

Buridan's Ass: Encapsulation as a Possible Solution to the Prioritization Dilemma of Digital Transformation

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Abstract

With public organizations pursuing digital transformation with limited resources, they find themselves in a dilemma between prioritizing IT transformation or digital transformation. With the intricate dependencies between operations and the digital infrastructure, lack of continuous IT transformation may hinder digital transformation, and access to capital and other resources force organizations into a situation where they need to prioritize either IT transformation or digital transformation. We refer to this dilemma with a parallel to Buridan's Ass, i.e., the paradox of a donkey destined to die of simultaneous thirst and hunger since its needs are as equal as the distance to the haystack and water trough. This study addresses an IT transformation strategy where a combination of real-time data layers, enterprise hybrid integration and low-code cloud-only environments are utilized explicitly to avoid tradeoffs with digital transformation in a government owned firm. The case is analyzed as an instantiation of Buridan's paradox, offering direct insight and a feasible solution to the dilemma of IT or digital transformation.

Keywords

IT transformation, digital transformation, technology renewal, digital debt, government owned firms

1. Introduction

Digital transformation refers to the organizational change brought about by the adoption of digital technologies¹⁻³. As found in previous research, this process^{4,5} involves the dual activities of technological renewal⁶ and changes in operations and strategic intent⁷⁻⁹. In terms of the technological renewal, the demand for new digital capabilities highlights a need for continuous IT transformation¹⁰⁻¹² where existing digital infrastructure (i.e., systems, platforms et cetera) needs to evolve to not incur digital debt over time. Said digital debt, as found in Rolland et al¹³ will inevitably delimit the behavioral- and strategic options of the organization, i.e. decrease maneuverability and agility⁴. As noted by Irani et al¹⁴ as well as Alexandrova and Rapanotti¹⁵, antiquated and obsolete legacy systems currently constitute a major challenge for public sector digital transformation.

With digital transformation initiatives becoming commonplace, the demands for IT transformation are escalating¹⁶⁻¹⁸. Numerous examples from both the public- and private sectors do, however, speak of the perils and hazards of engaging in IT transformation. Examples from diverse industries such as banking, telecom, defense, and insurance as well as the public sector all highlight the difficulties associated with "lifting yourself by the bootstraps", i.e., changing a critical underlying infrastructure while at the same time maintaining operations¹⁹. Regardless of the high reported failure rates and significant costs involved, organizations still engage in IT transformation²⁰.

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Previous studies of IT transformation have identified tradeoffs between digital transformation and IT transformation^{6,11,21}. Without evolving and continuously modernizing the digital infrastructure, the organization is stuck in a situation where the gap between necessary and available IT capabilities increasingly grows, i.e., incurring high opportunity cost. At the same time, the limited resources (i.e., time, attention, human- and financial capital) of the organization call for prioritization, where increased allocation to IT transformation invariably leads to decreased allocation to digital transformation²². This dearth of resources for modernization has been shown to be particularly challenging in the public sector²³.

The result of this is that organizations find themselves in a dilemma. If they prioritize digital transformation (organizational change that would afford new value offerings and increased revenues) they may down-prioritize IT transformation (new IT capabilities that would afford rapid deployment and radical scaling of new value offerings). This situation displays similar properties as the 14th century philosopher Jean Buridan's satirical free-will paradox commonly referred to as "Buridan's Ass". In the paradox, a donkey is situated at an even distance between a bale of hay and a trough of water. With the donkey being equally thirsty and hungry it is, according to Buridan, destined to die without satisfying either of its two urges.

We posit that organizations faced with the parallel activities of IT transformation and digital transformation risk finding themselves in a situation parallel to that of Buridan's ass. To mitigate the dilemma, they need to make a strategic choice in terms of how they prioritize IT versus digital transformation and find options that afford an avoidance of the potential trade-offs. On the basis of this rationale, the research question that this study addresses is:

How can a strategy for IT transformation avoid the tradeoffs with digital transformation?

This is answered through a revelatory case study of a large, government owned logistics firm within the railroad sector. The case is used as an illustration of an IT transformation strategy that aspires to avoid the tradeoffs with digital transformation, and the study explores how said strategy impacts the digital transformation of the organization. This study contributes through answering previous calls for research from Wimelius et al⁶ on technology renewal in the public sector, Gregory et al¹¹ on IT transformation and Irani et al¹⁴ on replacing legacy systems in the public sector to afford digital transformation. Contrary to previous studies on technology renewal, we demarcate IT transformation from the behavioral related impacts of changes in technology. This also demarcates our study from previous implementation studies, which display tendencies to emphasize the role of adoption and adaptation of fixed digital assets.

This paper is organized accordingly. After this brief introduction we present the previous findings and theoretical foundation through addressing the paradox of Buridan's Ass and reviewing the extant research on IT transformation. This is followed by a description of the method of the study, where we present the case, data collection and method of analysis. After this, we present the results in the form of a chronological recollection of the case 2019-2022. This is followed by the discussion where we use previous research to further explore and elaborate on the findings.

2. Previous findings and theoretical framing

2.1. The prioritization dilemma of Buridan's ass: IT versus digital transformation

"Should two courses be judged equal, then the will cannot break the deadlock, all it can do is to suspend judgement until the circumstances change, and the right course of action is clear." Buridan, c 1340.

What Jean Buridan addresses is a situation where the benefit of two options is equal and hence places the decision maker in a state of analysis-paralysis. In the context of digital transformation, these two options are portrayed as that of modernizing the underlying infrastructure (IT transformation) and the dual activity of the exploitation of operational excellence and exploration of new value streams (digital transformation)³.

IT transformation has a long history of inquiry, with the bulk of research being focused on the creation and maintenance of IT capabilities^{24,25} and the application of configurations of IT Governance

²⁶⁻²⁸. In a recent study, Wimelius et al ⁶ analyze the “technology renewal” practices associated with adapting the necessary capabilities for the digital transformation of public sector healthcare. According to their findings, technology renewal requires the balancing of a set of three paradoxes, i.e., inner/outer, established/renewed and emergent/deliberate. This supports previous findings on IT transformation from Gregory et al ¹¹ who similarly identify the handling of paradoxes as core to successful IT transformation and is supported by more recent studies such as Rinta-Kahila ¹².

This same line of reasoning, i.e., the necessity to balance tensions between opposing ideas is also central in the literature on digital transformation. Starting with the definition of digital transformation by Hanelt et al ¹ as the organizational change brought about through the adoption and utilization of digital technologies, the organizational change per se has been highlighted as involving the balancing of increased efficiency (e.g., automation of existing operations) and increased innovation (e.g., new value streams and -offerings)^{2,3}. This strategic choice constitutes one of the core tensions of digital transformation ^{16,29,30}. A burgeoning stream of research identifies the need for dynamic capabilities ³¹ to facilitate digital transformation ^{2,4,32,33}, further increasing the emphasis on the temporal nature of IT capabilities and the necessity to dynamically balance IT transformation with digital transformation ^{34,35}.

2.2. Extant strategies for IT transformation

Previous research hosts a plethora of different approaches to IT transformation, ranging from a strong emphasis on IT Governance ^{36,37} to digital infrastructure ^{6,19,38-40}. In Figure 1 we present four strategies described in literature. The strategies are differentiated in relation to two dimensions; the degree of criticality of digital transformation and the degree of restricted access to capital to fund the transformation. In addition to this, we also show how these strategies relate to the three paradoxes identified by Wimelius et al (2021) in their study of a public sector healthcare organization. The first paradox relates to the tension between the established versus renewed technology usage, where previous studies report on challenges associated with getting the renewed technology in use. The second paradox relates to the tension between deliberate and emergent renewal practices, where previous studies report on challenges related to distributing agency to afford emergent renewal. The third paradox relates to the tension between inner and outer renewal contexts, where previous studies report on challenges associated with tendencies to circumvent the outer contexts such as standardizations and emergent ecosystems.

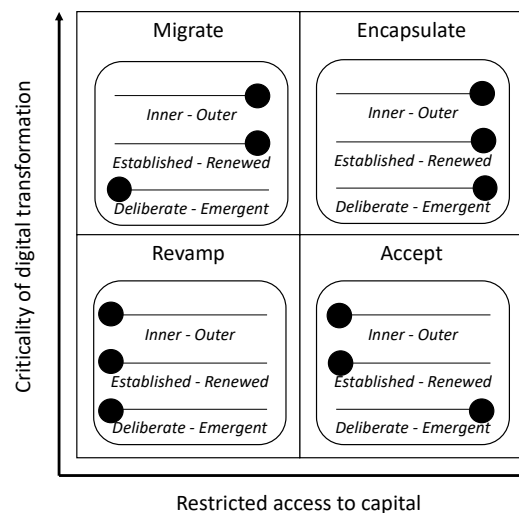


Fig. 1. Extant strategies as found in the literature coupled with Wimelius et al (2021).

For Strategy 1 (High criticality, low restrictedness): Migrate. In this strategy, the organization assesses the cost and effort of overhauling the existing systems flora as substantial and diverts its resources into replacing the entire systems environment in a phased manner. A new infrastructure is commissioned in parallel with the existing, with the intent of gradual transition of operations over into the new. The strategy requires substantial resources, whereby most examples are from organizations

setting up new value offerings with high margins, such as introducing IoT-enabled services that require an entirely different set of IT capabilities. The reported consequences of this strategy are either substantial (temporary) costs and potential caveats through potential poor adoption of the new infrastructure or substantially increased development productivity and decreased maintenance cost^{41,42}. The Migrate strategy is motivated by new demands (outer), focused on replacing existing digital infrastructure with parallel infrastructure (renewed) and implemented top-down (deliberate).

Strategy 2 (Low criticality, low restrictedness): Revamp. In this strategy, major IT Transformation programs are used as a means of assuring IT modernization. Core to these programs is the intent to either decommission or revamp existing systems, and significant resources are funneled into modernizing the installed base, often shifting into new architectural solutions. Through the high level of ambition coupled with the often-decrepit state of the existing legacy environment, the reported consequences of this strategy are either sunk cost or a successful major overhaul of the systems flora, resulting in either decreased maintenance cost and integration complexity or a steady state.^{6,11,43} The Revamp strategy is motivated by end-of-life of existing digital infrastructure (inner), focused on extending the life cycle of the infrastructure (established) and implemented top-down (deliberate).

Strategy 3 (Low criticality, high restrictedness): Accept. In this strategy, the organization displays little activity in terms of sentient and intentional modernization. Instead of decommissioning or revamping systems, new systems are added to meet changing needs without major over-hauls of the architecture or the existing installed base. The reported consequences of this strategy are bloating of the system flora, resulting in increased maintenance cost and integration complexity over time.^{19,44,45} The Accept strategy is a non-choice of aggregation of existing and new (inner), focused on extending the life cycle of the infrastructure through additions (established), reliant on path-dependent behavior (emergent).

Strategy 4 (High criticality, high restrictedness): Encapsulate. In this strategy, the organization accepts the derelict state of their current systems but use solutions such as microservices and APIs to mitigate the problem. Shifting over into an artificially created composable architecture, systems are separated from data through architectural decomposition with the intent of creating quick wins in terms of increased capabilities for operations development. The reported consequences of this strategy are increased capabilities for operations development and responsiveness to new demands, but also increased digital debt over time since the underlying systems are not decommissioned or modernized.⁴⁶⁻⁴⁹ The Encapsulate strategy is motivated by new demands (outer), focused on enhancing existing infrastructure through new architectural layers (renewed), and implemented top-down but executed bottom-up (emergent).

3. Method

An The case approach utilized in this study is one characterized as revelatory i.e., selected on the premise of it displaying instantiation of a novel phenomenon that so far has not been studied extensively⁵⁰. We selected the case of Green Cargo after three initial interviews with the CIO where the novelty of the approach of the organization was assessed by three independent researchers. All researchers agreed that the case seemed to offer insight into a novel approach to the prioritization of IT versus digital transformation. Green Cargo is one of the larger railway freight carriers in Europe with 1,800 employees and annual sales of €400 Million. The firm is owned by the Swedish government, and instrumental in the government's plan for the sustainable transformation of logistics. The rationale for focusing on a government owned firm lies in these firms constitute a mostly overlooked aspect of digital government⁵¹. These firms act as vehicles for political activity, instrumental in both the state infrastructure and the attainment of political goals⁵².

We initiated the data collection through parallel requests for interviews and documentation. The list of interviewees was iterated between the CIO (main point of contact) and the research group to arrive at a selection that would offer optimal coverage and depth for the case. The final list was agreed on and the CIO sent an email preparing all interviewees of the research project.

The list of respondents incorporated individuals on the executive, management, and co-worker levels of the organization, and spanned the IT-Operations divide (IT=11; operations=7).

Table 1. Overview of interview data.

Level	Roles (examples)	Amount
Executive	CEO, VP Operations, VP Market, CIO, VP Network Management, CFO	7
Manager	Heads of PMO, Architecture, Applications, IT Development, IT Operations, Analytics	4
Co-worker	Controller IT, Service Owner, Architect, Developer, Integration architect, Information architect	7
	Total:	18

The interviews were conducted in the fall of 2022 through Microsoft Teams and spanned 45-90 minutes. They were sound recorded and transcribed verbatim. In addition to the interviews, we also collected secondary data in the form of steering documents, financial information, strategies, consultancy reports, integration schematics, technical documentation and internal memos. A total of 87 documents were collected. The role of said documents was to expand the view gathered from the interviews, to afford data triangulation in instances where there were diverging views.

The method of analysis started with a longitudinal coding⁵³ of the interview and secondary data, coding to understand the unfolding of the case from inception in 2019 up to the present, with the intent of creating a timeline and increasing our understanding of the roll-out of the encapsulation strategy. We followed the Gioia method in aspiring for qualitative rigor in our analysis, carefully mapping first order concepts and second order themes to identify aggregate dimensions for the longitudinal analysis⁵⁴. As a final step in the analysis stage, we invited the CIO of the organization to step aboard as a co-author and part of the research team in an attempt to expand into transdisciplinary research to further assure the relevance, depth and potential utility of the analysis⁵⁵. This allowed us to further nuance the interpretation of the coding.

4. Results

Identification As seen in Figure 2, the case spans from the strategic decision to invest in an encapsulation strategy (2019) to the middle of 2022. We present the case chronologically, to create a basis for future discussion.

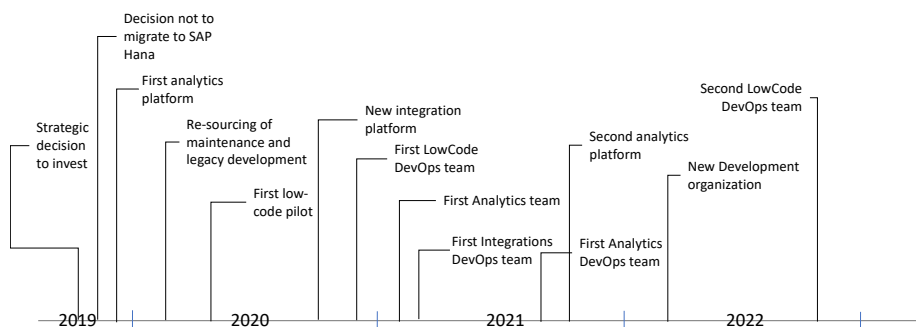


Fig. 2. Timeline for the encapsulation strategy of Green Cargo.

In 2019 Green Cargo was struggling with a history of poor financial performance, customer dissatisfaction and a crumbling digital infrastructure. It was apparent that something needed to be done, and at the core of this “something” was the modernization of the digital infrastructure. The existing systems comprising the infrastructure had long since reached end-of-life and displayed dual problems. First, they were a significant operational risk to a firm in an industry highly focused on uptime and continued operations. If the systems would go down, that would be highly critical to the operations of Green Cargo. Second, the rigidity of the existing infrastructure displayed a significant down-side in terms of dramatically decreasing the potential for operations development.

With IT having been deprioritized for years within Green Cargo (mainly through a focus on cost reduction), there was very little to work with. The existing infrastructure was operational, but significant technical debt in the form of missing documentation and staff turnover had resulted in a lack of insight into the integrations and dependencies between the different systems in place. The IT department lacked the insight and competence to handle a significant IT transformation, and this was well known in the

organization. The IT organization was entirely depending on outsourcing vendors, incapable of supporting the urgent needs of its operational functions. In addition, the organization was used to ignore IT policies, developed a chaotic approach to data management, and build critical incorrect and uncontrolled analytics capabilities.

The strategy selected for handling the issue of IT transformation was to hire a new CIO and task him with the assignment of replacing two of the core legacy systems (Planning/Scheduling mainframe and ERP). The organization understood that this was both risky, costly, and not offering a final solution to their problems, yet given sufficient scoping (only two systems) it should be manageable without disproportionate risk. The new CIO, however, was of a different opinion.

Upon joining the organization, the new CIO saw a problem with the logic of the decision to revamp the digital infrastructure. During his first meeting with the board, he expressed concern about the consequences of revamping two of the core legacy systems:

"I told them that it absolutely could be done. I will just call consultants at McKinsey and they will bring 180 PowerPoint slides and we will be on our merry way. But, going down this route would mean that we initiate a hiatus for all operations development for the next five to six years. If we are replacing the engine we will need to pull over. Instead, I presented a 6-slide strategy, recommending an evolutionary approach with incremental and experimental risk mitigation and problem-solving techniques. Being asked about the how, I answered diligently and clear, that the plan will be developed as a result of our efforts and learnings. I'll be back in two years." CIO

With the organization struggling and seeing continued operations without change as a sure recipe for disaster, the decision was made to accept the CIO's recommendation. The alternative that was presented to the board was regarded as radical but found instant acceptance. It involved not replacing the existing systems but rather accepting their continued existence if they did not hinder the pace of operations development. It involved fixing the most pressing issues of the core legacy systems and creating a composable architecture from the existing.

Through following ideas related to what was referred to as composable infrastructure, the legacy systems would be linked to development environments through a real-time data and integration layer. The development environment would utilize LowCode to dramatically increase the pace of release of new enterprise applications, meeting swiftly changing demands head on. The decision was also made to instill a moratorium on further development of functionality in the two legacy systems.

The choice was bold and involved significant investments to get the legacy systems functional enough to encapsulate. With the systems having been outsourced in the past, competence regarding the system configurations was hard to find, maintain and attract.

"... well, firstly we see that struggle to get hold of this type of competence. It seems to be very hot on the market. And also, the knowledge in terms of what we ... you know we're integrating towards the mainframe system, which is from 1985. You know, not everybody understands how these systems work. [laughs] And then, like I said, an older version of SAP, which also is ... means that we're struggling." Director of Sales.

Despite the apparent drawbacks and significant challenges associated with the choice in strategy, the board gave the sign-off to the roll out only seven weeks after the new CIO joined Green Cargo. The rationale was directly tied to the increased need for agility and pace in operations development, and that the proposed encapsulation strategy was the only viable alternative to assuring continued operations and operations development.

During 2020, initial resources were allocated to making sure that the reliability and maintainability of the two legacy systems was in place. This involved re-sourcing the mainframe development into a new local specialized company that accepted the terms and conditions of becoming a partner rather than a vendor to Green Cargo. Beside stabilizing the mainframe, reducing risks, and reducing complexity, and the agile team was accelerating releases from four per year to up to 16 per week. In parallel with this, the ERP system was undergoing significant improvements, securing stability and solving vulnerabilities and improving overall performance. At the same time, work was initiated preparing for the real-time data and integration layer in the cloud to make sure that the adaptation of the legacy environment would facilitate the new strategy and architecture. Significant attention was spent on expanding the competence in the organization through new hires to meet the new requirements.

"So, I can just see, for example, in the team I'm working, operations control, I think five of us are hired after 2020 or later. So, half the team, and half the team is before, and then me and a few others

were hired 2019. So, I think there's only ... yeah, only three persons that are ... that have been there ... been in my department for longer than five years." IT Controller

In 2021, the necessary cloud-based platform architecture was in place to be able to scale innovation initiatives related to the low-code development. Here, the separation of the legacy systems afforded speedy development in dev-ops teams, where people from IT worked alongside people from the operations side to drive operations development primarily through new apps enabled by loosely coupled services architectures, and APIs. Core for the CIO was the creation of autonomy, i.e., making sure that both people within Green Cargo and Green Cargo were autonomous and not path-dependent in their choices of how to design and enact strategies. This approach was essential in making rapid changes and relentless decisions into uncertainty, without being able confirming the choose design against best practices.

At the same time, the roll-out of the encapsulation strategy was indirectly threatened by the ownership structure since the required capital for the initiative hinged on the government (owner) injecting capital. With the EU legislation concerning competition and additional challenges caused the global pandemic, this proved to be a limiting factor concerning necessary investments and the roll-out had to be refocused and scaled down in terms of ambition.

"Yeah, and that's ... went through the budget process in Sweden and the parliament voted for capital injection in September 2020, of a maximum of 1.4 billion Swedish kronor. And then it has been a process with ... that we have not been part in. I need to be clear on ... I mean, it's an owner question, it's not a firm question. But the owners went to the EU commission and had a lot of discussions ending in that they decided on not to go for the capital injection. It is, I mean, obviously a tricky road..." CFO

By 2022, the implementation was done with three new teams (LowCode, integration, analytics) directly interacting with the operations side in a proactive manner. Table 2 contains an overview of the three years (2019-2022) in terms of resources and select performance metrics.

Table 2. Overview of planned budget and productivity of the strategy.

	2019	2020	2021	2022
CAPEX (IT)	€0,7M	€2,3M	€5M	€4M
OPEX (IT)	€17M	€19M	€21M	€24M
Development ratio (percentage of total, OPEX and CAPEX)	10%	20%	35%	39%
Yearly development initiatives/Micro services	13	232	1046	1076
Yearly mainframe releases	4	>50	>150	>200
Yearly apps launched	0	2	9	25

As seen in Table 2, a significant increase in investments from €0,7M in 2019 to €4M in 2022 (+470%), and an increase in operating budget for IT from €17M to €24M (+41%). The IT transformation per se is hence predominantly funded through investments, driving capital cost but designed not to directly affect the operations through chargeback. The accrued investment in IT transformation so far at Green Cargo is €12,4M, i.e., roughly the equivalent of 3% of annual revenues in 2022. The total cost of IT (not counting investments) is up from 4,3% to 5,7% of revenue, indicating a steady increase in the importance of IT in the execution of operations. At the same time, the productivity of the IT department has increased significantly through a shift away from a focus on the legacy systems to a focus on developing digital capabilities (applications, APIs, analytics, algorithms) building the foundation of Green Cargos digital transformation.

The encapsulation strategy has also impacted the role of IT within the organization. During 2022, the strategy has resulted in e.g., new solutions for customer onboarding, where the new interface significantly lowers the thresholds for customers without expertise in railroad logistics. Previously, the only customers that would be able to book logistics through Green Cargo were expert procurers with a deep knowledge of the railroad system. Through the new solution developed proactively through IT, the potential customer base is significantly expanded, while existing customers are benefiting from automated ordering, simplified processes transparency and many new services. In addition, hundreds of APIs are ready to use and available in our customer developer portal.

5. Discussion

Our revelatory case study of Green Cargo offers insight into how a choice in IT transformation strategy may afford the avoidance of tradeoffs between IT and digital transformation. As found, the choice of the organization to avoid the revamp strategy (as was the initial decision) was nested in precisely the strive to avoid the tradeoff of IT and digital transformation. The board, through the CIOs highlighting of the drawbacks of the chosen strategy on digital transformation, remitted its decision. Through doing this, they increased the risk but also the reward associated with the IT transformation.

As noted by the members of the board, this decision was not an easy one, but given the clear indication that a revamp would involve a hiatus for operations development for several years, they were practically left with no choice. We interpret this as a direct consequence of the firm being in a crisis, i.e., the option of mere continued operations was not presently on the table. As found in Bygstad and Øvreid⁵⁶, there is a clear link between accelerated digital transformation and the motivational factor of a crisis.

Comparing the revamp and encapsulation strategies through the three paradoxes identified by Wimelius et al⁶, we see that the choices offer diametrical different approaches. In the revamp, the organization would strive for Inner/Established/Deliberate, whereas the encapsulation strategy involved a strive for Outer/Renewed/Emergent. We interpret this as, not as fixed states on a continuum, but rather as added directions to a totality of strategic choices in the past. This interpretation builds on previous findings from governance, control and strategic management, where the path dependencies of past decisions have long-standing implications for the actual practices in the organization⁵⁷⁻⁵⁹.

From this perspective, the choice to go with the encapsulation strategy breaks with a past where IT was perceived as something that should cost as little as possible and primarily align with the operations strategy⁶⁰. The IT department of the past, reactive and cost-centric, is through the new strategy shifted into not merely a cost center but a driver of innovation and new revenue streams. The IT department is expected to act and acts proactively to build both new capabilities and services that fundamentally change the value offerings of the organization⁶¹, as in the case of the new customer interface or the new platform for European rail freight. This shift corresponds to the necessary changes advocated in conceptual studies such as Gregory et al³⁶ and Magnusson et al's⁶² study of government agencies, and opens for the modernization as described in Irani et al¹⁴.

At the same time, we see that the encapsulation strategy constitutes a break with the path-dependencies of complementary assets as identified in Wu et al⁶³. Hence, the strategy affords the organization a new technological trajectory and as such decreasing the previously identified tendency for incumbent organizations to over-invest in technology that is antiquated or running the risk of becoming antiquated⁶⁴. In other words, the decision to encapsulate existing legacy systems is, rather counter-intuitively, simultaneously a choice of breaking free from previous generations of technology.

While simultaneously affording increased impact in digital and IT transformation, the strategy could be criticized for not amply amortizing the technical debt found in obsolete technology and lacking documentation^{65,66}. The legacy systems remain, however contained, as core elements of the digital infrastructure of the organization. With the risks of the technical debt being intact, the strategy affords the organization to avoid the technology and digital debt, i.e., the decreased maneuverability stemming from the installed base^{13,67}. In other words, the organization builds strategic agility through their choice in IT transformation strategy⁴. This casts new light on the differentiation between digital-, technology- and technical debt, and the need for more concise definitions that will support additional studies that e.g., study the variation in amortization/lending between different forms of debt.

Through the encapsulation strategy, we find that the organization was afforded the possibility of avoiding the tradeoff between IT and digital transformation. The choice of the composable architecture and the encapsulation of legacy systems allowed the organization to after a year of preparation initiate significant activities related to operations development. This development, organized as DevOps teams using LowCode, integration, and analytics development, decreased the mean development time per initiative and increased the release pace without significant drawbacks in the form of increased technical debt. This supports previous findings from research about the merits of DevOps and LowCode^{68,69}. In other words, the encapsulation strategy as depicted in the case of Green Cargo, is a possible solution to the paradox of IT and Digital transformation. Through the strategy, the organization can continue to

engage (and accelerate) its involvement for increased efficiency and innovation through the utilization of digital solutions, while simultaneously modernizing the digital infrastructure in a composable manner. As found, the strategy is relative low-cost (compared to alternatives), fitting organizations with a restricted access to capital, yet at the same time it has several drawbacks in relation to not amply addressing the risk-related aspects of technical debt ⁶⁵.

Our study offers two main contributions to digital government research. First, we provide what we see as the first example of a longitudinal case study of an encapsulation strategy for IT transformation. The identified manner through which the organization handled the tension between IT modernization and operations development offers avenues for future research as a direct continuation of the calls addressed in our research^{6,11,14}. Second, the identification of the strategy offers new insight into the prioritization dilemma of digital transformation ^{19,34}. For sustainable digital transformation, organizations will have to balance continuous IT and digital transformation. We believe that application of the paradoxes identified by Wimelius et al ⁶ in our study offers an opportunity for researchers striving to better understand said dilemma.

In addition to the contributions to research, our study offers two contributions to practice. First, the identification of four strategies for IT transformation offers an entry-point into a more nuanced dialogue concerning the strategic options related to IT transformation. With the innate relationship between IT and digital transformation, the findings may be used to increase a necessary emphasis on IT transformation in discussions on digital transformation. This will be of particular relevance for e.g., the public sector displaying a lagging digital intensity. Second, the case itself offers inspiration for managers interested in trying to find alternatives to more traditional strategies for IT transformation. Here, we believe that the continued developments of the performance in Green Cargo will hold additional insights into the relevance and potential long-term utility of the encapsulation strategy.

There are two main limitations in our study. First, with this being a single case we acknowledge the issues related to transferability and generalizability of our findings. We have handled this limitation through refraining from theorizing based on our findings. Second, the choice to go with a retrospective case study approach, i.e., mapping the strategy retrospectively through data collection conducted in 2022 is also a limitation. No long-term performance effects have been assessed, whereby the study could be criticized for not amply assessing the potential merits or shortcomings of the encapsulation strategy. We suggest three concrete research projects based on our findings. First, a continued study of the performance effects of Green Cargos encapsulation strategy will be of relevance to identify potential challenges and opportunities brought about by the choice in strategy. Second, this should be complemented by additional studies of other public sector cases of the encapsulation strategy, to assess the variety of both design and output. Third, we believe that there is a need for quantitative studies of strategic choice in IT transformation. At present, there is no empirical basis for assessing neither frequencies nor contingencies in IT transformation strategic choice. We believe that these three studies would benefit not only the study of IT transformation, but also that of digital transformation given the identified dilemma.

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