

Introduction to The Digital Transformation Lifecycle

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Abstract. The ability of existing Digital Transformation concepts, to analyze the digital transformation potential, design concepts and execute them within organizations has an alarmingly poor historical track record. Based on the long-standing research work of Global University Alliance (GUA) and its members, a *Digital Transformation Lifecycle* is introduced. The *Digital Transformation Lifecycle*, underpinned by ontology, semiotics and pattern recognition, incorporates all the constructs that can be found in the most popular Digital Transformation concepts and frameworks. It demonstrates the value of the underlying enterprise ontology and describes the relationship between enterprise meta model, the Digital Transformation Lifecycle and various artefacts used around Digital Transformation work. The paper concludes with future scope and application that lies ahead for the *Digital Transformation Lifecycle*.

Keywords:

Digital Transformation Challenges, Digital Transformation Lifecycle, Digital Transformation Meta Objects, Digital Transformation Artefacts, Digital Transformation Semiotics, Business Ontology, Enterprise Ontology, Digital Transformation Framework

1 Introduction

There are numerable lifecycle concepts in existence that are used across a wide range of topics in an organization – these span from Product Lifecycle Management [1], Strategy Lifecycle [2], Process Lifecycle [3], Application Lifecycle [4], Software Lifecycle [5], IT Service Lifecycle [6], Data Lifecycle [7] to Infrastructure Lifecycle [8]. These lifecycles have been put in place, to manage and track changes across the specific concept that evolves over time. Whenever there are multiple changes happening throughout the phases of the lifespan, a lifecycle concept could be applied [3, 2]. The question therefore emerges, why there is no lifecycle concept for Digital Transformation? Similar to other lifecycles, Digital Transformation equally evolves over time as it passes through its evolutionary phases, such as initial analysis to design and execution till on-going improvement. The challenge of taking your Digital Transformation through initial strategy analysis, design through to execution has been well documented [9, 10, 11, 12, 13]. In fact, there has been an overwhelming rate of strategy execution and transformation failure reported within the last two decades [9, 10]. After years of McKinsey research on organizational transformations (2011-2012), the results from the latest McKinsey Global Survey (2018) on the topic confirm a long-

standing trend: few executives say their companies' transformations succeeded. Today, just 26 percent of respondents say their digital transformations, have been successful at both improving performance and equipping the organization to sustain improvements over time [9]. According to Sarvari, Ustundag, Cevikcan, Kaya, Cebi [14] the market is already now confused on what to use, how to use it and how it all fits together. Prisecaru even argues that the many different Digital Transformation frameworks, methods and approaches lead to more confusion and misunderstanding than they support transformation [15].

This paper positions itself around addressing these challenges and more through introducing the *Digital Transformation Lifecycle*. This consists of four distinct overall stages: Understand, Innovate, Transform, Continuously Improve. The paper starts with providing a summary how the *Digital Transformation Lifecycle* addresses the discussed gaps. This is followed by an overview of the *Digital Transformation Lifecycle*, its purpose, relevance to Digital Transformation and its compatibility with enterprise Digital Transformation regardless of industry. The Digital Transformation Framework fully integrated into the *Lifecycle* follows with examples of how Digital Transformation artefacts are related. The extent of the model is then presented with its embedded ontology and semiotics followed by the conclusion which summarizes the validity and highlights the future work surrounding this area.

2 Overview of the Digital Transformation Lifecycle

The gaps in the existing Digital Transformation landscape have just been discussed and how there is a need to work with a lifecycle perspective. What we need is to manage the entire *Digital Transformation Lifecycle*, from the *Understand Phase*, where one should understand the emerging trends, disruptive forces, customer needs as to develop a fitting direction i.e. strategy with related objectives and plans. To the *Innovate Phase*, where the goal is to create new customer value, through value added services or products. Once you move to the *Transformation Phase*, without having innovated, then you will typically 'get a lot more digital (which is all about the latest technology) but achieve very little transformation'. Which is the reason that nearly $\frac{3}{4}$ of all the digital transformation initiatives fail to deliver their actual business value, resulting in substantial economic and productivity losses of \$3 trillion, which corresponds to 4.7 % of global GDP [9]. What we need to understand is the magnitude of (opportunity) cost incurred and failed value realization in organizations. With their digital transformation, most organizations never get to the *Continuous Improvement Phase*, where the value realization is optimized and/or improved. A lifecycle approach is needed, as it is an instrument to represent the course of developmental changes through which an enterprise or organization evolves in order to actually transform its digital capabilities during its lifetime. Both in terms of evolution but also changes as it passes through different digital transformation phases during its lifetime existence. As illustrated in figure 1, the four distinct lifecycle stages (Understand, Innovate, Transform, Continuously Improve) help guide the practitioners to work with the Digital Transformation concepts and capabilities during its development phases and lifespan.

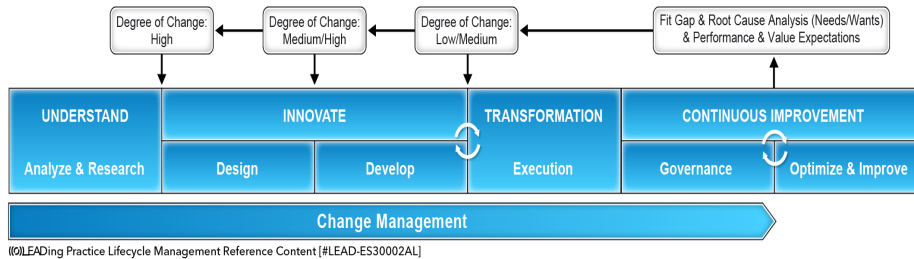


Fig. 1 Overview of the Digital Transformation Lifecycle

The *Digital Transformation Lifecycle* thereby consists of a set of phases in which each phase is interlinked with the previous one. It provides a highly useful sequence of phases and steps that any Digital Transformation practitioner, executive, business analyst, business architect as well as transformation expert can follow, regardless of industry or size of organization. The proposed *Digital Transformation Lifecycle* concepts are interlinked between each other. And they can also be combined with any kind of other lifecycle thinking, such as strategy-, product-, service-, process-, application- or enterprise architecture lifecycle [16]. The possibility to integrate lifecycle thinking, helps align all involved stakeholders to focus on the key activities of each phase in the critical digital transformation aspects of business, information and technology. This on the one hand supports the digital transformation execution but can also help with the other phases i.e. analysis, design, etc., of the Digital Transformation Lifecycle. What is also worth commenting is the necessity of continuous improvement that facilitates the feedback loop in a systematic approach, where depending on the degree of change it can help an organization optimize its underlying digital transformation concepts, solutions, initiatives and activities to achieve more effective and efficient results.

3 Overview of the Digital Transformation Framework

When a practitioner or organization decides to use the *Digital Transformation Lifecycle* to lay the foundation of their Digital Transformation way of working; all experts and employees across the organizational boundaries of the enterprise, now have a shared way of thinking and agile way of working with Digital Transformation over its lifecycle. This creates in turn a common understanding and consensus within the organization, which immediately increases the level of Digital Transformation maturity. Further, the application of the lifecycle to Digital Transformation allows the agile mapping of relevant any relevant components such as value drivers, risk, organizational competencies, owners as well as the specification of activities needed for each Digital Transformation phase to happen and create value. Figure 2 is thus an illustration of the Digital Transformation Framework that is fully integrated into the *Digital Transformation Lifecycle* phases and builds on top of it. You will notice that the individual steps are not linear and interlinked, this is due to the fact that this is not a waterfall approach. This should be viewed as an agile on-demand concept, that depending on your specific situation, different components and thereby steps matter.

Therefore, all these different Digital Transformation Framework building blocks could/should more be seen as steps you can do with a specific *Digital Transformation Lifecycle phase*. Enabling an organization to choose its optimal approaches over the lifecycle based on the components required to overcome a specific challenge. Due to space limitation of this paper, we will only illustrate the most relevant building blocks involved:

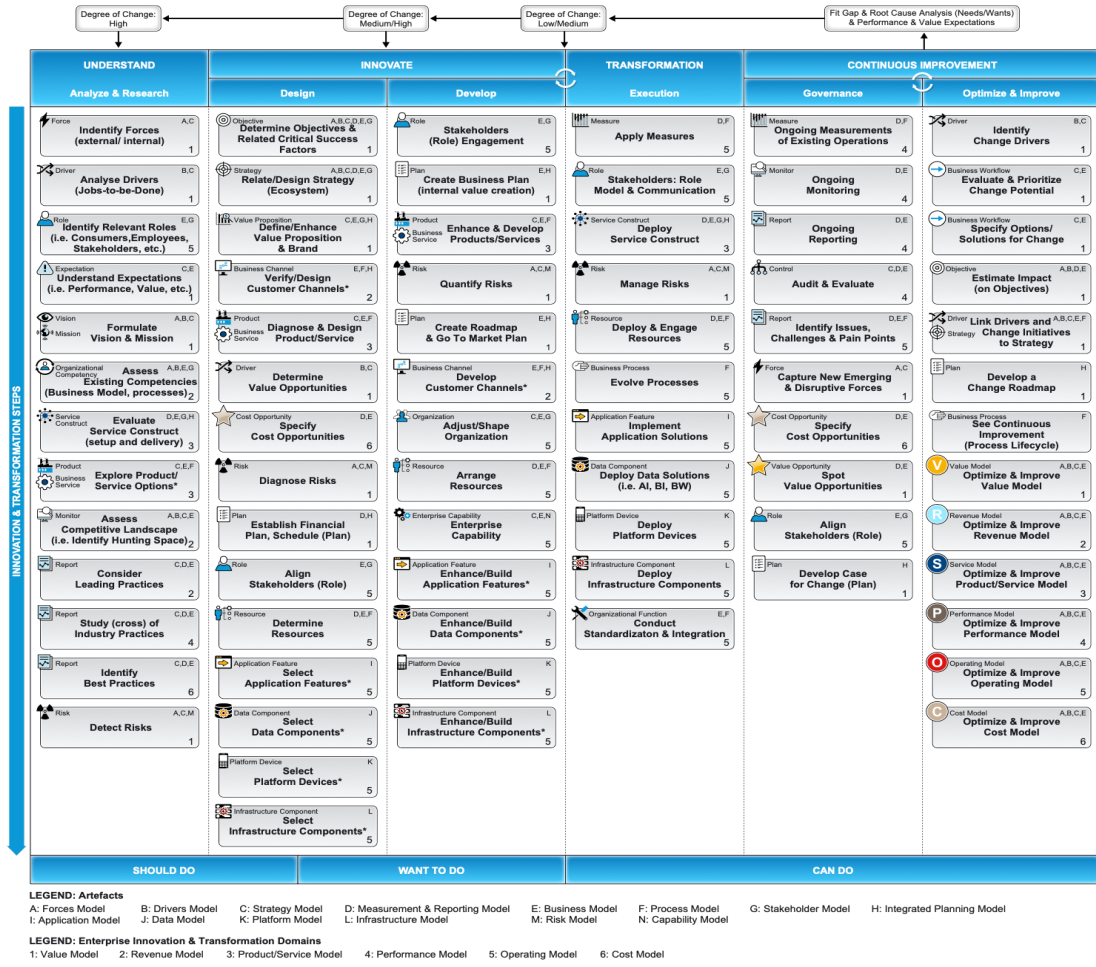


Fig. 2. Overview of The Digital Transformation Framework

What can be seen is that the Digital Transformation Framework with its Building Blocks, is sorted according to the Digital Transformation lifecycle phases and stages, empowering a user according to the agile concept to apply the needed building block.

As can be seen in figure 2 there are letters and numbers in the various building blocks that facilitate the usage of the correct artefacts [17] as well as the appropriate innovation and/or transformation concepts. Typical artefacts used in these phases are specified in figure 2 as letters i.e. A: Forces Model, B: Drivers Model, C: Strategy Map, etc. Obviously, other artefacts could be used in the various phases, such as a Stakeholder Map or Integrated Planning Model. However, some organizations will not develop any artefacts for the defined steps but rather, work through them in a workshop fashion. Therefore, we have included the most common examples.

4 How the Digital Transformation Lifecycle builds on existing Ontology

An ontology is an intentional semantic structure that encodes the set of objects and terms that are presumed to exist in some area of interest (i.e. the universe of discourse or semantic domain), the relationships that hold among them and the implicit rules constraining the structure of this (piece of) reality [18, 19]. In the context of the Digital Transformation Lifecycle, we have used ontology and semantics which are an aspect of semiotics, like syntax, to distinguish valid from invalid symbol structures, and like pragmatics, it relates symbols to their meaning within a context e.g., the community in which they are shared [20]. Ontologies can be categorized and classified according to several criteria (e.g., context, structure, etc.) [21]. When ontologies are classified according to their universe of discourse, we distinguish foundational, domain, task and application ontologies [21, 22]. The Enterprise Ontology [23] will be used as the foundational ontology, which was the basis to provide a source and center to pick which enterprise ontology meta objects [23] would be relevant, share and reuse meaning across all the various building block concepts portrayed in the Digital Transformation Framework. The meta objects and their notations (symbols) have been used as the basis and structure for the digital transformation building blocks (see figure 2). As described by von Rosing and Laurier [23] the enterprise ontology defines basic notions like enterprise objects, relations, structure, arrangements and so on. As the Digital Transformation Lifecycle concept has the ambition to cover all the aspects of Digital Transformation relevant components i.e. from strategy, organizational perspectives as well as information and technology relevant components i.e. application data, platform and technology. The following Enterprise Ontology theories were chosen (see figure 3):

1. The Enterprise Ontology is used as the foundational ontology. In combination with the foundational ontology, the task ontologies, specifically the Lifecycle Ontology will be applied. With the Lifecycle Ontology it also has a link to the Innovation & Transformation Ontology.
2. Through the foundational ontology there is a built-in link to the core reference ontology, where the business, information and technology layer can be applied in the Digital Transformation structure.
3. Through the foundational ontology there is a built-in link to the domain ontology, where the value, capability, service, process, application, data, platform and infrastructure ontology can be applied in the Digital Transformation structure.

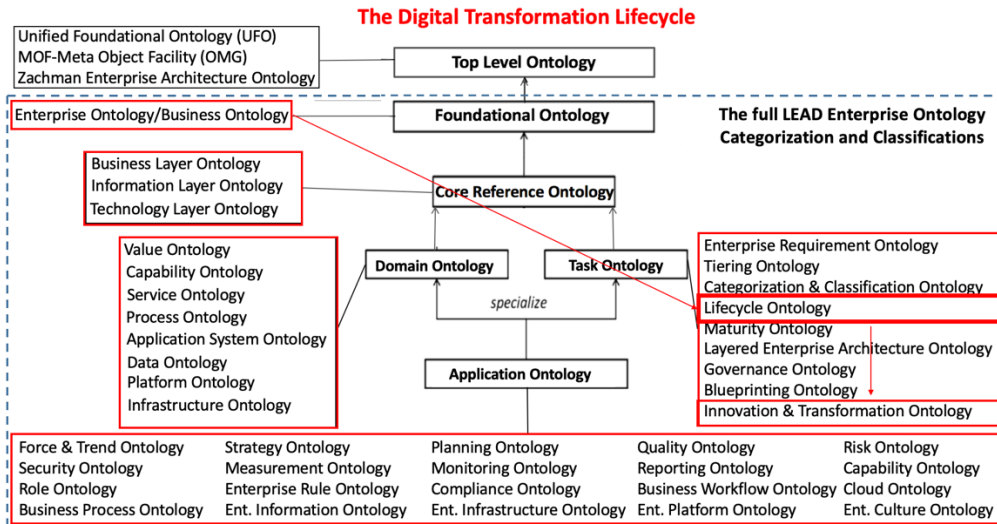


Figure 3. The link between the Digital Transformation Lifecycle concept and the Enterprise Ontology

There is academic proof that the approach of using integrated ontologies to develop new ontologies or concept is valid. For example, Fonseca et al. [24] describes a foundational ontology of geographic objects which was used as a structure to integrate various measure to evaluate the interoperability. This created new concepts and a domain ontology, which interlinked to the former higher-level ontology. Roussey furthermore argues [25] that the core reference ontologies, domain and task ontologies based on the same foundational ontology, can be more easily integrated to form a new ontology. This approach has also been applied to develop LEADing Practice standards where ‘the Enterprise Ontology [23] was used to develop Enterprise Standards’[26]. As illustrated in figure 3, this approach was also applied in this research. The approach should be possible, since Zachman et al [21] argue that the foundational Enterprise Ontology is applicable to any type of organization, independent of complexity or industry.

5 Conclusion:

The Digital Transformation Lifecycle provides a truly interlinked agile approach from the notion of digital strategy to the Digital Transformation execution. The underlying ontology and semiotics allow us to take any organizational Digital Transformation challenge and integrate it into the Digital Transformation Lifecycle way of working and modelling regardless of industry type. The Digital Transformation Lifecycle is based upon an empiric ontology, meaning that its roots lie in both practice and research. Consequently, it covers all aspects of the Digital Transformation phases. Some of the gaps discussed in the theory can therefore be fulfilled with the Digital Transformation Lifecycle approach and thereby help improve the currently high failure rate in industry. The related Digital Transformation Framework is designed to be an agile method, which is vendor neutral/agnostic and it can therefore be used with

most existing approaches that have any of the identified Digital Transformation building-blocks. Due to the limitations placed on this paper we were only able to demonstrate a brief overview of its usefulness. The Digital Transformation Lifecycle with its related Digital Transformation Framework can be used as described, in order to attain the desired level of completeness, track and manage changes over time or identify possible approaches based on the individual steps to overcome a specific transformation challenge. Further, it is complemented with elicitation support such as guiding principles for creating, interpreting, analyzing and using Digital Transformation engineering, modelling or architecture concepts within the Digital Transformation Lifecycle. In future publications this will be extended to evidence deeper insights into aspects such as Digital Transformation ontology and semantics, Digital Transformation architecture and multiple agile modelling disciplines such as value-, revenue-, performance- or service modelling.

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