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The Architectural Enablement of a Digital Platform Strategy

Research-in-Progress

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Abstract

Facing the opportunities and threats arising from digitalization, traditional brick-and-mortar companies are increasingly following the lead of digital natives and turning towards platform strategies to gain speed in the development of digital value propositions internally and co-create value in their surrounding ecosystem. This research project elaborates on the digitalization journey of the LEGO Group to investigate how companies can architect digital platforms to overcome previous limitations to digital innovation. Portraying Enterprise Architecture (EA) as a central mechanism to guide the transformational journey, the research elaborates how this dynamic capability can be built. Subsequently, a path constitution perspective reveals how a company can re-architect its pre-existing information infrastructure into a digital platform. The research project will be rounded off by articulating how this transformation removes previous barriers to digital innovation.

Keywords: Digital Platform, Information Infrastructure, Enterprise Architecture

Introduction

The progressing digitalization of economies and industries is characterized by a changing part played by information technology (IT) from a supporting role in foremost physical value propositions towards an essential role in business models that have digital components inscribed into their value proposition (El Sawy 2003; El Sawy et al. 2016). This shift bears promising opportunities for companies able to seize the moment, while posing enormous threats on incumbent firms that may see well-established business models being disrupted by digitally-enabled products or services from the network economy. Responding to these competitive dynamics, traditional brick-and-mortar companies are following the lead of digital natives through strategic digital transformations (Sebastian et al. 2017). Often associated with the injection of digital technology into physical products, these transformations seek to enable digitally-enabled platform-based business models, the agility to develop new products as well as services quickly, and a business ecosystems of partners to co-create digital innovation (Eaton et al. 2015; Gawer and Cusumano 2014; Tiwana 2013).

As companies start competing based on digital business models, "the role of corporate IT infrastructures is likely to transform" (Yoo et al. 2010, p.10) from a pure backbone of enterprise systems (ES) towards a digital platform for distributed service and product innovation (Sebastian et al. 2017; Sedera et al. 2016). The platform is the third elementary type of value configuration, as identified by Stabell and Fjeldstad (1998), and platform markets comprise a large and rapidly growing share of the global economy (Eisenmann et al. 2011). As a consequence, traditional brick-and-mortar companies are nowadays increasingly adopting platform-based strategies (Ross et al. 2016).

However, little is known in the academic literature on how digital platforms come into being or how they are constructed (de Reuver et al. 2016). Simultaneously, companies' pre-existing IT trajectories

are subject to path dependencies and irreversibility that complicate corporate IT platform innovations (Fichman 2004). Therefore, this research project takes an insider's perspective on how a company can bring about new development trajectories for its corporate information systems (IS) landscape to enable digital innovation internally and within its business ecosystem. The concrete overarching research question is subsequently: *How can a company design and implement a platform architecture to enable a digital business strategy?*

To answer this overarching research question through multiple individual contributions, this project investigates the digitalization journey of the LEGO Group and specifically the establishment of an Enterprise Architecture (EA) capability to transform the company's IS landscape into a digital platform.

Theoretical Foundations

The academic literature on platforms and information infrastructures is conciliated to provide conceptual precision around two fundamental concepts that have suffered from tremendous degrees of ambiguity and unclarity in research as well as practice. In addition, the practitioner-oriented EA literature provides a theoretical foundation for the purposeful (re-)design of a company's IS landscape.

Platforms and Information Infrastructures

The academic literature on technological platform management mainly consists of two separate research strands that a small, emerging body of research is beginning to bridge. On the one hand, the economic theoretical perspective has conceptualized platforms as two-sided markets and has produced insights on platform competition (Gawer 2014). The majority of research on technology platforms follows the engineering perspective, on the other hand, which studies platforms as technological architectures that drive platform innovation (Gawer 2014). Conceptualizing a platform as a stable core and variable peripheral components, this research strand explains how modular architectures spur organizational agility by providing a technological architecture to innovate upon in production and design (Eaton et al. 2015; Gawer and Cusumano 2014).

In the context of IS, more recent evidence suggests that firm-internal enterprise platforms and infrastructures, such as enterprise resource planning (ERP) systems, play a key enabling role in leveraging digital technologies for innovation (Henfridsson and Bygstad 2013; Sedera et al. 2016). Particularly ERP systems "are increasingly serving as a platform to which other tools can be added in order to take advantage of shared data resources" (Yoo et al. 2012, p.3). Sedera et al. (2016), on the other hand, reveal that not all enterprise platforms are suitable to support digital platform innovation and their impact remains unclear (Damanpour 1991; Sedera et al. 2016).

The concept of an information infrastructure (II) is to a large extent overlapping with the one of a platform and has therefore often been applied to study similar phenomena (c.f. Tilson et al. 2010). Both concepts describe shared socio-technical systems that consist of a set of IT capabilities, are emergent in nature, and evolve in a path-dependent nature to serve initially unknown user needs (Hanseth and Lyytinen 2010). Nevertheless, a platform and an II are distinct phenomena that exhibit decisive differences. Platforms are built into a design context, which remains under central control by architectural principles that form a design framework (Hanseth and Lyytinen 2010). II, by contrast, are unbounded, open, shaped by heterogeneous and autonomous actors, and lack global control (Henfridsson and Bygstad 2013; Star and Ruhleder 1996). Also, II are more heterogeneous in nature and serve the connectivity of disperse communities. Hanseth and Lyytinen (2010, p.1) argue that II are "recursively composed of other infrastructures, platforms, applications, and IT capabilities".

The development and evolvement of II bares an idiosyncratic coordination challenge (Grisot et al. 2014; Hanseth and Lyytinen 2010), which originates from the fact that most IIs are distributed across a diverse set of actors. Therefore, lack of control is a fundamental attribute of II development (Ciborra 2000). In the pursuit of individual goals, distributed actors leverage parts of the II's pre-existing components – referred to as the installed base (Grisot et al. 2014) – to append new socio-technical elements (Sanner et al. 2014). Simultaneously, it is rarely possible to redesign the II from scratch, such that II development

always "wrestles with the inertia of the installed base and inherits strengths and limitations from that base" (Star and Ruhleder 1996, p.113).

Enterprise Architecture

EA refers to the definition and the representation of a company's organizing logic for structures, roles, incentive systems, business processes, and IT systems (Ross et al. 2014). The purposeful (re-)design of these elements is a crucial strategic task that aims for coherence between organizational capabilities and broader business goals to yield a foundation for execution of the overall business strategy (Ross et al. 2006). In recognition of this continuous, path-dependent refinement, Rolland et al. (2015) introduce the concept of 'enterprise architecting' to describe the cultivation of existing architectures over time.

Focusing pre-eminently on technological components, EA has traditionally been conceived as interconnected layers of IT infrastructure, data, and applications (i.e. IT architecture) that enable appropriate degrees of business process integration and standardization. Following this perception, EA aligns systems as well as processes with a company's IT and business strategy to drive business value from IT (Ross et al. 2006). More recently, however, practitioners and researchers from the IS community start to recognize that EA is not a pure IT systems challenge and follow a more holistic view, which accounts for the dedicated business architecture (Mocker et al. 2015; Ross et al. 2014).

The design, implementation, and refinement of a consistent as well as effective EA enables companies to realize superior organizational performance (Ross et al. 2006). Despite difficulties to quantify business value from EA initiatives, consensus exists in the IS community that a high-quality EA improves organizational performance through several mediating organizational benefits, such as increased operational efficiency or strategic agility (Mocker et al. 2015). Therefore, EA management, commonly abbreviated as simply EA, is often used as a vehicle for strategic digital transformations.

Proposed Methodology

The overall research project follows the case study methodology (Dubé and Paré 2003) and generates distinct types of theoretical contributions in each of the individual publications. Based on the lack of previous research on how traditional companies can develop digital platforms, the platformization initiative in the LEGO Group was selected as a case for investigation, since it exhibits the typical contextual characteristics of the transformation challenge. The company's IS landscape had so far played a supporting role for the core physical value proposition and was being challenged to cater for a rapidly-changing business environment populated by existing and new competitors that apply digital technologies to reinvent value propositions, customer interactions, business processes as well as complete business models. Furthermore, there had been a growing awareness of the transformational need within the company, such that financial and managerial resources were allocated to the journey of potentially becoming a business enabled by a digital platform. More generally, the case allows for the investigation of a well-functioning company that has been recognized as an industry-leader in digitalization (El Sawy et al. 2016) and is making substantial investments into the journey.

Starting out with an initially broad scope, the study is based on the collection of three sources of empirical data: observations, interviews, and documents. As an industrial Ph.D. Fellow, the author is acting as an integrated member of the LEGO Group's EA team on site at the group's headquarters in Billund, Denmark, and collecting participant observation data (c.f. Yin 2013). These observations focus on the actions, decisions, and events through which the transformational process unfolds. In combination with relevant supporting material (documents), observation data is captured in a structured diary (c.f. Baskerville and Wood-Harper 2016). The diary entries are collected in a case database and each grouped by direct observations, reflections on observations, plans for future research, and supporting diagrams, drawings, or mind-maps. To address the threat to validity pointed out by Baskerville and Wood-Harper (2016) in this context, semi-structured interviews with key informants are used as a secondary source of evidence (c.f. Yin 2013). The individual interviews are conducted on a continuous basis at the company's premises, supported by an interview guide, and eventually transcribed as well as added to the case database (Yin 2013). To triangulate the findings further, internal

documents from the company, such as reports, presentations, architecture documentation, and emails are used as an additional source of evidence (c.f. Yin 2013).

Current Stage of the Research

Based on a brief description of the case evidence, this section provides an overview of the project's three theoretical contributions so far that are currently in peer review for international IS conferences.

Case Outline

As one of the first brick-and-mortar companies in the world, the LEGO Group has made digitalization a fundamental pillar of the overall business strategy already in 2012. To meet present and upcoming challenges, the long-term vision for the toy manufacturer from Denmark is to create a highly adaptive organization, which collaborates closely with external partners to harness an ecosystem of platforms to co-create innovation. As some of the early "digitalization moves" (El Sawy et al. 2016, p.2) placed heavy demands for novel technology on the existing enterprise IT platform, the need for a new complementary IT platform soon became evident. "We have a fairly complex landscape, but still […] one big system […] which is being used all over the globe. […] We have global processes, global solutions. That brings in a lot of advantages that things are integrated and tied together, but […] because of this huge, tightly integrated, tightly coupled solution, we have difficulties with reacting fast" (EA Director, Corporate IT, LEGO Group). The tight coupling between systems undermines IT flexibility as change requests and upgrades imply ripple effects on other landscape components.

This platform architecture results from the fact that architectural decision-making in the LEGO Group has previously not been managed from a global perspective to focus on the long-term flexibility and evolvability of the system landscape. "We are moving forward very quickly in the more digital space and there were really no principles or no overlying roadmap […]. [This] meant that the decisions were potentially going to be fragmented and the wrong decisions [were] taken for the long term" (Head of Business-Enabling Technologies , Corporate IT, LEGO Group).

In order to address these issues and trigger the transition from a distributedly-managed II towards a centrally guided digital platform, the LEGO Group has recently established a centralized EA capability. "When we started to talk in more details about what was needed for the future in terms of direction-setting and governance, it became clear in the leadership team that there was a need [for a centralized EA function]" (Head of EA, LEGO Group). The new EA function is a small organizational unit consisting of six Enterprise Architects (EAs) and guides the evolvement of the platform landscape with an integrated long-term perspective. "I hope and I already see that we have more time to look ahead and to figure out how we are going to create a platform for the LEGO Group that allows for the flexibility and the speed that we see around us, but also that we see our colleagues in the business asking [for] more and more" (EA Director, LEGO Group). The goal is to build scalable, adaptable and flexible IT platforms that have digital options embedded to make sure that new technologies can be seamlessly integrated. "We will not let EA or bad architectural choices limit future business opportunities" (Head of EA, LEGO Group). "We will get to a state with a more agile platform […] that will be more [flexible] towards future demands" (CTO and Vice President, Corporate IT, LEGO Group).

Dynamic Capability Building

The first research contribution conceptualizes EA as a dynamic capability that enables companies to continuously capture market opportunities through the reconfiguration and integration of digitally-enabled business capabilities under the circumstances of "next-generation competition" (Teece 2012). According to the dynamic capabilities framework, the long-term profitability of companies hinges on the ability to adapt internal resources and capabilities to evolving customer demands and technological opportunities (Teece 2007). These meta-competences have therefore been described by a company's capacity to *sense* as well as *seize* new opportunities and to continuously *reconfigure or transform* its assets and structures to fit the environment (Teece 2007). Despite tremendous research attention in the past decades, the development of dynamic capabilities remains an underexplored phenomenon.

In the LEGO Group, the EA capability specifically involves mechanisms that enable the sensing as well as seizing of technological and market opportunities and the continuous transformation of existing technology-enabled resources and capabilities. This perception of EA addresses a continuous challenge in the context of next-generation competition that will proceed throughout the digital future. Thus, EA is conceptualized as a dynamic capability to develop an explanatory theory on capability building. In particular, an inherent tension between "building capabilities for the future while ensuring success in the present" (Smith and Lewis 2011, p.4) is noticed in the process. Since the emergence of this tension results from the capability's nature as a meta-competence, it may be generalizable to all dynamic capabilities. Eventually, the case reveals a viable resolution strategy through combination of splitting and synergistic integration of conflicting demands (c.f. Smith and Lewis 2011).

Path Constitution Perspective on Platformization

The second research contribution develops a process model explaining the development of a digital platform as a process of path constitution in recognition of dependencies on a company's pre-existing and drifting information infrastructure (c.f. Figure 1).

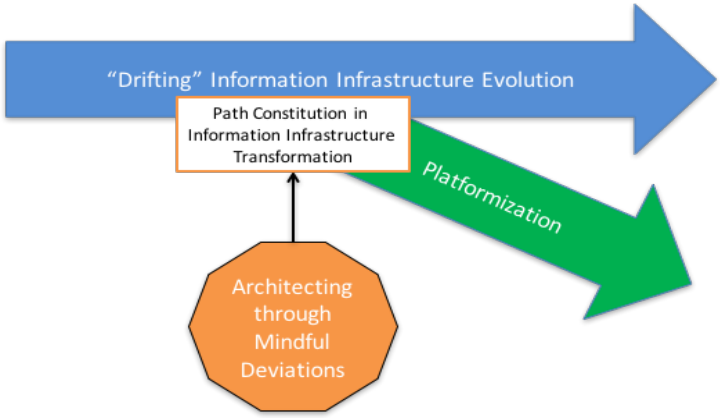

Figure 1. Conceptual Process Model: Creating a new 'Platformization' Path in the Transformation of an Information Infrastructure

In general terms, path-dependent processes are non-ergodic, beyond the influence by human actors, and shaped by contingencies as well as history (Sydow et al. 2009). The concept of path creation, by contrast, involves an active involvement through human agency (Garud et al. 2010). Actors deliberately shape the evolutionary path of processes through mindful deviations "from existing artifacts and relevance structures fully aware that they may be creating inefficiencies in the present, but also aware that such steps are required to create new futures" (Garud and Karnoe 2001, p.6). Path constitution unifies these two perspectives by defining a path as a non-ergodic process of interrelated events that may be actively influenced by knowledgeable human actors (Singh et al. 2015; Sydow et al. 2012).

Prior to the establishment of a centralized architecture unit, the LEGO Group's II was drifting in a path-dependent, socio-technical evolution process. In absence of cross-functional, long-term architectural guidance, the IS landscape was shaped by functionally-distributed actors that satisfied individual business requirements by bolting new IT components onto the infrastructure's installed base. This process increased architectural debt and limited the II's flexibility for the future while leading to individual lock-in situations. To break away from the path-dependent process of II drifting, architects engage in mindful deviations from existing relevance structures through publication and communication of various artefacts (e.g. architecture principles and scorecard) that should feed the centralized, long-term architectural vision into the organization. These deviations may create inefficiencies in the present and are met by resistance in the organization. Nevertheless, they impose a central design framework over the IS landscape and trigger the constitution of a new 'Platformization' path. This gradual transformation will enable the company's progressing digitalization journey.

The theoretical insights spell out the balance between constraining path dependencies and intentional path creation that actors need to manage when engaging in deliberate II transformation. In addition, the evidence discloses in detail how concrete deviations by architects guide collective action to cultivate the installed base of an II into an intended development trajectory. These findings stress the importance of human agency and boundary-spanning communication in platform development.

Internal Digital Platforms and Digital Innovation

The third research contribution develops a system-theoretic model on the generative mechanisms through which an internal digital platform enables digital innovation within a company. While the enabling role of multi-sided digital platforms for innovation in digital ecosystems is a well-researched phenomenon (Baldwin and Woodard 2008; Eaton et al. 2015; Selander et al. 2013), internal digital platforms have received minor research attention and results have not been conclusive (Sedera et al. 2016). Proceeding from the hypothesis that internal digital platforms enable digital innovation in a company, the third contribution adopts a critical realist research approach to substantiate the claim by exploring fine-grained generative mechanisms through which this process unfolds (Archer et al. 2013).

Based on the observation that all software systems and digital components in the IS landscape of a company can be conceived as larger or smaller clusters of functionality, Systems Theory (Simon 1962) is borrowed as a theoretical lens to develop a holistic concept of an internal digital platform. This perception underlines that digital innovation does not only occur in the periphery but also in the core of a digital platform. Specifically decoupled interactions via standardized interfaces among individual platform components is an inherent architectural characteristic that is essential to this conceptualization.

Inspired by the emergence of complex hierarchical systems, the subsequent analysis of the LEGO Group's IS landscape focuses on the granularity of individual components and how they evolve to address specific business problems in the real world. Even though the current state of the company's global IS landscape does not live up to the internal platform concept advanced, the evidence reveals how individual 'platformized' subsets enable digital innovation, while others take a constraining effect. The findings entail three generative mechanisms – modular upgradability, economies of substitution, and reproduction – through which an internal digital platform enables digital innovation. Modular upgradability refers to the ability to evolve the overall platform by implementing changes in individual components without creating ripple effects on other components. Economies of substitution, on the other hand, emerge when the cost of creating a new subsystem by reusing existing components is lower than building a system from scratch. Eventually, reproduction describes the imitation or adoption of externally-created solutions that address known business problems.

The third mechanism acknowledges the continuous prevalence of commercial off-the-shelf software and the increasing ubiquity of cloud-provided solutions. By adopting a holistic conception of an internal digital platform - including ES and more modern digital components -, the impact of their interactions on platform evolvability and on digital innovation within the company becomes apparent. Furthermore, the findings reveal the strategic choice of granularity that architects face during subsystem design, which should either strive for efficiency through reproduction or flexibility as well as speed through economies of substitution.

Plans for Completion

The completion of this research project will be based on (1) the continuous collection of case data, (2) the identification of further theoretical insights from the evidence, and (3) the continuous improvement of the presented research approaches in aspiration of conference as well as journal publications. Since the digitalization journey of the LEGO Group is ever on-going, future evidence will be valuable to evaluate the expediency of decisions and actions in the present. Eventually, these insights will feed the refactoring of the presented research contributions.

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