	Function
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

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Introduction



IT landscape agility survey

Welcome to the IT Landscape agility survey! In this survey we are going to take a closer look at the agility of the IT landscape of your organization. The IT landscape includes all active IT assets

Appendix N: Last iteration survey - Other departments

Qualtrics Survey Software

09-05-2024 12:04

Introduction

IT landscape agility survey

Welcome to the IT Landscape agility survey! In this survey we are going to take a closer look at the agility of the IT landscape of your organization. The IT landscape includes all active IT assets

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Qualtrics Survey Software

09-05-2024 12:04

within your organization, ranging from infrastructure to data. The purpose of this survey is to analyze the agility of the IT landscape within your organization.

We would like you to give an honest opinion on the current state. The results of this survey will be used for recommendations on further optimization. Filling in the survey will take about ten minutes.

It is important to understand that this survey is part of a graduation project for Strategic Product Design at the TU Delft, please bear in mind that this survey is still under development. Data collected throughout this survey is handled with care and confidentiality is guarded. By filling out the survey you give consent that data collected will be used in the result section of the graduation project.

Since this survey is still under development, there is a comment section at the end of the survey. This section is, in this stage of the graduation project, more essential than the actual responses on the survey. When you come across a question during the survey that should not be included, we would kindly ask you to select the option "not applicable".

The survey will touch upon several aspects of the IT landscap,

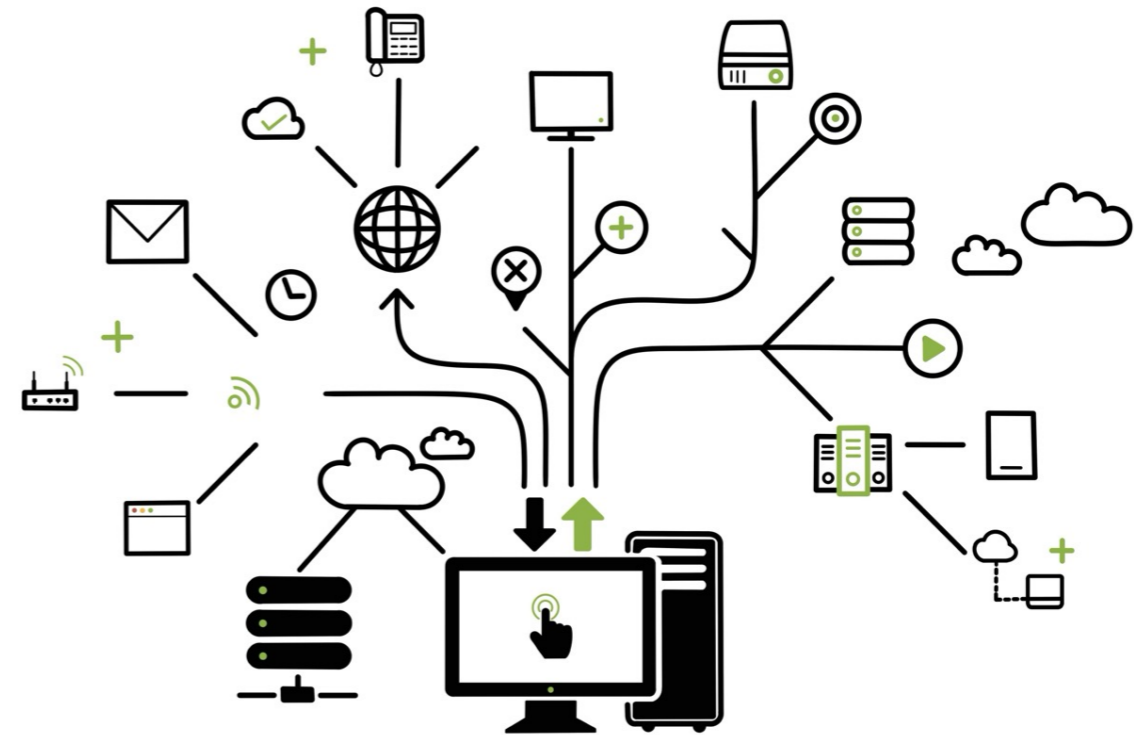
https://tudelft.eu.qualtrics.com/Q/EditSection/Blocks/Ajax/GetSurveyID=SV_8k7k2rNvqtMzcfY&ContextLibraryID=UR_1M4a3cr5UJuvy74 Pagina 2 van 30

and the first part is about your experience with the IT assets within your company. When you come across a question during the survey that should not be included, we would kindly ask you to select the option "not applicable".



Topic clarification

IT Landscape agility explanation



For this research the IT landscape is defined as the combination of all tangible and non-tangible information technology components, which includes the hardware, software and data. These components form information systems, which are under the influence of internal and external factors.

The agility of an IT landscape is for this research described as "the ability of an IT landscape to quickly sense and adapt to internal and external changes". This adaptatoon can both be executed through human interference or automatically.

The agility of an IT landscape is influenced by multiple factors, such different types of technologies and architectures, but also by the processes and people interacting with the information technologies.

IT landscape in General

IT Landscape in general



How satisfied are you with the functionalities of the current IT assets within your organization? (think about data, software and hardware you use)

Extremely dissatisfied	Somewhat dissatisfied	Neither satisfied nor dissatisfied	Somewhat satisfied	Extremely satisfied	Not applicable
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

We often have requests for changes to our IT assets.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Not applicable
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Stakeholders (users who aren't employees) often have requests that require changes in our IT landscape.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Not applicable
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How satisfied are you with the speed at which new requirements for the IT assets are implemented by the IT department?

Extremely dissatisfied	Somewhat dissatisfied	Neither satisfied nor dissatisfied	Somewhat satisfied	Extremely satisfied	Not applicable
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How effective are current IT assets in supporting the organization to innovate?

Very ineffective Somewhat ineffective Neither effective nor ineffective Somewhat effective Very effective Not applicable

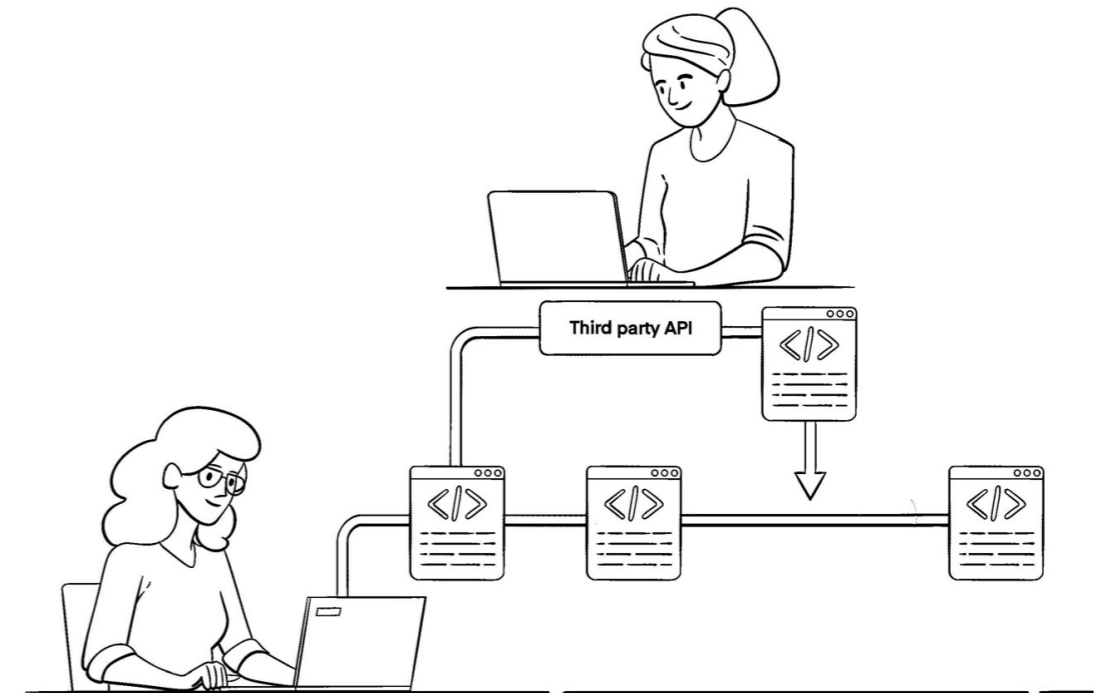
How well is the support provided on IT assets within the IT landscape?

Very poor Poor Acceptable Good Very good Not applicable

Data

Data

This section of the survey contains a couple of questions and statements about data and how it's handled within your organization.



We often have requests for changes in our data model.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

If we have request for changes in the data model, the change is generally implemented quickly.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

We are often asked to give our opinion on the way data in handled within our organization.

Very insufficient Somewhat insufficient Neither sufficient nor insufficient Somewhat sufficient Very sufficient Not applicable

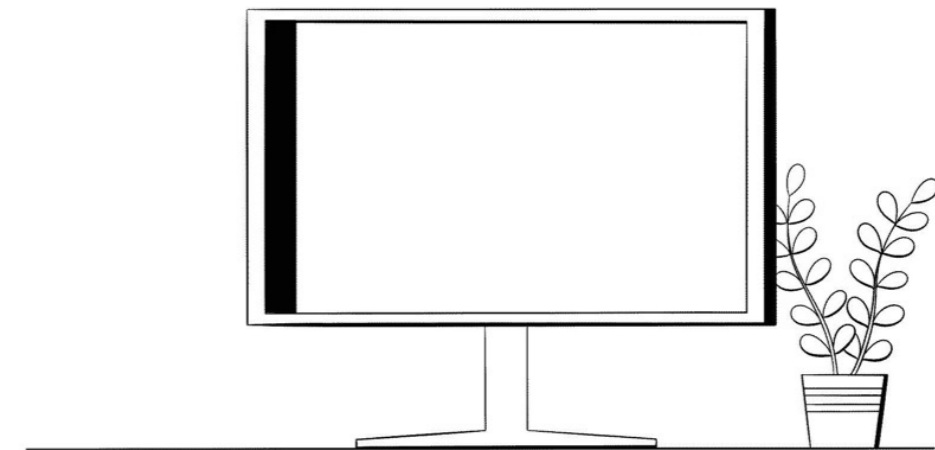
Data drives our decision making.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Software

Software

This section of the survey will require you to answer a few questions and statements about the software of your current IT landscape. Please note when your answers only apply to a specific section of the IT landscape.



The applications we use are completely tailored to our needs as employees.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Software is constantly improved to better support the processes within your work.

Strongly disagree Disagree Neither disagree nor agree Agree Strongly agree Not applicable

If there is a change in one of our processes, the required change to the software used is generally implemented quickly.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

The applications we use can be modified by me and my colleagues.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Our processes are slowed down because of the amount of applications we need to use.

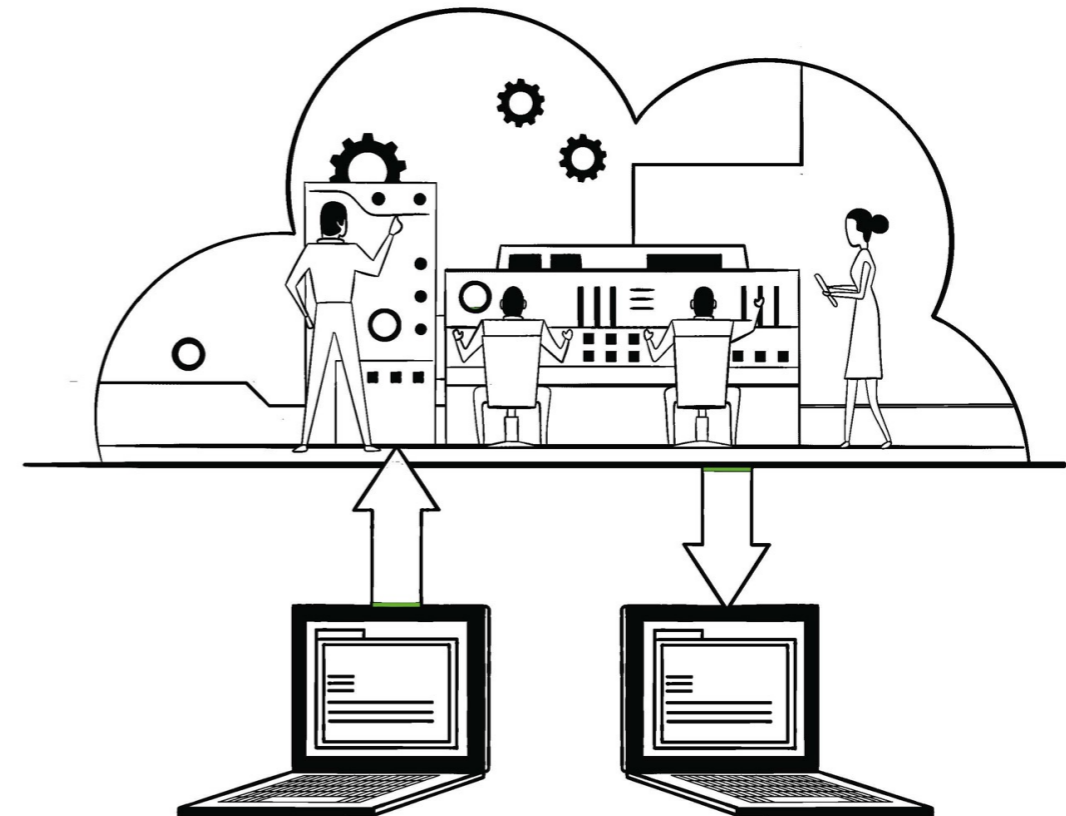
Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Infra and hardware

Infrastructure and hardware

This section of the survey will require you to answer a few questions and statements about the infrastructure and hardware of your current IT landscape. Please note when your answers only

apply to a specific section of the IT landscape.



We often have requests for the IT department to make changes to the infrastructure and hardware we use.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

If we have a request to for change to the infrastructure, this change is generally implemented quickly.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

The infrastructure in place is adapted to our needs as an organization.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Processes

Processes

This section of the survey will require you to answer a few questions and statements about the processes within your organization. Please note when your answers only apply to a specific section of the IT landscape.

We tend to think every decision thoroughly through, before we act on it.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

We work in short cycles.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

We create feedback loops.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

How well does the IT department communicate with other departments about the development of new functionalities?

Very poor Poor Neither good nor poor Good Very good Not applicable

We generally follow the following way of working:

Agile way of working DevOps Waterfall Other

If "Other" was selected in the previous question, please fill in here

what way of working is followed:

We can quickly change the processes we follow within our team.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Not applicable
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

People and teams

People and teams

This section of the survey will require you to answer a few questions and statements about the people and teams within your organization. Please note when your answers only apply to a specific section of the IT landscape.

We work in relatively small teams.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Not applicable
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Our teams are multi-disciplinary.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Not applicable
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Teams have clear responsibilities.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Not applicable
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Teams can operate autonomously.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Not applicable
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

We rely strongly on 'subject matter experts'.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Not applicable
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Individuals can operate autonomously.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Not applicable
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Individuals have clear responsibilities.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Management

Management

This section of the survey will require you to answer a few questions and statements about management within your organization. Please note when your answers only apply to a specific section of the IT landscape.

Management recognizes the need for an agile IT landscape.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

If we have requests for changes to IT assets within our organization, we have to request this through our management.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Management (CVB) supports investing in IT assets to increase

agility.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Management (CVB) is risk averse.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Organization

Organization

This section of the survey will require you to answer a few questions and statements about the organization of our company. Please note when your answers only apply to a specific section of the IT landscape.

There is a culture of change within our organization.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

There is a clear separation of responsibilities between

departments.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

There are silos within our organization that make communication between departments more difficult.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Our department relies on the same IT facilities as other departments.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Our department has sufficient alignment with the IT department.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Governance and risk

Risk and governance

This section of the survey will require you to answer a few questions and statements about the risk and governance within our company. Please note when your answers only apply to a specific section of the IT landscape.

There are clear compliance guidelines.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Risk management limits our ability to implement change.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

It is clear who to contact when it comes to questions about risk and governance of IT facilities.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

We can use third party services for our daily tasks.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

Strategy and vision

Vision and strategy

This section of the survey will require you to answer a few questions and statements about the vision and strategy of our company. Please note when your answers only apply to a specific section of the IT landscape.

There is a clear long-term vision to increase the agility of the IT landscape.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

The agility of information technology is part of our company's overall strategy.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree Not applicable

The IT strategy is aligned with the overall strategy.

Strongly agree Not applicable

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree

Comments

If you want to suggest changes necessary to increase the agility of the IT landscape, you may mention them here:

The purpose of this section is to evaluate the survey in its current state. Please give your unvarnished opinion on the aspects that should be improved.

If a consultancy firm would be assisting the TU Delft in an IT

transformation, would a survey like this be a suitable method for retrieving insights from employees? Please motivate your answer.

What are the shortcomings of this survey according to you?

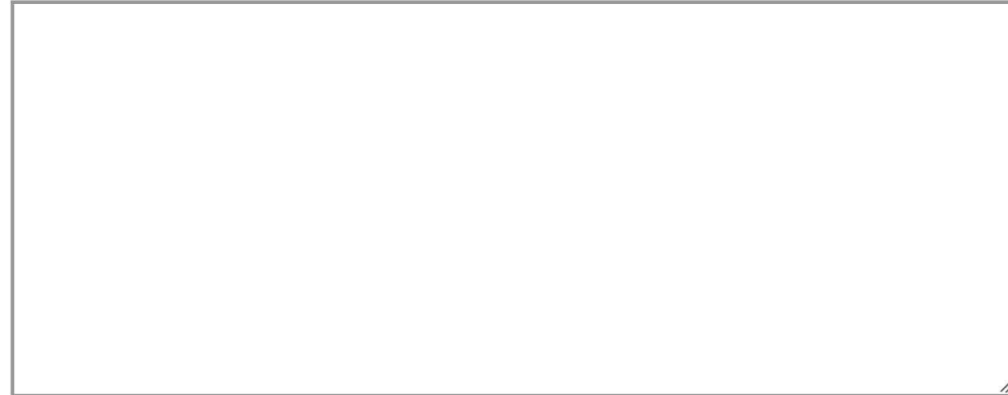
What do you think the strengts of a survey like this are?

What topics or questions did you miss in this survey which should be included in the survey for better insights in the agility of the IT landscape?

How would you like the results from this survey to be communicated to you as an employee?



The target audience for this survey is all employees from the TU Delft outside of the IT department and a similar survey is shared with the IT department. Is there another group of users that should fill in this survey?



If you have other suggestions to improve this survey or the outcome we would like you to mention them here:



Personal information

To finish the survey we would kindly like to request you to fill in your personal information. Data gathered in this survey will be treated with confidentiality and results can't be traced back to the participants.

Please enter your age:

Age 10 20 30 40 50 60 70 80 90 100

Please select your gender identity:

Please enter your current position

Click to fill in your department

Click to fill in your team

Click to fill in your function

How many years of experience do you have within our organization?

Years of experience (numerical values):

Department

Team

Function

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Deloitte.

IT Agility Scan



“Success today requires the agility and drive to constantly rethink, reinvigorate, react and reinvent”.

Bill Gates



EXECUTIVE SUMMARY

During the last decades, many organizations have gone through or attempted to go through digital transformations to create value for their customers, stakeholders and employees. Findings from a thorough literature research point out organizations are forced to implement strategies to embrace the implications of the digital revolution and improve performance by innovating with new technologies. It became clear that agility in the IT landscape of an organization is crucial for the success of digital transformations and survival in volatile market conditions. For Deloitte consultants the importance of agility in the IT landscape is clear, however, it is unclear how the agility of an IT landscape should be evaluated.

The aim of this research was to create a framework for the evaluation of IT landscape agility, on behalf of the Technology Transformation and Acceleration (TT&A) team within Deloitte consulting. The goal, method and content of the evaluation framework has been defined based on a combination of insights from seven expert interviews, observations during team and capability meetings, three different focus groups and extensive literature research on the topics of digital transformation, information system agility and information technology agility.

Using a design science research methodology, the framework has been iterated multiple times by moving between what is relevant for Deloitte and what is known in the literature sphere. Based on the final framework for evaluation, multiple concepts were developed, one of which was selected by the Deloitte consultants as most desirable. This concept was iterated during multiple rounds of evaluation together with employees from the University of Technology Delft.

This process resulted in the IT Agility Scan, a survey that can be used during client engagements, enabling consultants to efficiently and effectively assess what the agility of an IT landscape. The

evaluation considers the complete breadth of an organization, diving into technical and non-technical dimensions of IT landscape. By involving different employees and stakeholders across organizational boundaries.

Being timed based on project timelines, the IT Agility Scan will allow consultants to not only define the current state, but also track the impact of change. It is expected that applying the IT Agility Scan will improve the ability Deloitte consultants to evaluate clients by providing a standardized method for generating valuable insights in gaps and opportunities for the agility of a client IT landscape. The IT Agility Scan can decrease the time needed gathering and analyzing data during the assessment stage of client engagements.

The IT Agility Scan is accompanied by a recommended implementation strategy, illustrating the onboarding and optimization process. By making TT&A product owner, the position of TT&A within Deloitte is strengthened over time. Involving subject matter experts in the optimization process, ensures and stimulates information sharing between experts, teams and clients. To support the engagement and development process this handout provides Deloitte with a recommended strategy for the next five years, presented in a tactical roadmap for a holistic and automated IT Agility Scan. Lastly this handout highlights the recommendations for further research on the topic of IT landscape agility and the limitations of this project.

By onboarding the IT Agility Scan, TT&A will be able to become the connecting partner in every digital transformation and strengthen the position of Deloitte within the digital consulting market. Supporting Deloitte and its consultants in making an impact that matters.



IT Landscape agility

“The ability of the IT landscape to continuously adapt to both internal and external changes at a high speed.”



Agility elements

Internal and external change

The first element that is important for the definition of IT landscape agility is change, both internal and external. Organizations are continuously pressured by changing customer needs, market conditions, competitive pressures, legislative changes and introductions of new technology. Organizations can mitigate the risks associated with these external factors and innovate by changing their technologies, processes, business model, organizational structure and strategy. These internal and external changes are of influence on the value streams of organizations and organizations nowadays rely on information technologies for creating and capturing value, this is an essential element of the agility of the IT landscape.

Sensing

One of the most essential components for the agility of the IT landscape is the ability to sense internal and external change. Without the ability to sense and interpret what change is ongoing, the client will not be able to respond quickly and effectively. Agility is therefore considered as the ability of a system to sense and evaluate change. Sensing can be done in many ways, but generally relies on the ability of an organization to collect data and analyze data to retrieve valuable insights on the internal and external environment.

Responding

Creating agility is about the responsiveness to change. The implementation of new digital technologies, and the adaptation of existing systems are crucial for organizations to create new value and remain relevant in a rapidly changing business landscape. The responding component of IT landscape agility refers to the ability to continuously adjust and rearrange existing assets and capabilities and implementing new ones. For IT landscape agility, the ability to respond means react to unpredictable changes, while prospering from uncertainty.

High speed

Adaptation of the technological core of an organization requires speed in the ability to change technologies, processes, and people, to minimize costs and limit the impact on critical processes. Which is why the last component of IT landscape agility is high speed. The goal of creating IT landscape agility is improving business performance by adapting to the needs of employees and stakeholders. This must be done at high speed continuously to create competitive advantage and prevent the invested time and money from going to waste.



IT Agility Scan

The IT Agility Scan enables you to evaluate the agility of IT landscapes, the outcome provides you with insights to transform your client's landscape. Together with this guide, it provides you with the knowledge and guidelines to become an IT consultant who can assist their client towards future-proof and agile IT landscapes.





Content

In this section of the handout we will explain what technological and non-technological dimensions are covered by the IT Agility Scan.

Coverage

Technology dimensions

Technologies are at the core of the IT landscape. The technology dimensions are therefore completely covered by the IT Agility Scan. The content of IT Agility therefore covers all of the technology dimensions and touches upon the overall state of the complete system. Included in the technology dimensions are data, software and infrastructure. How the different dimensions are composed within an organization and connected to its value streams is determined by the different architectures. Within the IT Agility Scan this means that the different architectures for information, data and solutions are evaluated. Different technologies and architectures result in system characteristics that affect the ability of the IT landscape to adapt and be adapted to internal and external change at high speed, by reconfiguring and adding components. Therefore, the survey covers these technological system characteristics.

Organizational dimensions

Around the IT landscape, there are many organizational dimensions that rely on and influence the IT landscape and its agility. These factors are therefore crucial to consider during the evaluation. The organizational dimensions covered by the IT Agility Scan are: people, teams, leadership, processes, organizational structures, organizational structures, governance, compliance & risk management and strategy & vision. Evaluating these dimensions will help you understand how the IT landscape supports the organization in quickly adapting to internal and external change by creating and capturing value. This will allow you to recognize the influence your client organization has on the ability of their IT landscape to adapt and be adapted quickly to these changes in their operating model and environment.

Complete breadth

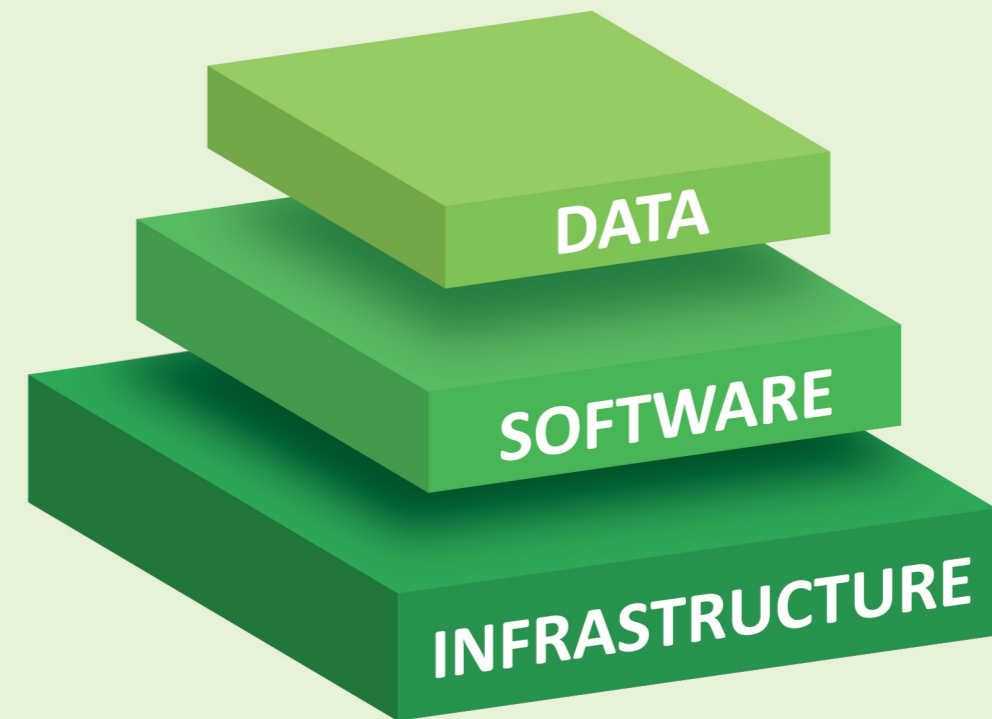
Essential for the ability of the IT landscape to sense and respond to change are the IT departments, as they translate insights into solutions. The insights on value streams stem from business departments. By including the business departments within the organization, the evaluation covers the complete breadth of the organization. Allowing you to analyze differences in opinions from several perspective by making a distinction between departments, teams and functions.

All hierarchical levels

Many organizations nowadays are still not flat, hierarchical levels and silos may exist. Taking into account these different levels in the IT Agility Scan will enable you to point out where the different hierarchical levels such as C-level management, middle management and operations differ in opinion. Based on these different opinions, you will be able to create a strategy to align the different hierarchical levels to stimulate the agility of the IT landscape.

Environment

The value streams of your client depends on the environment it is operating in. The client organization interacts with users, customers and other stakeholders to achieve specific goals. Taking into account the needs of these stakeholders and the volatility of the environment will allow you to understand to what extend the needs are fulfilled and what level of agility is required to fulfill these needs.



Technology dimensions

IT landscape in general

This section questions how satisfied employees are with the current state of the IT landscape. Evaluating whether the IT landscape is tailored to the value streams and the needs of employees. To understand whether the IT landscape in general is able to sense the internal and external changes and how effectively it responds to change. Additionally, it evaluates what level of agility is required, by questioning employees how volatile the internal and external environment is.

Data

Data has a big influence on an organization's ability to sense both internal and external change. By using data analytics, organizations are able to gather valuable insights on customer needs, market conditions and operations. This section of the IT Agility Scan aims to evaluate the influence of data on the agility of the IT Landscape. By focusing on processes, technologies and characteristics it evaluates the organizations ability to sense and respond to change based on their data.

Software

The section about software and applications questions respondents about their support for processes and value streams within the organization. Evaluating to what extend the organization has defined certain standards for the development and features and to what extend business employees are allowed to implement change autonomously. It touches upon the use of software to understand and prioritize new features and functionalities. Respondents are asked what type of hosting model is applied and whether this supports the agility. Lastly, when it comes to the development of software, it aims at understanding how current assets allow for continuous deployment, integration and automation.

Infrastructure

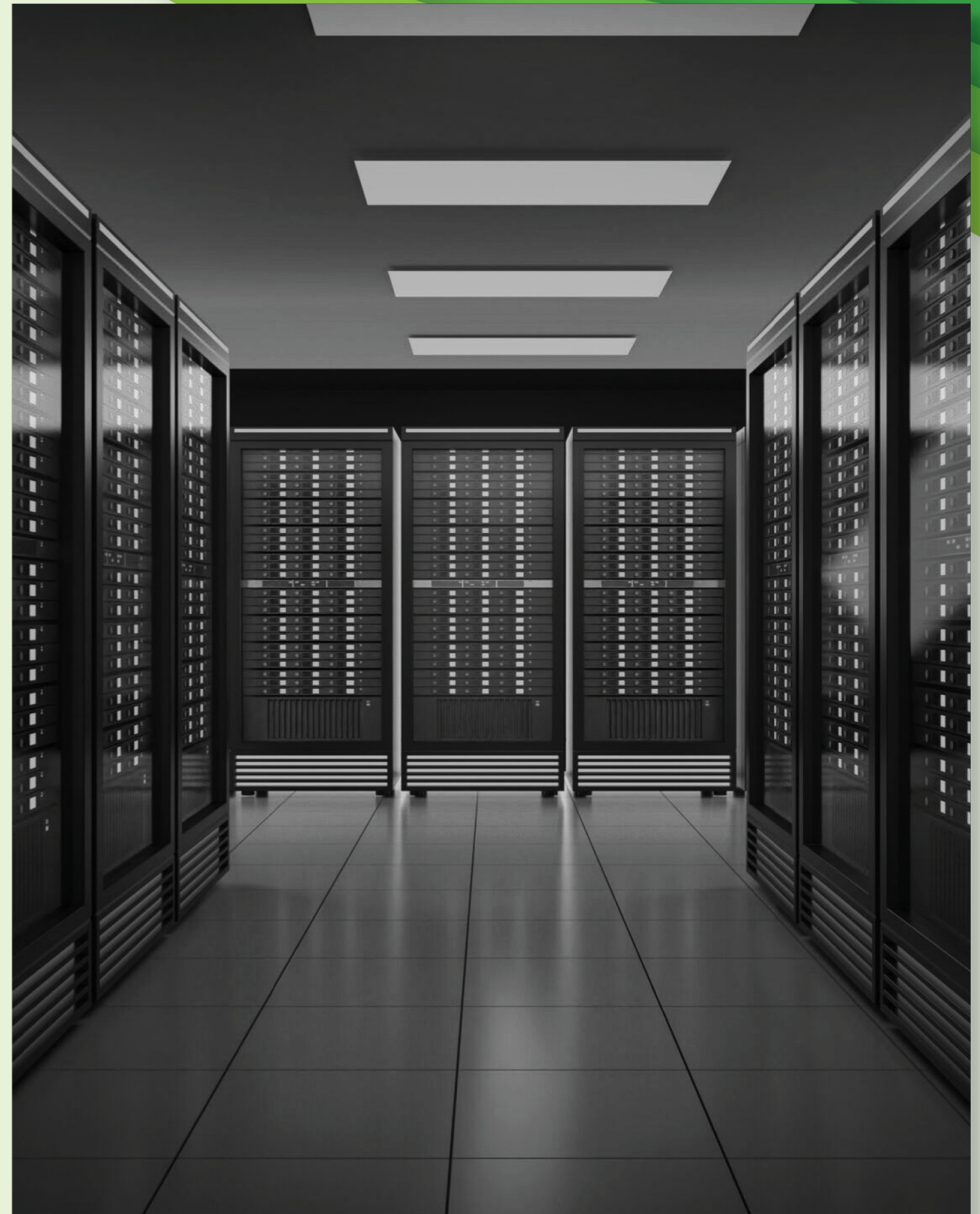
In this section respondents are asked how frequently change is required to the infrastructure to support changes in value streams. Evaluating how well the infrastructure is monitored, documented and reviewed. It touches upon the hosting and delivery model utilized for the infrastructure and questions whether operations on infrastructure are automated. Lastly, it evaluates whether the infrastructure is sufficiently and cheaply scalable and available.

Architecture

Several types of architectures are covered in the IT Agility Scan, such as the information, data and solution architectures. Evaluating if architecture guidelines are clear and documented for all landscape dimensions and whether guidelines are based on business requirements to support value streams. Additionally, the section evaluates what architecture archetypes are used, how well architectures are documented, who is in charge of guidelines and how they are governed.

System characteristics

The IT agility Scan evaluates the IT landscape based on a set of technical system characteristics. The following characteristics are covered by this section of the survey: connectivity, dependencies, coupling, complexity, homogeneity, integration, modularity, redundancy, scalability and interoperability. Understanding whether these characteristics are present and to what degree, gives an indication for the ease and speed at which change can be implemented. Respondents are asked whether these different characteristics are documented and included in architectural guidelines to understand how the organization copes with them.



Organizational dimensions

People

The evaluation aims to build an understanding of the type of people, their roles and their responsibilities. It questions respondents whether individuals have clear responsibilities, can work autonomously and collaborate sufficiently. We try to discover whether value streams rely strongly on experts or are supported by multiple employees. We try to discover whether employees are up to date and trained continuously. Lastly we evaluate if new talent is actively being recruited.

Teams

During the evaluation respondents are questioned about the composition of teams and team size. The goal is to discover whether teams are kept small and multi-disciplinary to support the ability to collaborate and adapt. Similar to the section about the people within the organization, this section evaluates whether respondents think that teams have clear responsibilities, can operate autonomously and collaborate across departments sufficiently to support agility.

Leadership

This section is focused evaluation the support and guidance from leadership with regards to the agility of the IT landscape, IT modernization and IT investments. Since lack of leadership support can be a blocking factor, you need to understand what priority IT landscape agility has amongst the leaders within the client organization. Additionally, questions aim to evaluate to what degree leaders are risk averse and support the organization in the identification of risks and opportunities.

Processes

Ways of working and processes are essential to support agility in the IT landscape. Questions aim at understanding whether the client works in short cycles, collects and implements user feedback, creates feedback loops, focuses on planning or on actions and whether processes are being automated. Additionally, questions focus on the current way of working, the ability to change processes and the relative amount of handovers required for implementing change.

Organizational structures

Questions about the organization are focused on the culture within the organization, organizational structures and alignment. Aiming to understand to what extent there is a culture of change, a clear separation of responsibilities and presence of silos. The questions help to understand whether different departments rely on the shared IT facilities and if there is sufficient collaboration, communication and alignment present across organizational boundaries.

Governance

IT governance can have a strong influence on the agility of the IT landscape, by limiting the freedom to adapt. The IT Agility Scan aims to understand to what extent governance supports the ability of employees to sense, respond and innovate. It questions whether the governance structures are perceived as a limiting factor for change and whether they limit the speed of change. Furthermore, it evaluated to what extent governance guidelines are clear and documented.



Organizational dimensions

Compliance and risk management

This section focuses on evaluating the compliance guidelines and policies within the organization. This will help you find out whether the compliance guidelines are clear and allow employees to implement change within the boundaries set for them, or whether they slow down the implementation process. Additionally, questions focus on understanding how the organization manages risks. Since risks are an essential component of both internal and external change. Understanding how risks are controlled and how risk management affects the agility of the IT landscape is essential.

Strategy and vision

The last topic is strategy and vision, which questions the respondents about the long- and short-term strategy and vision of the organization. Questions help you to understand to what extent the agility of the IT landscape is part of the company and IT strategy, how well the IT strategy and business strategy are aligned, whether IT management is involved in the business strategy and vice versa, and what financial support is cleared for the IT strategy. Additionally, this section elaborates on the existence different IT strategies, such as digital and cloud strategies. Respondents are able to give their opinion on the effectiveness of these strategies and their ability to support agility.



Dimensions for stakeholders

IT landscape in general

The main focus of the IT Agility Scan for stakeholders like users, customers, partners and suppliers is on the state of the IT landscape in general. By requesting stakeholder input, through the client's website, you will be able to find out well the IT landscape meets their needs. Additionally the IT Agility scan will help you and the client find out whether the speed at which innovation takes place and requested change is implemented satisfies the needs of stakeholders. This will allow you to discover new needs from stakeholders and it offers an additional perspective on the agility of the IT landscape.

Data

The IT Agility Scan for stakeholders will contain a section on data to understand how quickly and effectively the client responds to stakeholder needs with regards to data collection, processing and sharing. It touches upon topics like products, services, sales and after sales to find out how well data is utilized to service stakeholders.

Software

Client organizations may offer several interfaces or applications to their stakeholders. How well these are adapted to the needs of stakeholders and how quickly they are adapted to changing needs is evaluated in this section of the IT Agility Scan for stakeholders.

Infrastructure

The infrastructure of the organization may be used by its stakeholders, such as the present networks and storage facilities. These are therefore considered in the IT Agility Scan, to understand how satisfied stakeholders are with the infrastructure.





Evaluation setup

This section of the handout elaborates on the format of the IT Agility Scan. Covering the evaluation process and analysis.

Evaluation type

Quantitative survey

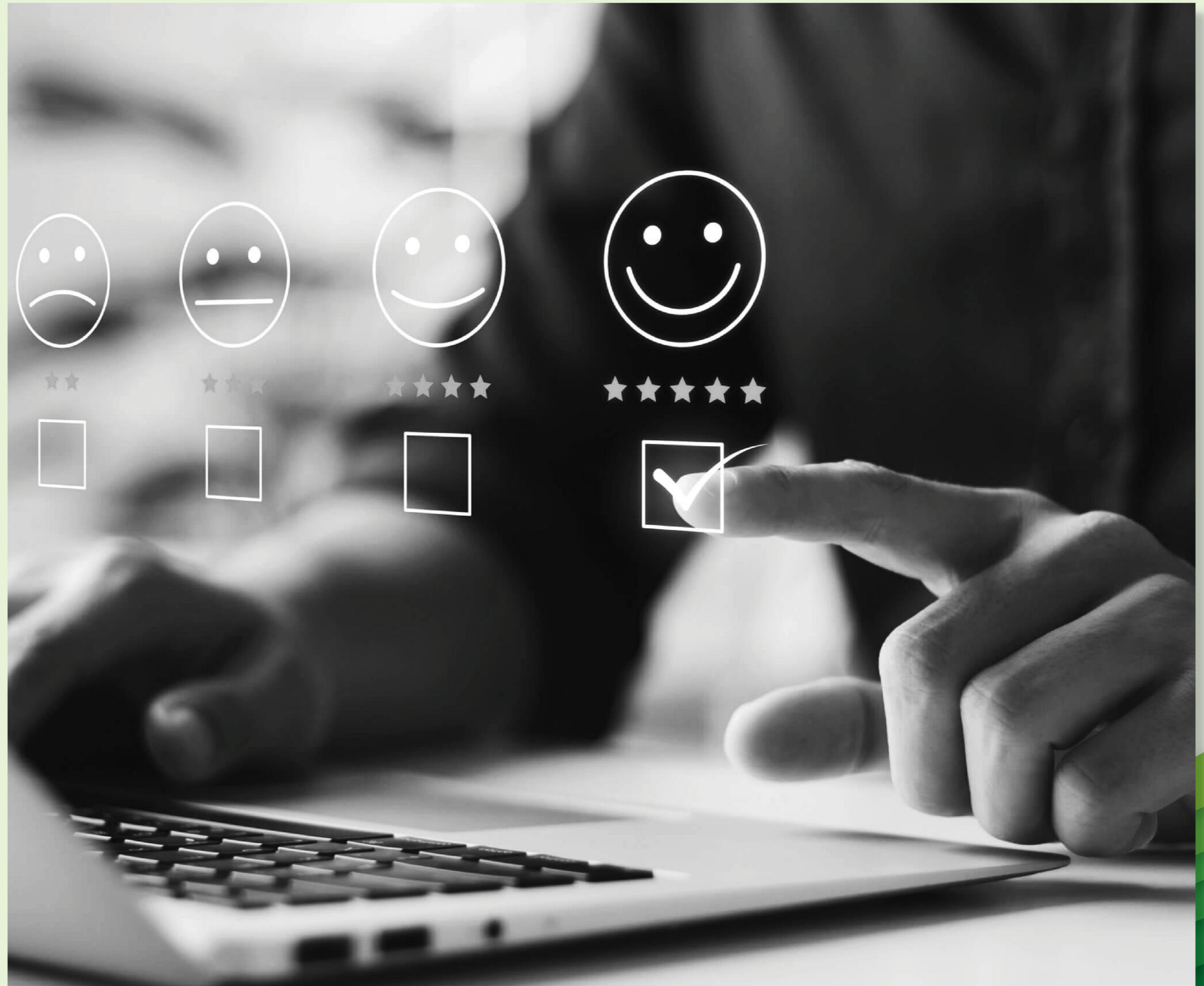
The IT Agility Scan is a survey-based evaluation tool, touching upon different topics to analyze how agile the IT landscape of your client is. The survey focuses on quantitative data gathering allows for straightforward statistical analysis. This can facilitate the identification of patterns, correlations, and significant findings that are essential for the evaluation of IT Landscape agility. Surveys can serve as a direct feedback mechanism, enabling evaluators to understand the effectiveness of programs, services, or interventions from the perspective of the participants.

Efficient

The IT Agility Scan is cost-effective and time-efficient, by using tools that automate data collection and analysis. It can be distributed quickly through emails or websites, and can collect responses in real-time, enhancing the efficiency of the evaluation process. This gives you time to focus on the interpretation of results and formulation of a suitable strategy. The IT Agility scan ensures that all respondents are asked similar questions, creating consistency in data collection. This standardization is crucial for comparing results across different groups and time periods.

Comprehensive and scalable

The IT Agility Scan includes a broad range of topics, allowing you to analyze the complete breadth of the organization. With high scalability horizontally and vertically, the IT Agility Scan enables you to include a broad range of departments, teams and functions, as well as a large number of participants for each of these target groups. It provides all of these respondents with freedom to give an honest opinion, since the survey is anonymous.



Questions

Multiple-choice

For each of the different dimensions, questions are formulated based on a multiple-choice format. This format was chosen to limited the time consumption for the respondents with regards to filling in the survey. They are able to quickly select the answer that resonates with them or the IT landscape. For you this limits the time required for gathering and analyzing data.

Likert Scale

The multiple-choice questions contain a question or statement followed by a five-point Likert Scale. The answer options vary per question or statement. A Likert Scale was chosen since each answer option is given a value from zero up to four. This allows you to quantify the given answers during the analysis of the data. The answers that have a negative effect on the agility of the IT landscape are given the value zero and the answers that improve the agility the value four.

Personal information

In the personal information section of the survey there are open questions included for the age, employment duration and location of the respondent. This will allow you to define the demographics of the respondents and find correlations between demographic variables and the perception of agility for each of the dimensions. The personal information is requested in the last section of the survey, this way respondents will not be scared off by this at the start of the survey. There is no personal information requested that will allow the client to identify who answered certain questions.

Survey logic

To limit the time consumption, reduce the number of questions and prevent respondents from filling in questions they do not have any knowledge on, the survey applies a Survey logic. The survey logic allows you to change the behavior of the survey and its content based on the answers given by the respondents. The logic consists of a set of rules that ensure some of the pages and questions can be skipped when the respondent does not have any knowledge of a certain topic or is satisfied. The page on the right, displaying questions for non-IT employees, includes a survey logic. If the respondent replies strongly disagree on the last question, the survey will take them to the next dimension. If they select another option, an additional number of questions will be displayed.

Survey flow

Each of the different dimensions of IT landscape agility is presented on a different page in the IT Agility Scan. Each page starts with a small introduction to make clear to the respondent what the section is about. On top of each page is the logo of the IT Agility Scan and at the bottom of each page is a next and previous button to navigate between the pages. The bar on the bottom of the page shows the respondent what progress they have made. When a respondent thinks they are ready to move onto the next page of the survey, but they have forgotten to answers, they will be prompted to answer these questions before continuing. If in such a case they intentionally have not answered the question, they can click on the button that will take them to the next dimension without answering. This will prevent the dataset to become polluted.

Deloitte. IT Agility Scan

Data
This section of the survey contains a couple of questions and statements about data and how it's handled within your organization.

Data drives our decision making.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree

We utilize data analytics to improve the value we deliver to external stakeholders.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree

We are asked to give our opinion on the way data in handled within our organization.

Strongly disagree Disagree Neither agree nor disagree Argee Strongly agree

I am familiar with the standards for information and data structuring, processing and storing.

Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree

< Previous Next >

Process

Target groups

There are three types of respondents considered for the IT Agility Scan. The first target group consists of the IT employees within the client organization. The second target group consists of employees in other departments than the IT department, for example human resources and finance. The third and last target group consists of stakeholders, such as users, customers or suppliers. For each of the target groups there is a different survey, containing different questions. However, questions contain similar topics so results can be compared among different target groups.

IT department

Within the IT department target group there is a distinction between the different teams and functions in which respondents are employed. Ideally the composition of the sample represents the composition of the IT department.

Other departments

Within this target group there can be a broad range of departments, teams and functions. For this target group the sample should also consider the composition of the organization itself.

Stakeholders

Within this target group there are several different types of users. There can be larger variations within the sample and sample size. The sample is difficult to influence, but the dataset can be manipulated in such a way that it represents the target group.

Timing

The timing of the IT Agility Scan should correlate with the timeline of client engagements. This means one evaluation should be executed at the start of a project. One or more evaluations should take place at different milestones on the project's roadmap. The last evaluation should take place at the end of a client engagement. The first distribution allows you to evaluate the current state of the client's IT landscape. The distributions at milestones will allow you to identify whether the changes affected the agility of the IT landscape. Finally, at the end of a client organization you will be able to prove to the client what the impact of your suggested interventions is. Preferably, follow-up surveys are sent to the same sample, to improve the comparability of results.

Analysis

The last step of the process is analyzing data and interpreting the results. The next page of this handout will present a few recommendations for the analysis of the survey data. The analysis, interpretation and presentation of results will be further validated and optimized in during the upcoming months.

Risks and opportunities

There are some risks and opportunities involved in this process. A risk e.g. could be that the outcome of the survey could show that suggested changes have not made the expected impact, suggesting that your work led to unsatisfactory results. However, a business opportunity can arise from the results if they prove the success and indicate a new opportunity or gap. Seeing that the IT landscape agility is impacted but not optimized, can result in continuation of engagements.



Analysis

Descriptive analysis

The goal of the survey is to understand what the agility is of the IT landscape, based on the input of the respondents in the survey. Descriptive analysis focuses on summarizing and presenting key features of a dataset to identify patterns, trends, and significant insights. This includes calculating the following measures of central tendency which are representative data points for the data gathered:

- Mean: The average value obtained by summing all data points and dividing by the number of observations.
- Mode: The most frequently occurring value in the dataset.
- Median: The middle value of a dataset sorted in ascending or descending order.

Mean scores

It is advised to initially do a descriptive analysis to determine the mean 'score' of each of the questions. Calculating and presenting these representative data points will indicate whether the respondents agree or disagree with certain statements about the agility of the IT landscape. Additionally can the descriptive analysis be done to determine the score for each of these dimensions:

- IT landscape in general
- Data
- Software
- Hardware
- Architecture
- System characteristics
- People and teams
- Leadership
- People and teams
- Organization
- Governance, risk and compliance

Interpreting data

Based on the mean value of the different aspects of the IT landscape will determine which of the dimensions are creating the largest gap and indicate where the biggest opportunities for improving the agility of the IT landscape are. There is ample knowledge within Deloitte on strategies for increasing the agility of the IT landscape over these different dimensions. If an organization scores low on a specific dimension, consultants can propose a certain strategy or initiate additional investigation for this dimension.

Demographic data

Personal information from participants is gathered as a final step of the survey. With this information data can be checked on correlations between age, location, department, function and other variables. For instance, older employees might be less flexible and innovative, so if there would be a left skew in the age distribution this could potentially affect the agility of the IT landscape negatively. By evaluating the correlations between the mean scores and demographic variables, such as age, function or location, it can become clear whether this is the case within the client organization.



Presenting data

Bar charts

It is suggested to use bar charts to communicate the mean values, or the number of answers given for each score, as these are the most suitable type of chart for displaying the magnitude of specific variables. Three examples of a visual presentation of data are given in the image on the right, used for comparing results between the three different target groups. Within each bar chart, different bars can represent a different team or function to display additional information.

Demographics

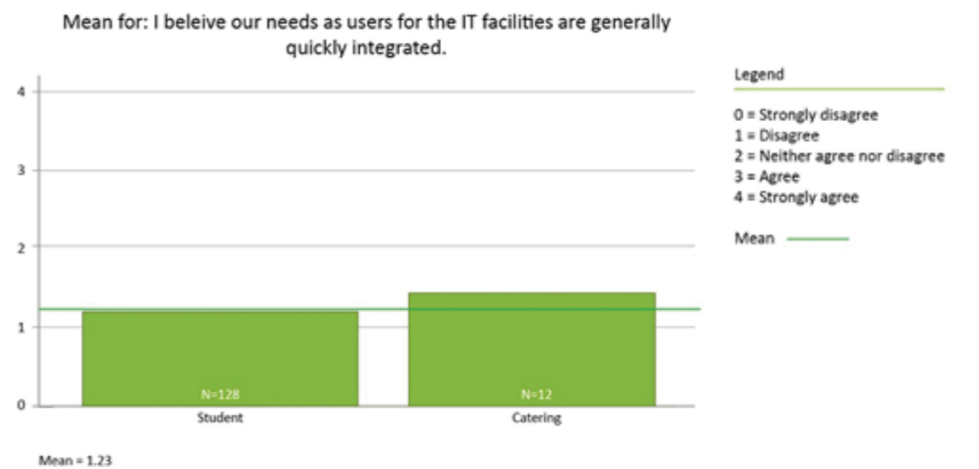
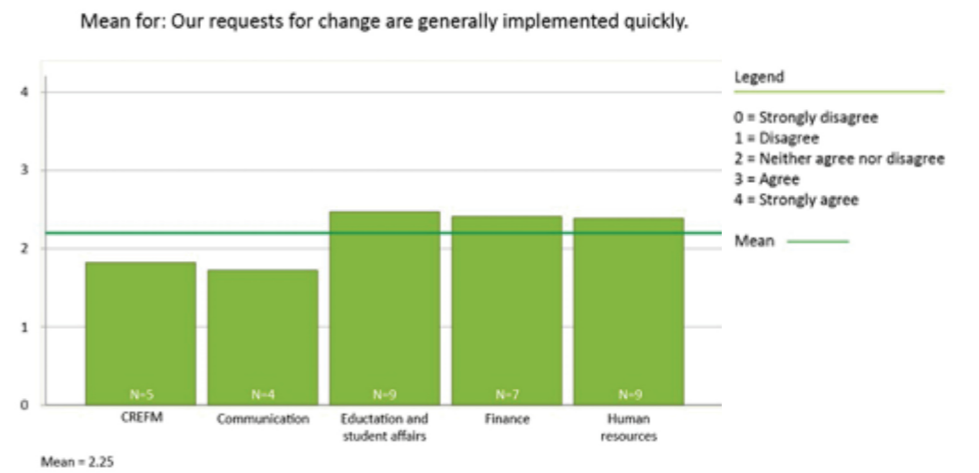
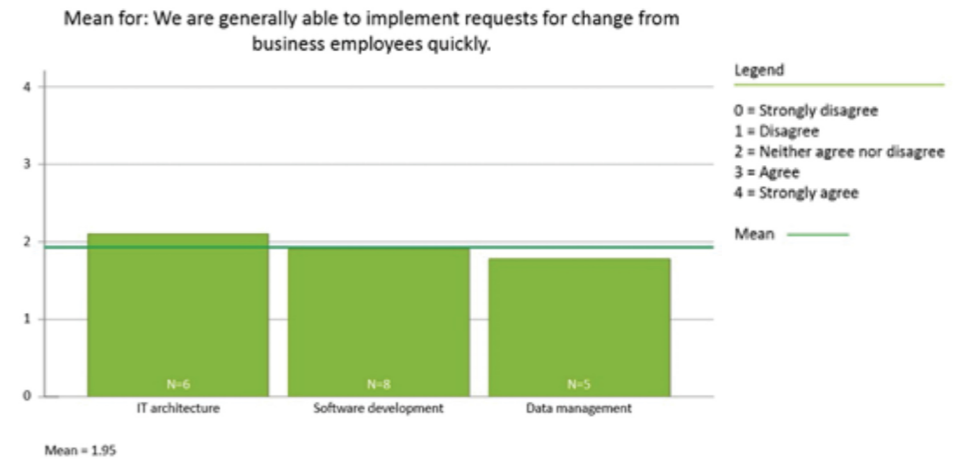
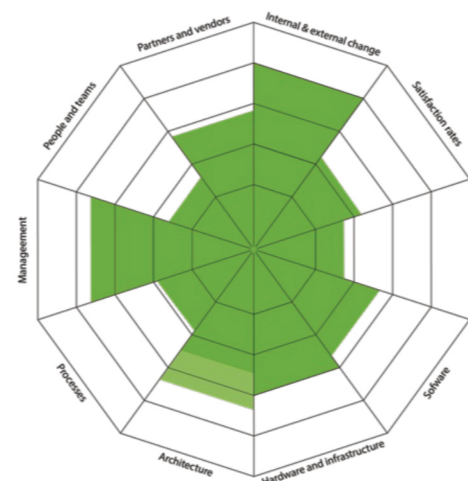
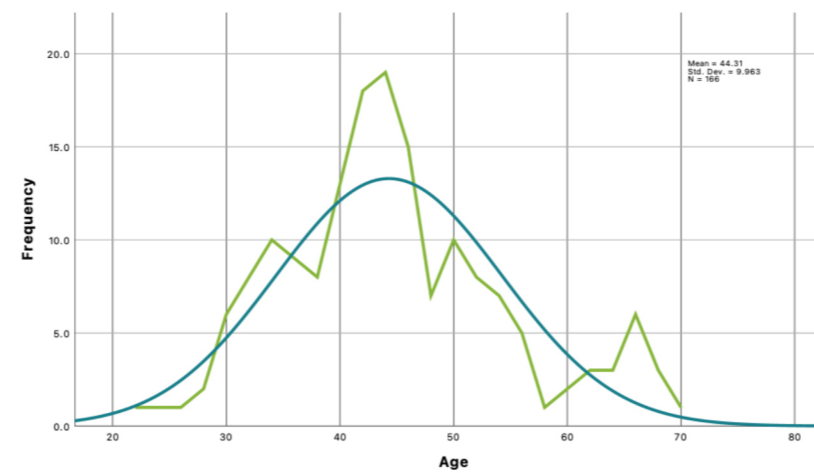
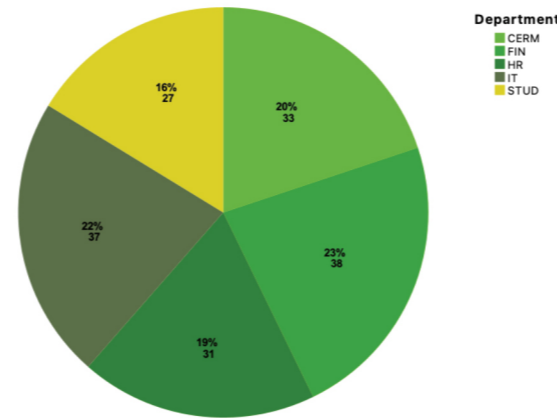
By displaying the different departments in a pie chart like in the top left chart. You and your client can quickly evaluate what the distribution of different departments, teams and functions is among the respondents. It is suggested that a pie chart would be used to illustrate the ratio between respondents, as the pie chart is most suitable for displaying proportions. For the visualization of age, it is suggested to use line charts to see how the distribution of the age is, an example of this is given in the middle left.

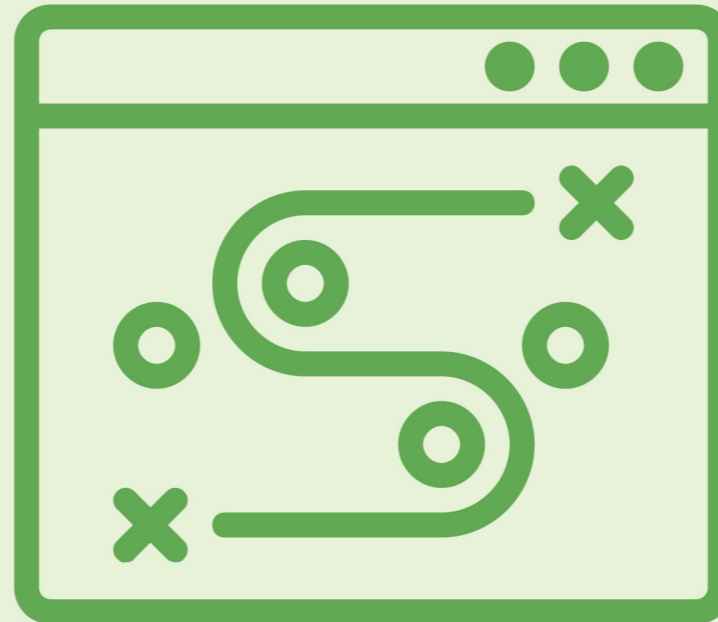
Additional chart information

Lastly it is suggested that each chart contains a reference line for the mean overall mean, axis titles for clarification of the question, a legend to explain to which answer each value was connected and the respondent count in every bar, as shown in the graphs on the right.

Overall agility scores

To display the mean score for each dimension, it is suggested to use a web chart. If multiple evaluation have been executed, a color difference can indicate the change in score as shown on the right.





Implementation

The success of the IT Agility Scan depends on the implementation strategy applied. In the following pages we will explain how the IT Agility Scan will be onboarded and what future steps will be taken.

Implementation strategy

AIDA model

An implementation strategy was created for the introduction of the IT Agility Scan at Deloitte. The AIDA framework has been used to create the implementation strategy and onboarding process starting with employees within TT&A and the Tech Agility Guild. The AIDA framework is applied, because it is framework proven to be effective in marketing, guiding individuals through the steps that lead to a certain action. AIDA stands for Attention, Interest, Desire and Action. There are three effects that form the behavioral sequence of the framework, first the cognitive, then the affective and lastly the conative effect.

Attention

During the attention phase, the proposed user should become aware of the IT Agility Scan. By spreading this handout at different coffee corners and sharing the digital version by e-mail.

Interest

During the second phase we will spark the interest of employees, the IT Agility scan will be presented during monthly meetings and capability meetings. It will become clear why clients need the IT Agility Scan.

Desire

During the desire phase, it will become clear how this method will make your job easier. By allowing you to quickly evaluate your client. During this phase we will collaborate on improving the content of the IT Agility Scan and define a standardized method for analysis.

Action

In the last phase it is time for action. We will slowly start implementing the IT Agility Scan during client engagements. Starting with a pilot run to make sure all the kinks have been removed.

	 Attention	 Interest	 Desire	 Action
Timeframe	2 weeks	1 month	3 months	1 year
Target group	TT&A Tech agility guild	TT&A Tech agility guild	TT&A Tech agility guild	TT&A Tech agility guild Clients
Goals	<ul style="list-style-type: none"> Show Deloitte how agility in an IT landscape will improve every transformation 	<ul style="list-style-type: none"> Show Deloitte employees why they clients need to evaluate the IT landscape agility of their client Create a shared understanding of the concept and definition of IT landscape agility 	<ul style="list-style-type: none"> Show Deloitte employees why the IT Agility Scan will improve the quality of their work Show how the impact of the IT Agility Scan for clients 	<ul style="list-style-type: none"> First introduction of the IT Agility Scan during a client project. First analysis and presentation of results based on company data
Activities	<ul style="list-style-type: none"> Spread the hand-out throughout the office at the coffee corners Share the digital version of the handout in an email to TS&T 	<ul style="list-style-type: none"> Introduce the concept of the IT Agility Scan within the Tech Agility Guild Introduce the concept during monthly TT&A meeting 	<ul style="list-style-type: none"> Iterate on the content of the IT agility Scan together with subject matter experts. Define the data analysis steps in a co-creation session. Testing the IT agility scan within Deloitte 	<ul style="list-style-type: none"> Start using the IT agility scan on the first clients Iterate on the methods for evaluation and analysis based on client feedback.
Description	During this phase the employees of TT&A and the Tech Agility guild should become aware of the existence of the IT Agility Scan.	During this phase the employees of TT&A and the Tech Agility Guild are actively involved in a presentation of the IT Agility Scan to spark their interest in the topic and solution.	During this phase the employees are actively involved in the ideation process for further development to create a desire to work with the IT Agility Scan.	During this phase the participants get a call for action to start actively implementing the IT Agility Scan in their processes.

Future roadmap

Roadmap

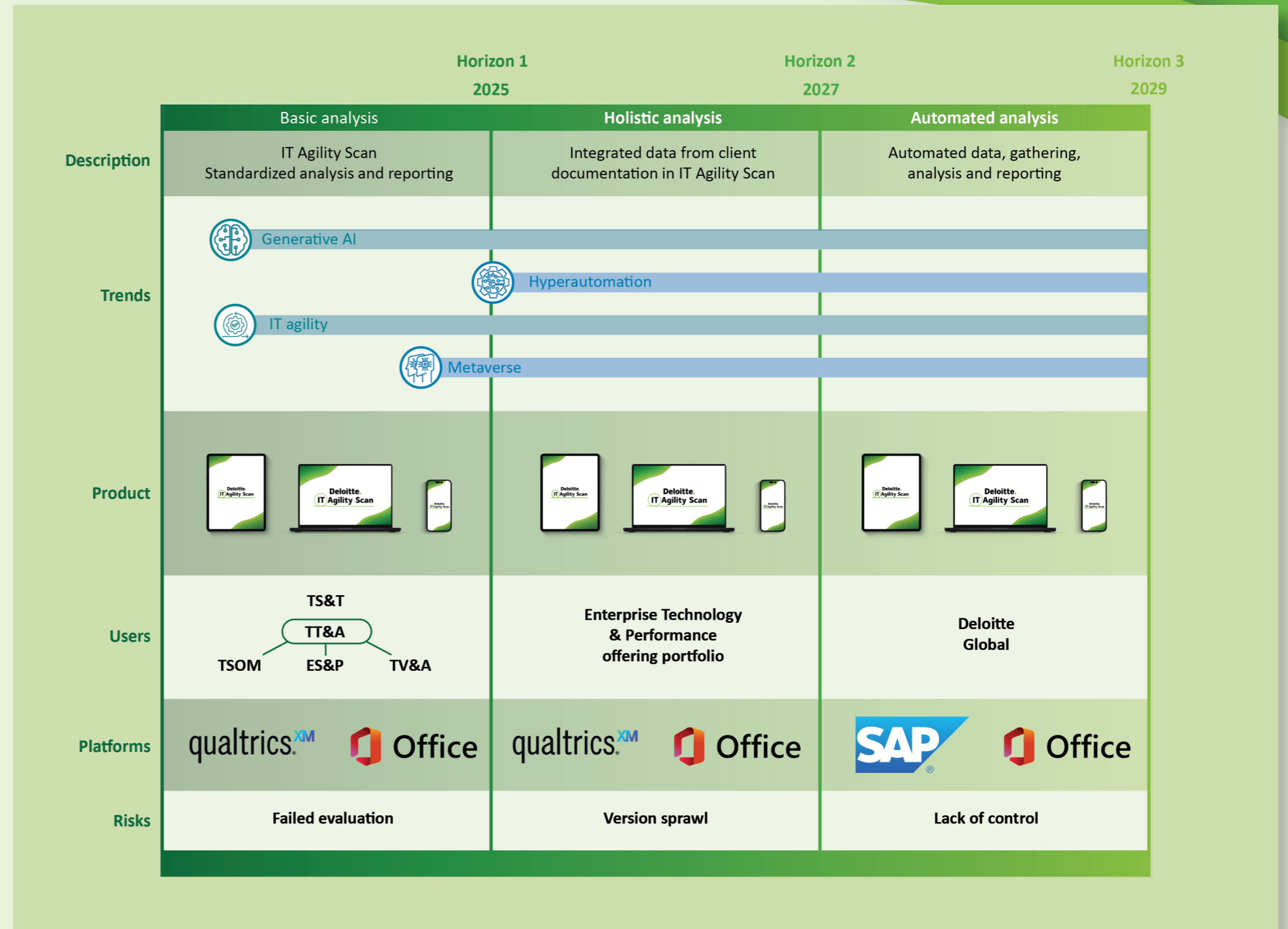
By thinking ahead, we can ensure that the quality and content of the IT Agility Scan will continuously be improved. Besides the content being improved, it is important to push the development of and use of technology to adapt the format of the evaluation.

Based on the trends in annual reports from Deloitte, there are a few trends that are going to influence your job as a consultant, but also the tools you use. We see that the coming years, there will be a surge of artificial intelligence and hyper automation. Based on these trends, we believe that the IT Agility Scan can evolve from a basic analysis, to a holistic analysis in 2027 and finally become a automated analysis tool in 2029.

The IT Agility Scan will initially be used within Deloitte consulting in the Netherlands, starting within TS&T. When the tool has been improved, within a couple of years it will be used throughout the complete ET&P offering portfolio. This is the point where we have to bundle forces together with our global partners to start the automation process, to spread use of the tool to Deloitte Global by 2029.

Important partners in this process will be our current partner SAP, since they have a large body of knowledge and technology for both artificial intelligence and automation. Reporting and internal communication will then still be done through Office 365.

During this transformation, we need to consider the risks of the first evaluations failing. When the IT Agility Scan spreads within our offering portfolio we need to control the versions, to make sure there is not an abundance of versions. During the last phase, our biggest risk will be the lack of control because of automation and artificial intelligence.





Recommendations

To improve the quality and support the development of the IT Agility Scan, some recommendations are made considering the ownership, expert input, knowledge base and strategy.

Recommendations

Ownership

There should be a limited number of consultants in charge of the development and distribution of the survey. This is done to create a sense of ownership among a selected group of people. The ownership should lay with consultants who are part of TT&A and the Tech Agility Guild. TT&A should become involved in the early stages of every IT transformation within Deloitte. The survey needs to be optimized before it can be applied during client projects and the IT sector is constantly changing, so the survey will have to be adapted continuously from the moment that it is onboarded within Deloitte. Having dedicated owners of the solution will ensure that experts are appointed and involved in the process of optimization. Additionally, this will help in controlling the versions of the survey to prevent proliferation of versions on multiple locations.

Expert input

For each of the different dimensions included in the survey there are different subject matter experts. For the questions, analysis and interpretation of the results it is essential that different subject matter experts will be involved during the onboarding process of the IT Agility Scans. This will support the optimization process, create a standardized method for analysis and build a knowledge base around the survey for the interpretation of data. It is advised to organize a co-creation session for each of the dimensions, in which multiple subject matter experts are invited to collaborate on the content creation. Additionally, there should be one or more co-creation sessions for the analysis and interpretation of the results to create and iterate on a standardized way of working. These co-creations should be repeated until the product owners are satisfied with the content and guidelines.

Knowledge base

The knowledge base should be located within the intranet of Deloitte, specifically in the repository of TT&A. This will help to guide other teams to TT&A when they are searching for an IT related evaluation tool, and this is the most convenient location for members of TT&A. This handout explaining this research and IT Agility Scan should be the first file in this knowledge base. The handout will have to be extended, with more information on the different dimensions, analysis and interpretation of results. Since there are specific subject matter experts, these should be referenced within this handout. This will help consultants to get in touch with the experts and connect clients to the experts.

Implementation strategy and roadmap

Lastly, it is advised to iterate on the implementation strategy and future roadmap. The strategy and roadmap presented in this handout are a starting point for the product owners of the IT Agility Scan. Currently these have not been validated, but this should be the first step of the implementation. By iterating the strategy and roadmap, they will become more realistic and catered to the needs of TT&A and Deloitte. At a glance the implementation strategy and roadmap look like linear processes, but in reality there will be step backs and hurdles not accounted for. By co-creating and iterating the the implementation strategy and roadmap along the way, TT&A will be able to overcome these and make the IT Agilitty Scan a success.



