

# How the LEGO Group Is Embarking on Architectural Path Constitution to Transform Its Information Infrastructure into a Digital Platform

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**Abstract:** Traditional companies are increasingly turning towards platform strategies to gain speed in the development of digital value propositions and prepare for the challenges arising from digitalization. This paper reports on the digitalization journey of the LEGO Group to elaborate how brick-and-mortar companies can break away from a drifting information infrastructure and trigger its transformation into a digital platform. Conceptualizing information infrastructure evolution as path-dependent process, the case study explores how mindful deviations by Enterprise Architects guide installed base cultivation through collective action and trigger the creation of a new ‘platformization’ path. Additionally, the findings portrait Enterprise Architecture management as a process of socio-technical path constitution that is equally shaped by deliberate human interventions and emergent forces through path dependencies.

## 1 INTRODUCTION

While information technology (IT) has traditionally occupied a supporting role for organizations, new business models emerge that have digital components inseparably inscribed into their value proposition (El Sawy, 2003). The economic and societal shift towards this digital paradigm is commonly referred to as “digitalization” (El Sawy et al., 2015, p.2). Companies that are able to capture the moment can seize opportunities from new ways of doing business, but the disruptive forces of digitalized business models also pose enormous threats on incumbent firms. Incumbents are therefore embarking on strategic digital transformations to inject digital technology into their physical products, gain the agility to develop new products as well as services quickly, and leverage business ecosystems of digital partners for co-creation of value (Matt et al., 2015).

At the heart of this digital transformation rests an increased orientation towards digitally enabled platform-based business models (Cusumano & Gawer, 2002; Eisenmann et al., 2011; Gawer, 2014; Eaton et al., 2015). Responding to competitive pressures from digital natives, traditional brick-and-

mortar companies are nowadays equally adopting digital platform 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’ IT trajectories are subject to path dependencies and irreversibility that complicate corporate IT platform innovations (Fichman, 2004). Consequently, addressing this phenomenon requires an insider’s perspective on how such dependencies can be overcome to create new development trajectories for corporate IT landscapes. This paper therefore elaborates how the Enterprise Architecture (EA) function in the LEGO Group is constituting a new ‘platformization’ path to gradually transform the company’s information infrastructure. Thereby, the study sheds light on the following research question: *How can a company trigger the transformation of its drifting information infrastructure into a digital platform?*

Accordingly, this paper presents a single case study as part of an action research project in the LEGO Group. The primary source of evidence entails ten semi-structured interviews with key informants that were conducted at the company’s premises. The interviews were supported by an interview guide

containing open-ended questions. Additionally, the action research diary of the author as well as internal documents from the LEGO Group are used as supporting sources of evidence.

The remainder of this paper starts with a review of the academic literature on digital platforms, information infrastructures, and path constitution. Then, a recap of the LEGO Group's ongoing digitalization journey and the case evidence expose how the LEGO Group is applying EA management as a vehicle to gradually transform its information infrastructure into a digital platform. The subsequent analysis develops a path constitution perspective on this process. Eventually the paper closes with findings and conclusions.

## 2 INFORMATION INFRASTRUCTURES AND PLATFORMS

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; Thomas et al., 2015). The majority of platform research within the context of information systems (IS) follows the technological 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 (Ghazawneh & Henfridsson, 2013; Gawer, 2014; Eaton et al., 2015).

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 (Sedera et al., 2016; Lokuge & Sedera, 2016; Henfridsson & Bygstad, 2013). Particularly ERP systems “are increasingly serving as a platform to which other tools can be added in order to take advantage of shared data and resources” (Yoo et al., 2012). Sedera et al. (2016), however, also reveal that not all enterprise platforms are suitable to support digital platform innovation and their impact remains unclear (Sedera et al., 2016; Damanpour, 1991).

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 & Lyytinen, 2010). Nevertheless, platforms and 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 & Lyytinen, 2010). II, by contrast, are unbounded, open, shaped by heterogeneous and autonomous actors, and lack global control (Star & Ruhleder, 1996; Henfridsson & Bygstad, 2013). Hanseth & Lyytinen (2010, p.1) argue that II are “recursively composed of other infrastructures, platforms, applications, and IT capabilities”.

The development of II bares an idiosyncratic coordination challenge (Grisot et al., 2014; Hanseth & Lyytinen, 2010), which originates from the fact that most IIs are distributed across a diverse set of actors and 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). In recognition of these constraints, most extant research on II development tends to see path dependence as a deterministic force on the development trajectory. Accordingly, II development has been framed as ‘installed base cultivation’, which denotes the incremental modification of the installed base until it comes as close as possible to a desirable scenario (Hanseth, 1999).

## 3 PATH CONSTITUTION

In the general path dependence literature, this perspective corresponds to the phenomenon of processes that are “unable to shake free of their history” (David, 2001, p. 19). This conceptualization entails an ‘outsider's view’ that neglects the active engagement by human actors as path evolution is determined by contingencies and cannot break out unless exogenous shocks occur (Sydow et al., 2009). Accordingly, processes are driven by mutually interacting variables that generate feedback loops and nonlinear dynamics (Masuch, 1985; Stacey, 2007).

The concept of path creation, on the other hand, takes an ‘insider’s’ view on path-dependent processes (Garud et al., 2010) and stresses the active involvement of agents driven by ‘a logic of control’ in shaping the evolutionary path (Garud & Karnoe, 2001; Karnøe & Garud, 2012). At the heart of path creation lies a process of mindful deviations by embedded agents “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 & Karnoe, 2001). Consequently, innovation trajectories are less deterministic than assumed by the path dependence view.

Integrating the two perspectives, Meyer & Schubert (2007) and Sydow et al. (2012) introduce the notion of path constitution to account for the entanglement of history and human agency in the process of technological innovations. Both contributions define a path as a non-ergodic process of interrelated events through which one of multiple initially available options gains momentum, even though the eventual solution was not predictable at the beginning of the path. Processes involved in a path may be partly or entirely influenced by knowledgeable human actors (Sydow et al., 2012; Singh et al., 2015), but are independently characterized by irreversibility, momentum, and potential lock-in situations (Sydow et al., 2012).

Additionally, Singh et al. (2015) reveal that path trajectories are shaped by sequences of reinforcing and transforming episodes that determine if a path eventually results in a lock-in or not. While reinforcing episodes continuously reduce the availability of options, transforming episodes make additional options actionable and contribute to the prevention of lock-in situations (Singh et al., 2015).

#### 4 DIGITALIZATION IN THE LEGO GROUP

As one of the first brick-and-mortar companies in the world, the LEGO Group has made it a top management agenda to leverage digitalization as a fundamental pillar of the overall business strategy. As the implementation of this agenda resulted in several “digitalization moves” (El Sawy et al., 2015, p.2), which placed heavy demands for novel functionality on the enterprise IT platform, the need for a new complementary IT platform soon became evident. An EA Director explains: “*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). Business processes have been standardized and integrated to a large extent on non-redundant, global enterprise platforms that enable efficient operational transactions. The tight coupling between systems, however, 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. As competing constraints, such as cost or functional requirements, have often been prioritized over architectural considerations, design decisions did often not follow a coherent architectural framework and were largely shaped by choices of autonomous departments that were prioritizing local demands. “*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). According to the Head of EA, “*there has been wild freedom to operate from an architectural point of view. [...] Because we had a distributed EA landscape before, [...] nobody took the end-to-end responsibility of those priorities that go across the platform”* (Head of EA, Corporate IT, LEGO Group). At the same time, some design decisions involved “*less optimal solutions, because [the architects] wanted to stay within [the] platform. [...] I think we got too many solutions that are a little bit artificially engineered, so they fit into what we had and thereby we stuck also to stuff that we know* (EA Director, LEGO Group). The company’s holistic IT landscape therefore evolved in the form of an II with lack of centralized architectural control.

While the existing enterprise platform is a “rock-solid, carefully designed and thoroughly tested platform” (El Sawy et al., 2015, p.23), a new platform was initiated to satisfy the future demand of rapidly adding prototype functionality for innovative digital products and services. This platform should be rich in digital options and enable the implementation of innovative value propositions without limitations by

technical debt (c.f. Woodard et al., 2012). Integrating with the traditional enterprise platform in a loosely-coupled manner, a new digital platform based on micro-services as well as application programming interfaces (APIs) should emerge (El Sawy et al., 2015). Consequently, the platform would also embody the option to open interfaces up for external innovation by ecosystem-partners when appropriate.

## 5 ENTERPRISE ARCHITECTURE IN THE LEGO GROUP

In order to trigger the transition from a distributedly-managed IT towards a centrally guided digital platform, the LEGO Group has 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). Subsequently, the function was created out of well-experienced former Solution. *“We did not bring in new people [...], because we needed people who had an internal understanding of our landscape”* (Head of Business-Enabling Technologies, LEGO Group).

The new EA function is a small organizational unit consisting of six Enterprise Architects (EAs) and guides the evolution of the platform landscape with an integrated long-term perspective. 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 [...] and we will optimize the cost of operating what we have”* (CTO and Vice President, Corporate IT, LEGO Group).

### 5.1 Strategic IT Direction

Against these overarching goals, the team’s specific strategy and focus areas (c.f. Figure 2), emerged in a cognitive process of sense-making that was shaped by various stakeholders. Most notably, this process revealed the need for long-term strategic directions for data management, internal as well as external integration, and cloud adoption going forward. *“It was not called out – to start with – that EA should lead such big initiatives. [...] It was first when the team met and we started to talk about what the biggest challenges for our platform are, that it became clear”* (Head of EA, LEGO Group).

In contrast to the management of large-scale enterprise systems, the challenge for IT departments in the digital age will be the implementation and composition of specialized services and modules to support desired value propositions. *“Most companies that are in the retail or consumer-facing sector are very much moving away from that monolith concept and towards the whole idea of micro-services and contact solutions”* (Head of Business-Enabling Technologies, LEGO Group). Along with this paradigm shift, also the tasks and responsibilities of the EA function are changing. For the IT organization to gain agility, Solution- and Application-Architects need to operate in close collaboration with business

#### Focus areas 2017

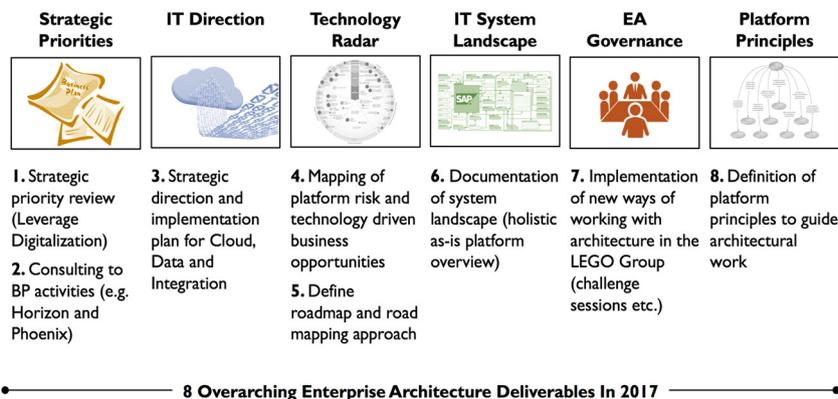


Figure 1: EA Focus Areas 2017 in the LEGO Group (Source: the LEGO Group).

stakeholders and require autonomy to compose specific solutions with minimum constraints. *“That is where the EA role becomes so critical in terms of setting the right principles and ensuring that what we do gives people or technology the freedom, but is done in a way that is right for the organization long-term”* (Head of Business-Enabling Technologies, LEGO Group).

Consequently, the EA team decided to not only manage and govern, but also lead the platform direction by elaborating long-term strategies. The development and implementation of these strategic directions is primarily an organizational, rather than a technical, challenge as the EAs have to convince key stakeholders of the expediency and feasibility of strategic architectural choices. *“They need to catch fire. [...] We have to change the mindset not with a big bang, but more: ‘See what we have found! Do you agree?’ [...] not just because it is something new, but because we actually strongly believe that it is something that can make us even more agile”* (Senior Enterprise Architect, Corporate IT, LEGO Group).

## 5.2 System Landscape Documentation

In addition, the EA team has elaborated a documentation of the LEGO Group’s entire system landscape that provides a clear picture of the as-is situation, demonstrates the complexity of the system landscape, and is currently leveraged to communicate the criticality of a new architectural direction to all relevant stakeholders. In the future, this landscape documentation will mainly provide a basis to track the platform’s state and elaborate the transition path towards the target platform architecture. The CTO explains: *“Sometimes we all live in our small silos and we forget how much stuff we have actually put together [...] In order to get anywhere, you need to know where you are”* (CTO, LEGO Group).

## 5.3 Engagement with the Architecture Community

In order to bring the strategic directions to life, the EA function’s design has been rooted in an architecture community of Solution- and Application-Architects that will implement strategic directions in concrete architectural designs and thereby expose the EAs to some of the actual decision-making. *“We created this kind of hybrid organization [...] which meant that the architects were still rooted in [the delivery of technology] and could not become too ivory tower”* (Head of Business-Enabling Technologies, LEGO Group).

In order to spread the strategic directions within the organization, the EA team has, on the one hand, developed new EA design principles, an architecture success scorecard, and new architecture panels in the LEGO Group. The EA design principles are following the lighthouse metaphor and describe the ideal future state of the platform architecture that individual design decisions should strive towards. The success scorecard safeguards their implementation by evaluating individual solution designs in terms of their impact on the overall platform architecture. In addition, the architecture panels provide a forum where individual solutions are challenged against the principles and all architects engage in discussions around architectural quality. As the principles and the scorecard are guiding a multitude of diverse stakeholders from within and outside the architecture community, the specific content has been carefully elaborated in close collaboration with a variety of heterogeneous opinion leaders to provide meaningful guidance to all distinct perspectives and interpretations. In the future, the artefacts will be continuously refined by new insights from strategic directions and should feed them into the architecture community to guide platform evolution.

For this purpose, the vitalization and empowerment of the architecture community has been one of the most crucial challenges for the EA team to foster close collaboration as well as cross-fertilization. An important step in this context has been the establishment of the mandate for all architects to enforce architectural quality in individual solution designs over other potentially contradicting interests. *“What I do hope that we will not see happening in the future anymore is that project leaders [...] take architectural decisions because of time-pressures, [or] budget constraints”* (EA Director, LEGO Group).

While the development of the strategic directions is still on-going, the introduction of new EA design principles and the success scorecard in the architecture community are already making an impact on design decisions in the LEGO Group. For once, the two artefacts have triggered changes of mindset and discussions around architectural quality in the community. *“I have already seen [...] that it gives people the ability to take a step back and look at the decisions that we have made and actually question: ‘Are they the right ones?’. I am quite encouraged by that”* (Head of Business-Enabling Technologies, LEGO Group). Additionally, discussions around the two artefacts have also lead to revisions and modifications of actual solution designs under

construction and their implementations are making the first impact on the overall system landscape. Nevertheless, these steps only constitute the small beginning of a long journey of transforming the LEGO Group's II into a digital platform.

## 6 ANALYSIS

This section provides a detailed analysis of how the LEGO Group's EA function is embarking on path constitution to pull its drifting infrastructure around and introduce transforming processes through collective action that will eliminate path dependencies and pave the way towards a flexible digital platform (c.f. Figure 2).

### 6.1 Path Dependence of Drifting Information Infrastructure

Before the establishment of the EA function, the LEGO Group's IT landscape was shaped by functionally distributed actors bolting individual solutions onto the II's installed base to satisfy contemporary business requirements. This process continuously reduced IT flexibility by increasing tight coupling and architectural debt. The result was an installed base that implied lower development effort for novel IT capabilities, if they were simply appended in the same fashion as previous solutions. Since this behavior increased architectural debt even further, the process was self-reinforcing in nature.

Consequently, the organization was progressing on a socio-technical path of drifting II evolution (c.f. Hanseth, 1999) that was beyond the influence of human actors, incrementally reducing actionable technology options, and lead to individual lock-in situations in the selection of solutions.

### 6.2 Mindful Deviations and Path Creation

The EA team has mindfully deviated from existing structures in several ways to address the path dependence of the IT landscape by creating a new transforming evolution path and increasing actionable technology options.

Against the predefined strategy of solely governing the platform architecture, the EA team identified the need for fundamentally new strategic directions for integration, cloud, and data. As the development of these strategies is met by resistance from individuals in the company, the EAs are faced

with the challenge to mobilize minds, span organizational boundaries, and co-evolve stakeholder minds with ideas (c.f. Garud & Karnoe, 2001). For this purpose, the team is involving key stakeholders into the strategy-development process to equally modify ideas and challenge mindsets in the organization. According to Garud & Karnoe (2001), the management of this tension between commitment and flexibility is a crucial challenge of path creation.

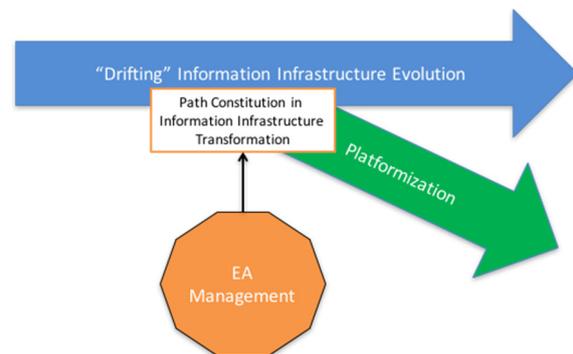


Figure 2: 'Platformization' path triggered by mindful deviations in EA Management.

Another mean of deviation has been the development of new EA design principles, which constitute a breaking departure from existing practices and meanings. As they will impact the frames and actions of a large stakeholder audience (c.f. Garud & Karnoe, 2001), the principles have been equally shaped through an engagement process of heterogeneous stakeholders that required EAs to be persistent to their initial ideas while equally maintaining flexibility for modifications. Hence, the ability to span boundaries and present "ideas in ways that are understandable by others" (Garud & Karnoe, 2001) has been crucial to mobilize stakeholders.

By introducing the EA design principles and the success scorecard to the organization, the EA team strives for the guidance of collective action to constitute a new path of platformization (c.f. Figure 2). This approach resembles the concept of installed base cultivation and what Rolland et al. (2015) term "enterprise architecting" to describe the intentional cultivation of existing architectures over time. In contrast to installed base cultivation, which tends to view path dependencies as a near-inexorable force in II development (Hanseth & Lyytinen, 2010), the LEGO Group's approach to EA management is primarily focusing the constitution of new paths through small incremental steps.

To enable these steps, the attainment of the mandate to enforce architectural quality over competing constraining factors in the design of

individual solutions is a key deviation. As both, the principles and the scorecard, are continuously refined based on new strategic directions, the routes of more fine-grained individual paths, which constitute the overall platformization path, will be subject to periodic change. Nevertheless, the overall direction will remain constant and gradually transform the system landscape into a digital platform.

Eventually, the generation of momentum around future directions was additionally amplified by the documentation of the current system landscape that elucidates the path-dependent nature of the II's evolution and simultaneously supports the mobilization of minds for a new platformization path.

So far, the path-creating junction from the II's previous development trajectory is mostly observable in terms of organizational momentum, mindset changes, and the redesign of several individual solutions. The continuation of this transformation towards a digital platform will depend on the path's sustainment in the future.

## 7 FINDINGS AND CONCLUSIONS

The case evidence and analysis reveal how companies embarking on a digitalization journey can apply EA management as a vehicle to trigger the gradual transformation of a distributedly-managed II towards a centrally-guided digital platform. Particularly, the conceptualization of EA management as a process of path constitution elucidates how an organization can break away from the prevalent development trajectory of an II shaped by socio-technical path dependence. This paper discloses in detail that enterprise architecting is a challenge of mindfully deviating from existing structures to guide collective action and cultivate the installed base of the IT landscape through small incremental steps into an intended development trajectory.

For this purpose, the case evidence explores which specific deviations the EA team in the LEGO Group is embarking on. By taking an insider's view on this process, the analysis shows that the creation of a new platformization path requires EAs to not only address socio-technical path dependence in terms of IS (including their users), but also the relevance structures and mindsets of stakeholders in the IT organization. This observation stresses the significance of human agency in EA management and underlines the importance of boundary spanning communication as well as the co-evolution of minds

and ideas (c.f. Garud & Karnoe, 2001). In the LEGO Group, the hybrid setup of the EA function as well as the pro-active engagement with key stakeholders ensure buy-in in the organization for EA initiatives and prevent the team from becoming an ivory tower.

The evidence therefore also supports Singh et al.'s (2015) proposition that path constitution is equally emergent as well as deliberate in nature and may entail periods of stronger path-dependence, while offering opportunities for deliberate intervention by human actors at any time.

## 8 LIMITATIONS AND FUTURE RESEARCH

Although the case evidence indicates a juncture in the current development trajectory of the LEGO Group's II, it remains to be seen if this path can be sustained and if the EA team's deviations will truly create a flexible digital platform. It is therefore impossible to evaluate how effective the disclosed deviations are and if the case evidence should be utilized to derive normative conclusions. Nevertheless, the paper takes an insider's view on path creation in the present and future research will address the significance of these interventions for the eventual path evolution. Eventually, this paper only presents evidence from a single case. Before generalizing conclusions to a wider population, more evidence is required to evaluate, if and how other organizations are facing as well as solving similar challenges.

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