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IT architecture as an ESG accelerator

A business excellence approach for ESG-enabling IT architecture

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Content

01 **Abstract** **Page 03**

02 **The Importance of ESG IT Architecture** **Page 05**

03 **A Holistic Approach** **Page 08**

04 **The Way Forward** **Page 27**

05 **Glossary** **Page 29**

06 **References** **Page 31**

07 **Contacts** **Page 32**

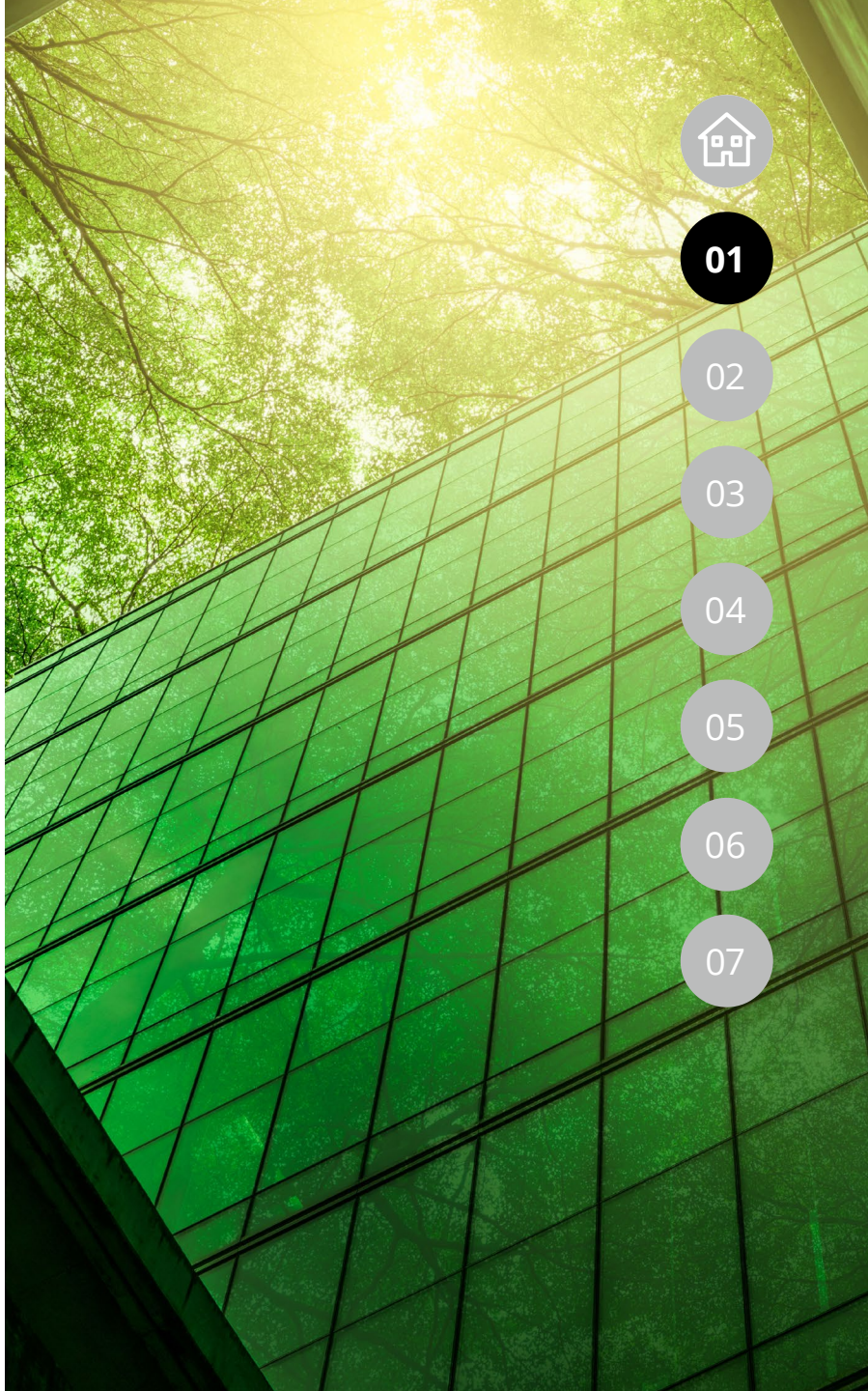
01

Abstract

Environmental, Social, and Governance (ESG) is an endeavor that cuts across all units and teams of an organization. Information technology is key to translating ESG strategy into daily business and to making overarching strategic decisions. Starting at the backbone of an organization, the conceptual design of an organization-wide, cross-business and therefore holistic IT architecture driven by its ESG strategy facilitates measurement, management, and visualization of strategical and operational processes. To support organizations in upgrading their IT architecture, this whitepaper discusses a use-case-agnostic ESG IT architecture approach consisting of 5 specific steps. It outlines a way forward for defining and deploying customized ESG IT architecture so that organizations can take data-driven, timely, and effective business decisions with ESG aspects at the core.

“Data are the lifeblood of decision-making.”

United Nations Secretary-General’s Independent Expert Advisory Group on a Data Revolution for Sustainable Development (IEAG)



02

The Importance of ESG IT Architecture

Decision-making is the foundation for comprehensive ESG transformation. The basis for decision-making is data, which leads to a substantial rise in demand for ESG-related information.[1] An organization's IT can enables correct and timely decision-making by providing analytics and insights on emissions and natural and human resources, across the entire value chain. This yields improved investment decisions, risk mitigation, an optimized value chain, resilience building, and new customers, lenders, and investors.[2,3,4] IT strategy plays a pivotal role in delivering on ESG-related targets. While many organizations have some level of insight into their current ESG impact, an ESG IT Architecture can enhance their ability to measure, monitor, and manage ESG impact to uncover other areas such as waste reduction, carbon footprint management, biodiversity, and social impact.[5] It is key to reaching wider ESG-relevant organizational goals and ambitions.

Organizations must act now and face the challenges to prepare for the future and tap the full long-term potential of ESG management and its social, economic, and ecological benefits.[6,7] Table 1 highlights some of these challenges[8] and opportunities of IT architecture.

Only with a well-designed and correctly implemented IT architecture organizational ESG strategy and business process integration can be steered successfully.

IT Architecture ...
... is a formal description of an organization's IT application, data & technical infrastructure, providing information about the structure of components and their interrelationships.

ESG IT Architecture ...
... is an organization-wide, cross-business and therefore holistic IT architecture driven by an organization's ESG strategy.

Tab. 1 – Common ESG-related challenges during ESG transformation

	Challenges	Solutions via IT Architecture
Anchoring ESG in Organization	Lack of anchoring of ESG strategy in organizational processes & structure	ESG IT Architecture enables cross divisional cooperation across the entire organization and value chain
ESG Measurement	Lack of indicators to measure, evaluate and monitor ESG impact and targets	Defines what and how to measure via the ESG IT Architecture
ESG Management	Lack of ESG parameters anchoring in business processes to enable ESG-based decision making	Integration of ESG management and governance for each use case via digitalization
Data foundation	Lack of quality and granularity of ESG data	Enables comprehensive E2E real-time data collection, reliable data processing, assurance, and consolidation
Capability Mapping	Lack of transparency with regard to business capabilities and their relationship with ESG	Provides information about current capabilities by mapping business capabilities against the existing IT Infrastructure
ESG Gap Analysis	White spots in transparency of ESG performance	Identifies and closes gaps, and provides a structured way to integrate further data sources in existing IT Architecture

03

A Holistic Approach

03 | A Holistic Approach

To support an organization-wide ESG transformation by enabling management and steering, the IT implemented must provide data, metrics, and ESG performance insights.[9] A holistic approach to IT architecture is inevitable to enable organizations to achieve their ESG goals.

Business Capability Map ...
... depicts the complexity of an organization and clearly shows what business activities are needed to reach its objectives. It provides a basis to structure responsibilities and to identify focus areas for action

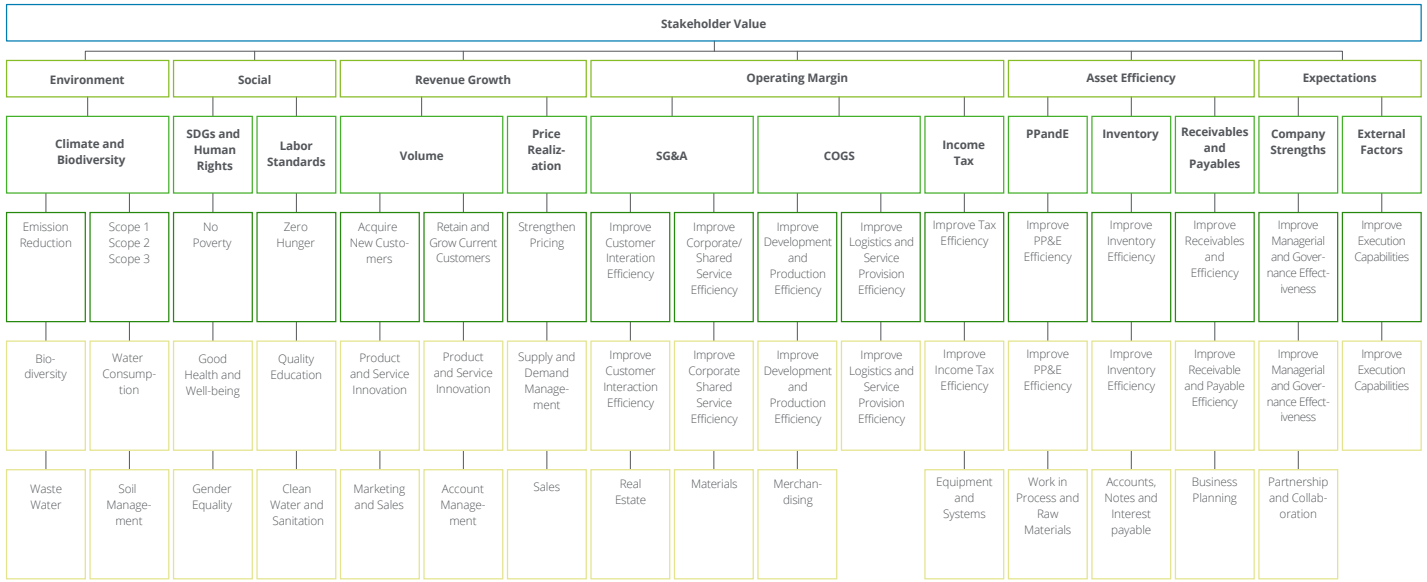
Figure 1 shows an organization's typically large variety of capabilities based on its business and ESG ambitions. Below business capability map can be understood as an exemplary depiction of the requirements for IT architecture.

As the graphic indicates, gathering and releasing ESG information in a holistic manner may require data collection from multiple systems managed by different departments or individuals, which can create challenges in sourcing, collecting, validating, analyzing, and reporting ESG information.

Organizations must apply a holistic ESG approach to their existing IT architecture. A reference IT architecture must be developed to describe the scope of the technologies and products or services required for the realization of system functionalities derived from the business capability map, recommending structures and options for integration of IT products and services.

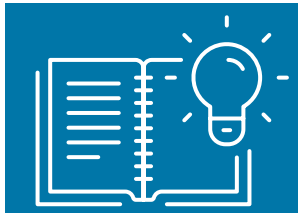
Reference IT Architecture ...
... provides a structure and categories of technology necessary for the enablement of functionalities to reach specific objectives; it therefore facilitates the definition of a specific target IT architecture.

Fig. 1 – Enterprise Value Map



A critical success factor for the enablement of ESG analytics capabilities is their tight integration into organizational IT strategy and IT architecture. It is important to emphasize that "ESG IT architecture" as described in this paper implies the integration of ESG capabilities in the entire organizational IT architecture and does not refer to a parallel, stand-alone IT architecture for ESG-related business activities. The aim is the holistic integration of ESG functionalities into end-to-end business processes.

An end-to-end ESG transformation can be realized by following a dedicated 3-phase approach (figure 2) consisting of "Activate & Prioritize", "Lay the Foundation" and "Transform & Embed". While the focus of the first phase is understanding ESG strategy and prioritizing topics and use cases, the focus of the second "Foundation" phase is to realize the goals of the ESG strategy, the prioritized topics, and the built use cases. The developed concepts and defined structures are then implemented in the "Transform & Embed" phase.



Knowledge Nugget

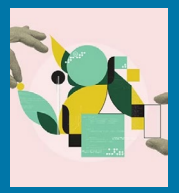


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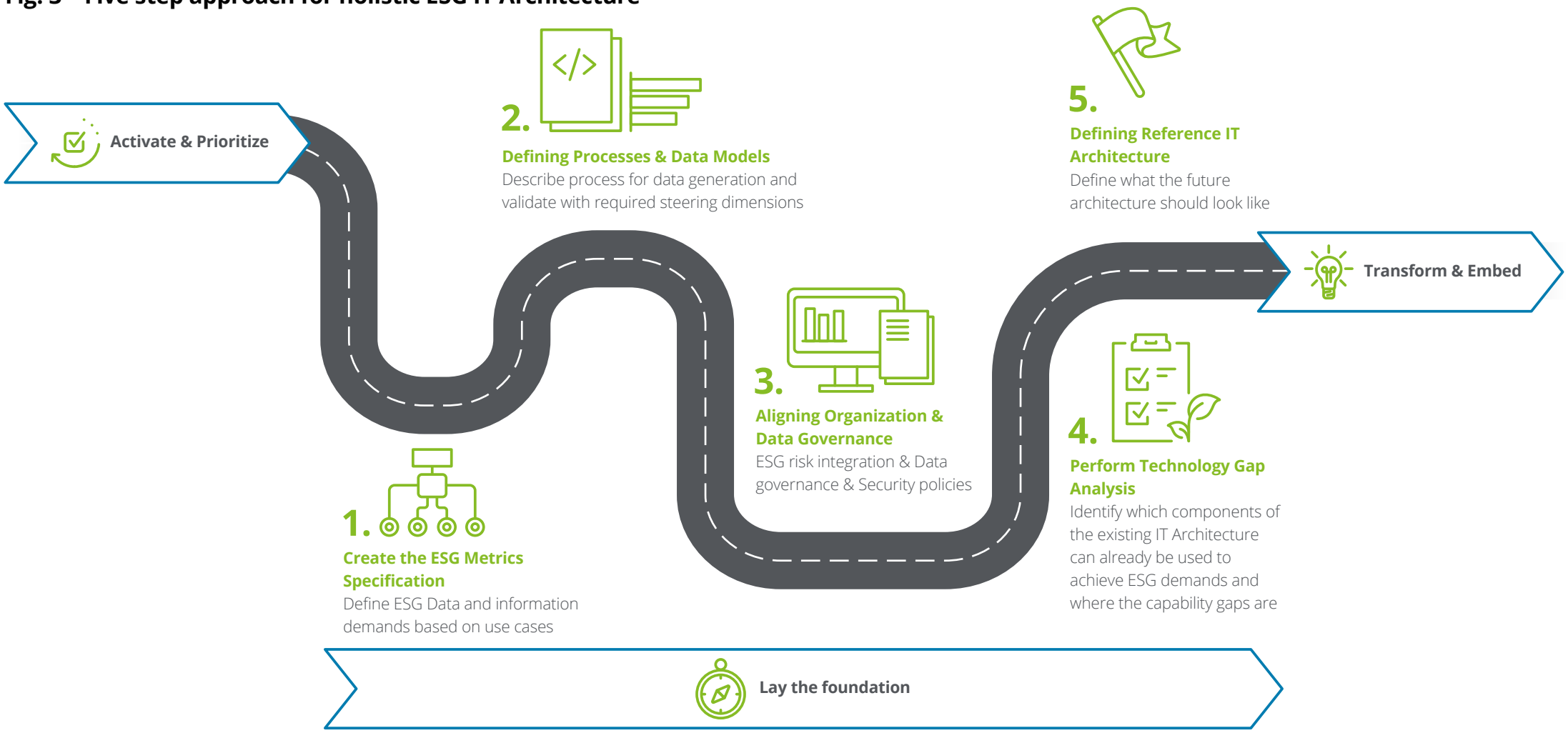
Fig. 2 – The three phases of ESG transformation

Defining a reference IT architecture lays the foundation for an ESG transformation by providing a framework for the specific target IT architecture to enable ESG business capabilities. It is therefore allocated to phase 2 and is its centerpiece. This phase can be broken down into 5 steps, as depicted in figure 3, and is further described below as a step-by-step guide to defining a reference IT architecture.

Target IT Architecture
Target IT architecture is an organization's specific realization of the reference IT architecture through best-fit technologies. It demonstrates the post-transformation IT Architecture of an organization, including application integration & data models, down to the last detail.

Fig. 3 – Five step approach for holistic ESG IT Architecture



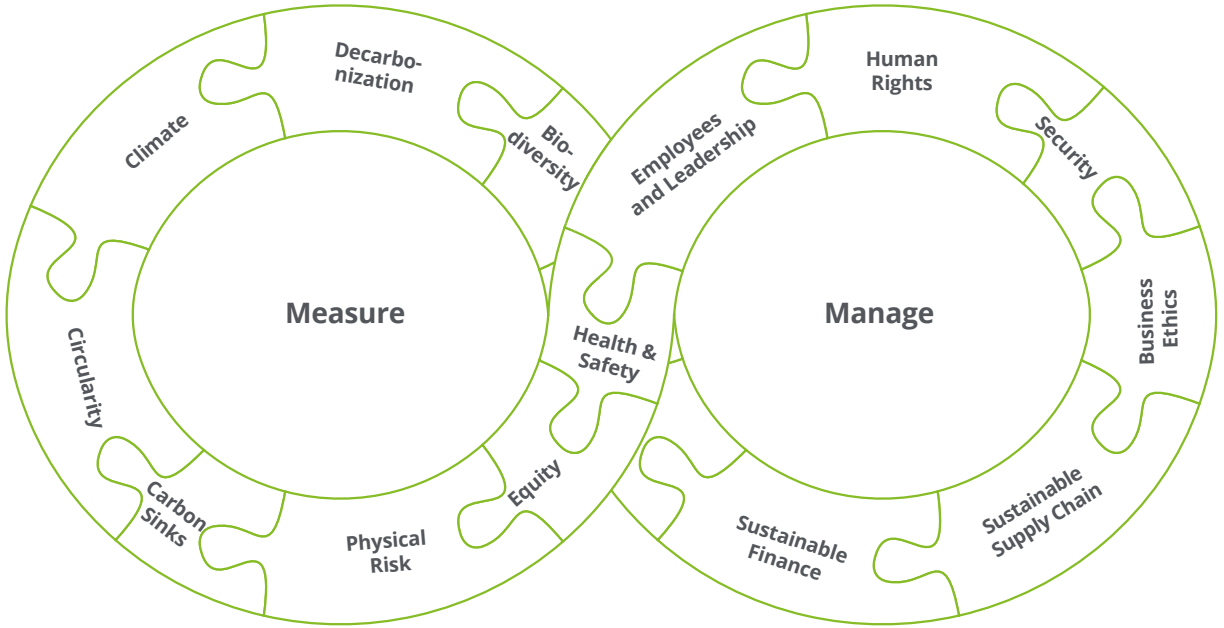
1. Create the ESG Metrics Specification

The first step in defining a reference IT architecture is to identify an organization's strategic fields of action, which includes a breakdown of strategic requirements, goals, and ambitions into operational steps. An overarching catalog of metrics with definitions should be created by translating the ESG strategy and its associated targets and requirements into measurable and manageable ESG metrics. The measurability of corporate ESG impact is a major challenge for organizations in the context of ESG, so defining these metrics is important and should be done with care. Particular attention must be paid to consistency in the collection of metrics, and to compliance with clearly agreed definitions regarding specifications, reporting frequency, subcategories, and calculation logic. To ensure the controllability of ESG measures via defined metrics, and to enable targeted control and monitoring, it is important to consider the complete capability map and its impact on various aspects of ESG ambitions (figure 4).

Data as a Foundation

Data and metrics are the foundation for ESG strategies, management, and compliance. "If you can´t measure it, you can´t improve it." – Lord Kelvin

Fig. 4 – Use case examples for continuous ESG data measurement and management



Each tile/block represents a metric which can be a measurement element for actuals, plans, forecast, targets with different dimensions

2. Defining Processes and Data Models

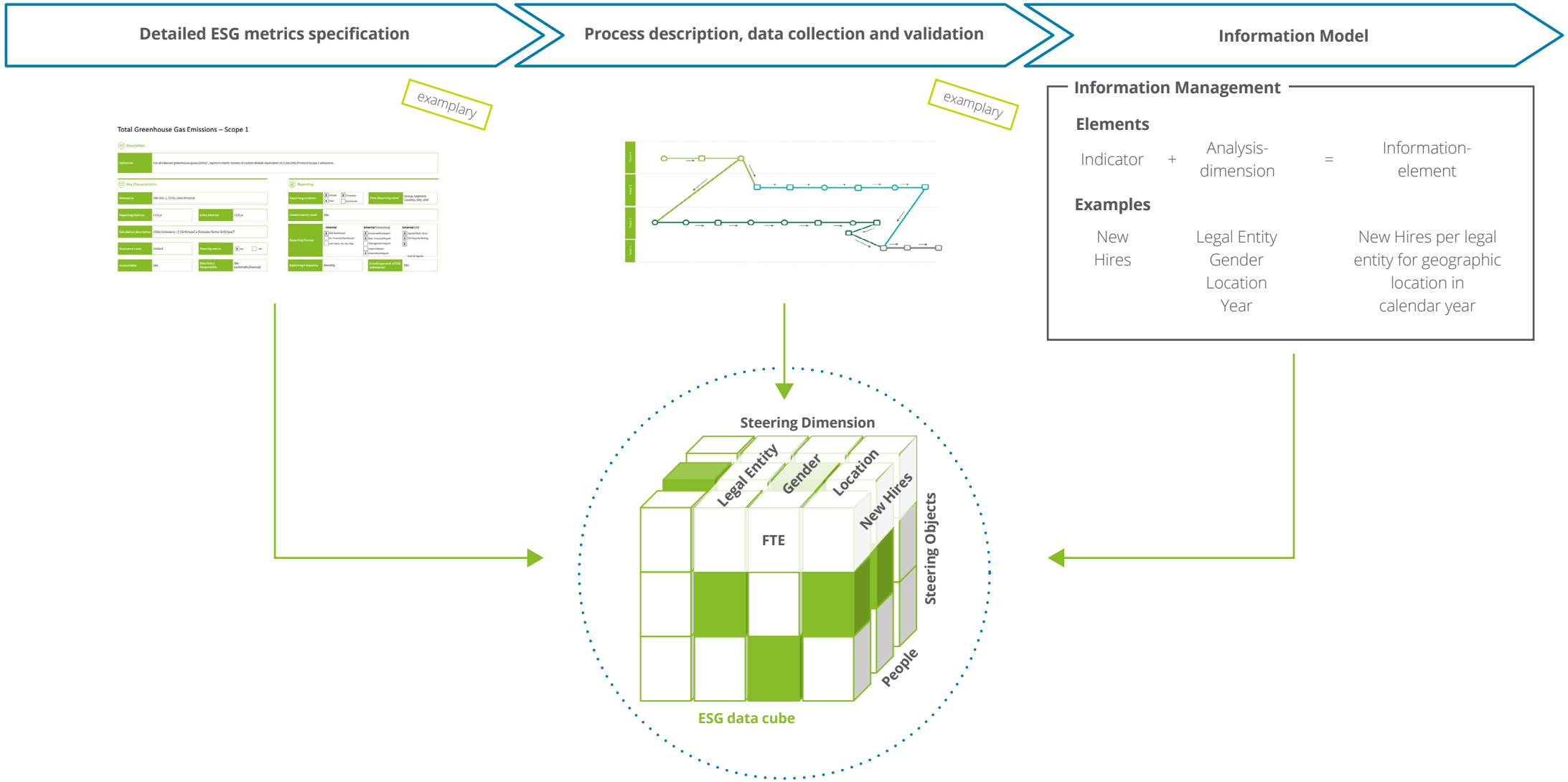
After creating the ESG metrics, the next step is to specify process descriptions for data generation and collection. The process definition must include any business activities containing relevant data, the data delivery process, and update rates, etc., on an organization-wide scale. This step must be validated in coordination with various external and internal stakeholders, business units, and committees. The resulting metrics, information elements, and measurement dimensions then must be documented in form of an information model.

To close the loop, the defined information model must be converted into a data model as depicted in figure 5. The data model contains the measurement objects, their relationship to one another, and their mapping to the technical fields (if known). To provide transparency, completeness, and consistency across the organization, steering dimensions and steering objects must also be part of the data model. Moreover, appropriate master data objects must be specified and integrated into the data model along with defined calculations, planning, and simulation logics.

Information Model
An information model formally describes a problem domain without constraining how that description is mapped to an actual implementation in software. It is a representation of concepts, relationships, constraints, rules, and operations to specify data semantics. It provides sharable, stable, and organized structure of information requirements for the domain context.

Data Model
A data model is an abstract model that organizes data elements and standardizes how the data elements relate to one another and to the properties of real-world entities.

Fig. 5 – Defining process and data model



03 | A Holistic Approach

The details of the steering concept, including the interfaces between content, processes and systems, and the simulation mechanisms must be aligned with one another. This will not only provide the necessary insights into progress on ESG targets, but enable organizations to manage countermeasures and ESG-related improvements. This concept will be refined as part of data governance, discussed in the next step. Nevertheless, the definitions and priorities resulting from the process and data model definition serve as functional requirements for the IT architecture.

3. Aligning Organization and Data Governance

The main objective of data governance is compliance with regulations. But there is more to it. Data governance enables organizations to unlock the full potential of data-management and analytics capabilities to make the most effective use of their data. As a set of quality control processes, data governance supports organizations in holistically managing, using, improving, maintaining, monitoring, and protecting data. Data governance provides a framework to manage the quality, access, privacy, and security of an organization's data. It enables organizations to manage their data proactively, thereby ensuring that their data is fit for purpose. A data governance framework is depicted in figure 6.

Knowledge Nugget

1. Data Governance Deloitte UK

2. Future of Controls Deloitte

"Data governance is a system of decision rights and accountabilities for information-related processes, executed according to agreed-upon models which describe who can take what actions with what information, and when, under what circumstances, using what methods."

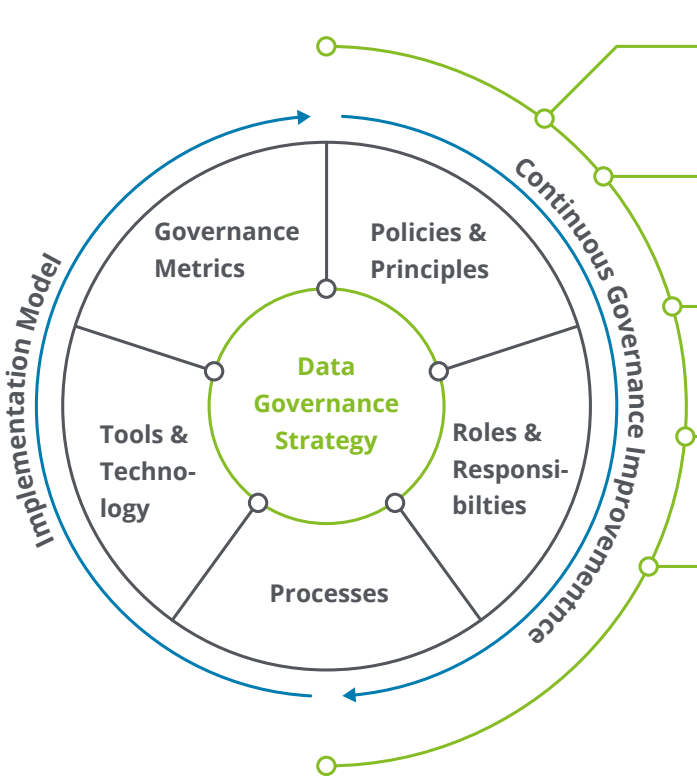
Data Governance Institute[10]

Proper ESG data governance and its organizational alignment, reliability, and security are key to the quality of any ESG data used to achieve an organization's full potential during its ESG transformation.

An ESG data governance strategy which, most importantly, is aligned with organizational data and overall governance strategy must be defined, heeding the data governance framework as follows:

Fig. 6 – Data Governance

Deloitte Data Governance Framework



Data Governance Objectives

- Enhance analytics capabilities
- Reduce operating costs
- Reduce complexity
- Ensure regulatory compliance
- Improve data quality

Policies and Principles

Policies are binding guidelines for the different data management functions that data governance oversees. It is important to entrench ESG data controls to ensure compliance with drastically changing regulatory requirements and market needs (such as Germany's aim to get 100% of energy from renewable sources by 2035).

Roles and Responsibilities

Roles and responsibilities for ESG data should be defined in an ESG governance model by setting up a chain of decision-making bodies and ensuring alignment between IT, business, risk, compliance, and other organizational functions around ESG. This cross-functional steering should be analogous and closely coordinated with the organization's Governance, Risk & Compliance (GRC) function. Clear accountabilities on all levels accelerates progress while controlling risk.

Processes

To enable effective management of data-governance operations, data-governance processes must be defined based on the needs of the ESG data and ESG data-governance stakeholders, as well as of organizational functions.

Tools and Technology

The existing IT landscape must be evaluated for its GRC capabilities and its suitability to fulfill further ESG data-governance requirements. If GRC technology is not already part of the IT landscape or existing tools have shortcomings, it must be highlighted and covered in the next step of the five-step approach. Evaluation and selection of technology must ensure organization-wide consistency of the tool and data landscape.

Governance Metrics

To measure the success of ESG data governance against its objectives, ESG data-governance stakeholders should agree on a set of metrics that reflects the overall business objectives. The definitions of ESG data-governance metrics must include corrective improvement measures.

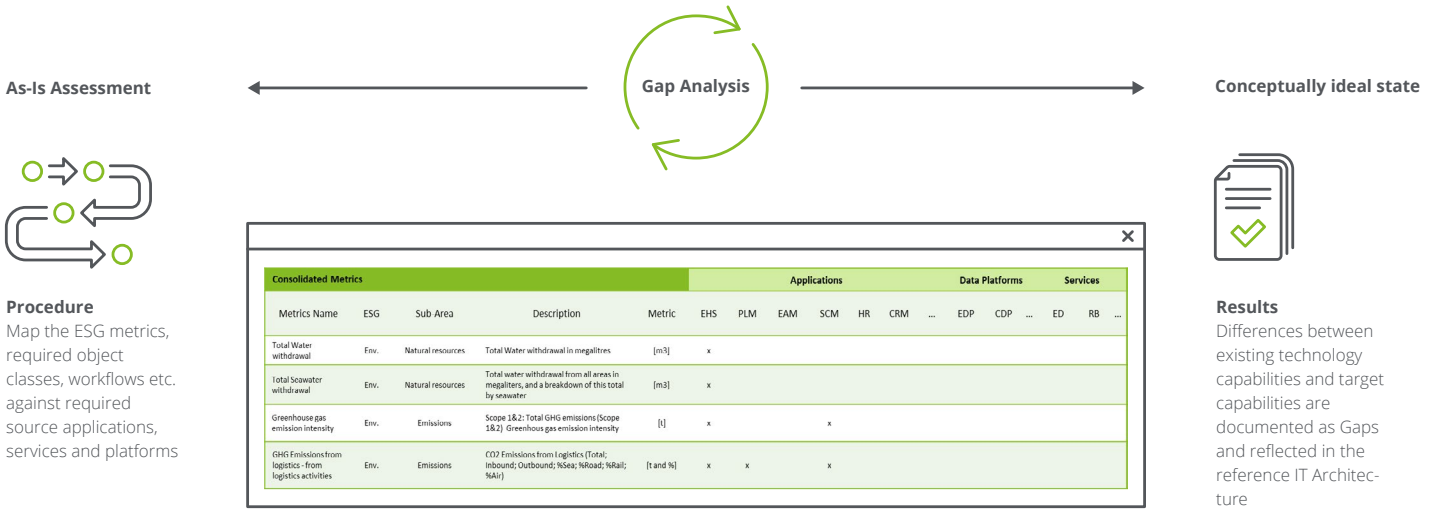
4. Technology Gap Analysis

Existing IT architecture must be analyzed based on the aforementioned steps. This includes which of the required processes and data models have been addressed already, whether these processes and data models are already digital, and which technologies are needed to incorporate the target business and data models.

A general obstacle on the road to end-to-end digital processes is technology that has not yet been implemented. This may include platforms, services, or applications. A complete analysis must determine which data sources would require which kind of applications and services, and if the platforms are suitable to host those applications and services (figure 7). There must also be analysis of whether the functionalities of available technologies are being used to the fullest already or if further functions could be leveraged.

Best practice for performing such analysis is to map the requirements derived from target business capabilities against existing technologies. For example, whether the proper tracking technology for recycled and incoming materials of an organization involved in recycling is available and precise enough. Similarly, a construction business should have a human resource management system integrated with health and safety management. All differences between the requirements derived from target business capabilities and existing technology capabilities must be documented as gaps and addressed in the reference IT architecture.

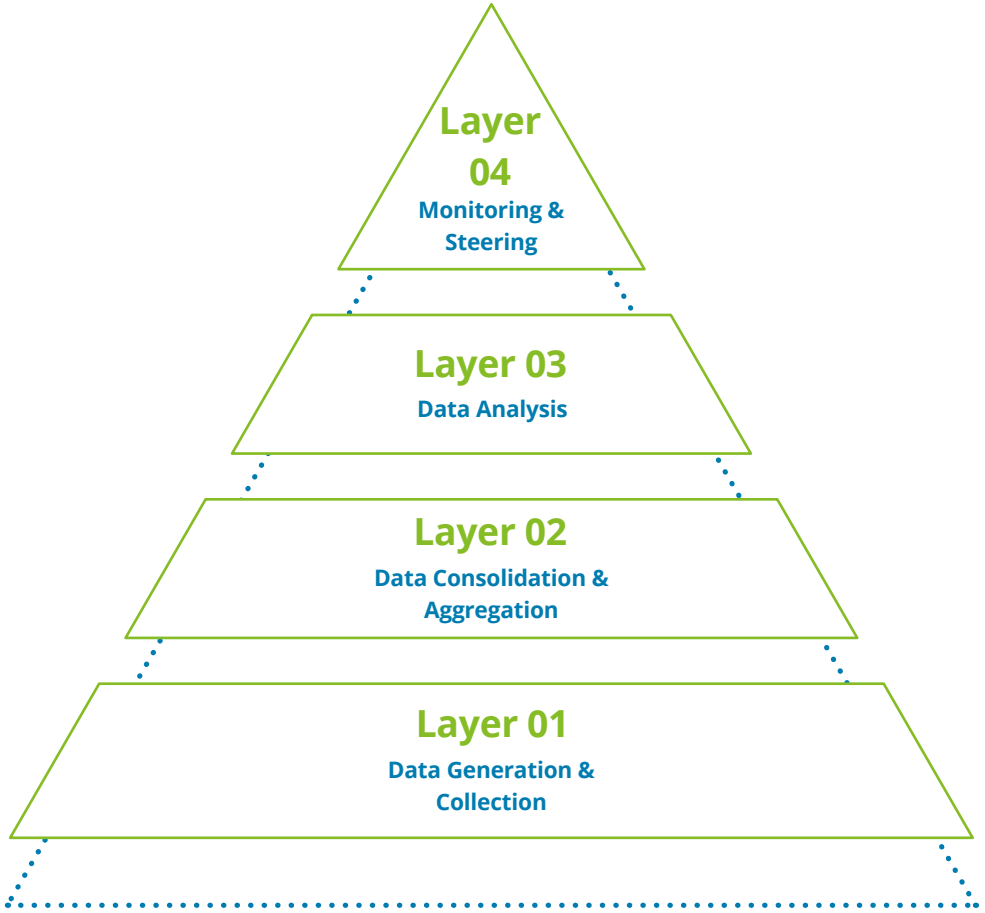
Fig. 7 – Technology gap analysis



5. Defining Reference IT Architecture

Once there is an understanding of ESG business requirements, corresponding ESG reference IT architecture can be derived. Figure 8 shows the layers of an IT architecture that forms the basis for an ESG IT reference architecture as illustrated in Figure 9.

Fig. 8 – The four layers of an IT architecture



Layer 1 Data Generation and Collection connects to transactional sources and forms the basis for data consolidation by extracting, transforming, and loading data into the data consolidation and aggregation layer (Layer 2). Layer 1 also determines the degree of automation of data transfer via the respective interfaces, depending on frequency and type of data collection. Based on the data model defined above, several existing source systems might have data points required for ESG metrics as well. The source systems may need to be enhanced or deployed due to unavailability of data. In any case, integration of ESG and non-ESG source systems is inevitable to reap the benefits of an end-to-end business process.

Layer 2 Data Consolidation and Aggregation, also known as the data integration layer, contains the infrastructure for data storage and amalgamation. This database is connected to the various data sources and aggregates data (from Layer 1) into a single, centralized, consistent data store to support data analytics, data mining, artificial intelligence applications, machine learning, and several other capabilities. This is a crucial part of IT architecture for subsequent powerful analytics (in Layer 3) with vast amounts of planned, actual, and historical data, important to the ESG domain due to data-driven decision-making. An organization-wide central ESG data hub that ensures the completeness and consistency of ESG control and monitoring while guaranteeing transparency and governance of all relevant metrics is essential and a core element of ESG IT architecture. Architects must avoid data redundancy and utilize and enhance existing data models for a lean, optimum and efficient database. Eventually, this ESG data hub will serve as the “one source of truth” for all organizational ESG-related information. The ESG data hub must not contradict the holistic approach, since it is the product of data aggregation, consolidation, and contextualization, and remains the subset of an organization’s holistic data management approach.

Layer 3 Data Analysis facilitates the execution of computational logic and data modifications based on the defined data model. The analytics engine and the predictive analytics functions are located on this layer. The structures and functions of the data analysis level already exist in almost every organization. They must now be expanded to include the ESG component and ESG information. In traditional systems this level includes, among others, tax applications, plan applications, and group consolidation. Deferred taxes, mid-term planning, budget planning, etc. are analyzed here. In an ESG IT architecture it is supplemented by ESG components like ESG metrics calculation using the steering dimensions and objectives and other ESG information.

Layer 4 Monitoring and Steering offers the structure for converging of all information and displaying it in user interfaces to manage, steer and communicate the ESG strategy. Organizations must extend existing systems with ESG components and integrate them without building interfaces from the ground up. ESG is not a separate steering area and should be integrated into the existing steering systems and decision-making processes.

Figure 9 illustrates an ESG reference IT Architecture which enables the capabilities displayed in the business capability map (figure 1). For better comprehension and coherence of the different layers, examples have been included to illustrate which source and target systems could be involved in developing a organization specific target ESG IT architecture.

The methods and aspects described above illustrate a holistic approach by considering ESG components from the outset when designing an IT architecture, decisively advancing ESG through IT at the organization. Scope and complexity prevent comprehensive coverage of all details in this document, but figure 10 shows some crucial success factors that underline the need for ESG IT architecture and what to be aware of to become a leader in an ESG-friendly future.

Fig. 9 – Use case agnostic ESG reference IT Architecture

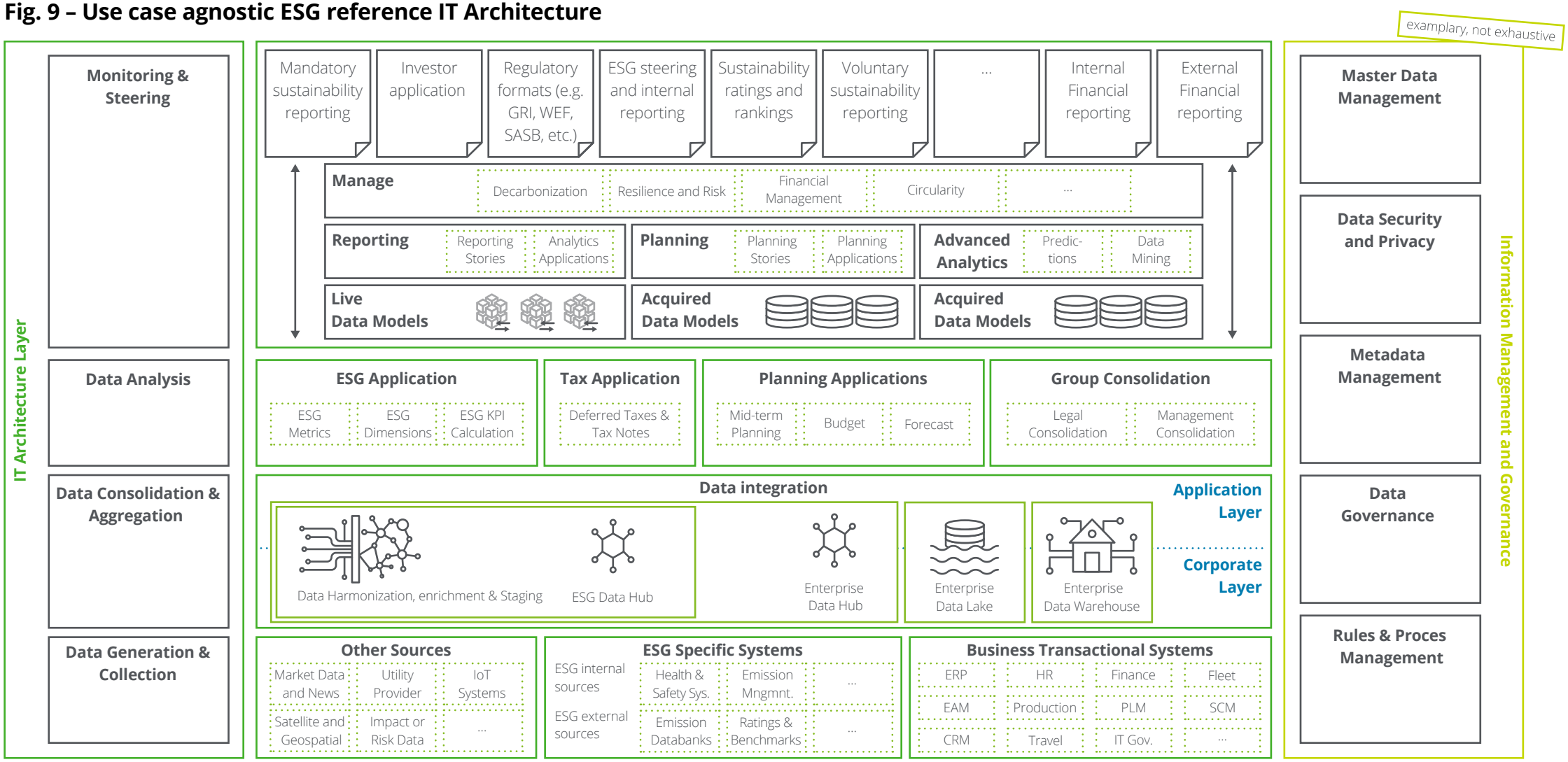


Fig. 10 – Success factors for ESG IT Architecture

ESG IT Architecture best practices

Planning
Clarification of business requirements in advance, but technical concept considered directly from the start

Integration
Integration into existing reporting and management approaches and processes, no creation of parallel ESG world

Data Management
Straightforward rule processes for data availability and assurance of relevant data quality

Enablement
Knowledge transfer and employee enablement

Anchoring
Anchoring ESG in existing and future business processes as foundation for strategic decisions

Change Management
Transparent as well as regular communication and change management to ensure acceptance

Key characteristics of ESG IT architecture

Simplicity
Simplification of persistent data models for a lean and virtual modeling approach

Agility
Enabling agile projects that promise early business value and evolve incrementally

Openness
Opening Business Warehouse resource for tools, methods and target groups that are not typical BW applications

Consistency
Ensuring coherent information and adherence to a “single point of truth” strategy

Scalability
Creating scalable applications that allow for growth in scale, usage, and functionality

04

The Way Forward

Organizations must reconsider whether their ESG goals and strategy have translated into operational steps, and how to transform their business to fit into an ESG-friendly world. The IT requirements for achieving strategic objectives, as mentioned, must be defined holistically. They must be reflected in the overall IT architecture, the key enabler for achieving an organization's ESG targets.

Even though IT enables ESG strategy, strategic ESG targets are the starting point for all actions. Due to highly volatile business environments, ESG business requirements tend to change continuously, so the development process of the reference IT architecture should be agile. After development of a reference IT architecture, the next step in the transform and embed phase is to close any identified IT capability gaps by selecting not yet implemented but relevant applications, services, and platforms for a target ESG IT architecture. These technologies can be used for ESG intelligence gathering and to execute operational level ESG business processes. Detailed process and data models, up to the level of technical fields of the concerned technologies, must be developed, implemented, and enabled via organizational change process.

Deloitte supports its clients end-to-end to realize a successful transformation towardsESG-friendly business without compromising on profitability. Deloitte employs a customer-oriented and structured approach and helps clients leverage ESG IT architecture. In a stepwise approach, from defining the target business state to recommending technology and action plans, Deloitte accompanies organizations in their transformation to becoming more ESG-friendly.

This article is the 1st in the Deloitte PoV series "Sustainability & Technology". Deloitte will continue to promote ESG in the future and help its clients tackle challenges in ESG tech, ESG tool selection, and other use cases across the value chain – as a pioneering partner for an ESG-friendly future, making an impact that matters.

05

Glossary

ESG: Environment, Social & Governance

Business capability map: Depicts the complexity of an organization to clearly see what business activities are needed to reach its objectives. It provides a basis to structure responsibilities and identify focus areas for action within an organization.[11]

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06 | References

01. United Nations Secretary-General's Independent Expert Advisory Group on a Data Revolution for Sustainable Development (IEAG), A world that counts – mobilizing the data revolution for sustainable development, November 2014, p. 2.
02. Deloitte, Deloitte 2022 CxO Sustainability Report, The disconnect between ambition and impact, January 2022, p. 11 et seq.
03. Deloitte, Financing a sustainable transition CFOs in Europe open up on sustainable finance, 2020, p. 1 et seq.
04. Christine Robinson, Inna Vodovoz, Kristen Sullivan, and Jennifer Burns, Deloitte & Touche LLP, "#DeloitteESGnow — Sustainability Disclosure Goes Mainstream," Heads Up 26, no. 21 (2019): p. 1 et seq.
05. Deloitte, "The CIO's call to action: Driving an environmentally sustainable tech agenda to accelerate organizational change," press release, May 18, 2022.
06. Deloitte, Globally consistent ESG reporting, March 2022, p. 1.
07. Gina Miani, Meadow Hackett Rutenbar, Christine Robinson, and Kristen Sullivan, Deloitte & Touche LLP, "#DeloitteESGnow — Setting the Standard: When ESG and Climate Reporting Meet Financial Reporting," Heads Up 28, no. 16 (2021): p. 1 et seq.
08. Deloitte, ESG executive survey, Preparing for high-quality disclosures, March 2022, p. 8 et seq.
09. Deloitte, The CFO as the Driver of Sustainability, January 2021, p. 7.
10. Data Governance Institute, "Definitions of Data Governance," accessed March 30, 2023.
11. Cf. Gerrit Versteeg and Harry Bouwman, Business architecture: A new paradigm to relate business strategy to ICT, Information Systems Frontiers, 2004, p. 92.
12. Cf. World Wide Web Consortium, "XQuery and XPath Data Model 3.1," accessed March 30, 2023.
13. Cf. Yung-Tsun T. Lee, Information modeling from design to implementation, National Institute of Standards and Technology, 1999, p. 2.
14. Cf. The Open Group, "The TOGAF® Standard, Version 9.2, "accessed March 30, 2023.
15. Cf. Pekka Pääkkönen and Daniel Pakkala, "Reference Architecture and Classification of Technologies, Products and Services for Big Data Systems," VTT Technical Research Centre of Finland, 2015, p. 1 et seq.

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