TECHNOLOGY ADOPTION IN PUBLIC CLIENT ORGANISATIONS: INSTITUTIONAL PERSPECTIVES FROM SWEDEN AND THE NETHERLANDS

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Public construction clients are slow to adopt new sustainable technologies, which is problematic if public clients want to lead the charge of constructing for the future. This inertia is investigated by studying two cases: Swedish public housing companies and the Dutch public infrastructure agency. By applying an institutional logics framework and comparing the challenges of technology adoption in two different contexts (Sweden vs. the Netherlands, housing vs. infrastructure, small client vs. large client), the findings show how technology adoption is difficult due to uncertainty avoidance and institutionalised norms, values and physical infrastructure that do not support necessary changes needed to adopt new technologies. Also, the organisations struggle to reconcile conflicting logics of cost vs. sustainability, efficiency vs. flexibility, and a short-term project-related corporate logic vs. long-term asset management logic. The paper contributes an understanding of how and why changes that enable technology adoption is limited in public client organisations, and what issues must be addressed for public clients to construct for the future.

Keywords: change; institutional logics; public client; technology adoption

INTRODUCTION

For the construction and real estate sector to construct for the future, adopting new technologies will be especially vital to enable a transition to more efficient and sustainable practices (Bokrantz *et al.,* 2020). Public clients have a large role to play to drive innovation in the sector to contribute to sustainable development, due to their mission to fulfil public values, but also because of their influence over the market and considerable purchasing power. To adopt new technologies requires changing old ways or working and thinking, and the technologies themselves introduce new work practices, roles, and values. However, previous research has found that the sector in general, and public clients in particular, are risk averse and slow to adopt new sustainable technologies (Papadonikolaki *et al.,* 2022). In response, this paper seeks to understand the institutional mechanisms underlying this inertia that limits this change, where the purpose of this paper is to investigate the challenges that public client organisations face in adopting new technologies. An institutional logics

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framework is applied as this can help explain what these challenges are and why they occur.

The paper builds on a multiple case study of two types of public client organisations in two geographical settings. The first case is of public housing companies in Sweden, and the second case is of the public infrastructure agency in the Netherlands. The two cases provide a good base for comparison, as they share some similar features, such as being well-developed economies and subject to EU regulations, and by working to manage, maintain, improve, and refurbish their assets. The studied organisations are thus conducting the same type of work, to maintain their assets as best possible, and both deal with the built environment and have a big impact on public well-being. They also share some dissimilarities, like the size of the organisations and types of assets. By comparing the experience of technology adoption in two different geographical contexts and in two different sub-sections of the sector (housing vs. infrastructure, small client vs. large client), we can get a more comprehensive understanding of why change to enable technology adoption is limited.

Institutional logics and the institutional context of public organisations within housing and infrastructure

To understand the challenges that public client organisations face when trying to adopt new technologies, it is useful to understand their institutional and socially constructed context, as this impacts on their ability to change to accommodate new technologies. Institutional logics is one way to do this. Institutional logics are widely held shared values and beliefs within a specific community, and these prevailing, taken-for-granted values and beliefs influence practice, change, and legitimacy (Friedland and Alford, 1991). This means that legitimacy often trumps efficiency (Battilana and D'Aunno 2009). Thereby, institutional logics provide scripts for action and create heterogeneity within the field (Martin *et al.,* 2017; Reay and Hinings 2009). Material and immaterial structures and values that support a dominant logic is difficult to divert from, and thereby limits ability to change (Modell *et al.,* 2007).

It is not uncommon for multiple parallel institutional logics to coexist within the same field. Sometimes these parallel logics are conflicting, causing instability within the field. This pluralism can arise either due to endogenous factors such as old logics no longer being useful, or due to exogenous factors such as the introduction of a new technology or crises that demands a shift in logics (Martin *et al.,* 2017). So, contradictions and conflicts between parallel institutional logics can lead to change where new logics become dominant and displace older logics (Reay and Hinings 2009).

Sweden and the Netherlands are similar in their institutional context in terms of public management practices, strong EU regulations, and structure of the built environment. Within both these contexts, public organisations are often described as institutionally pluralistic (Kadefors 1995; Volker and Hoezen 2017; Nederhand *et al.,* 2019; Fred 2020; Maine *et al.,* 2022). Since the introduction of the new public management movement with its market and industrial ideals of customer service, economic rationality and efficiency, public clients have long had to balance this mindset with the traditional public bureaucracy logic of regulation and democracy (Fred 2020).

Public housing companies influence sustainable development via its large square footage within the built environment, and its role in promoting well-being and quality of life. Public housing companies engage in facilities management (FM), which concerns the use, operation, development, maintenance, and improvement of housing

(Nielsen *et al.,* 2009). Public housing companies function like a hybrid organisation that are driven by market ideals and competitiveness that pursue financial prosperity, while simultaneously being driven by public, social and environmental goals of supplying housing for all demographics. This goal multiplicity creates ambiguity and tensions where different institutional logics compete (Maine *et al.,* 2022).

Infrastructure agencies also have a large role to play in sustainable development. Infrastructure projects negatively contribute to climate change through its large consumption of natural resources, waste generation, and global greenhouse gas emissions (Ahmed *et al.,* 2022), and public infrastructure agencies have considerable power over what gets built and how things are built (Volker and Hoezen 2017). Infrastructure agencies are also a type of hybrid organisation with institutional multiplicity where they embed a corporate logic of efficiency, and bureaucratic and public values. These agencies also embody a project-based logic with a more short-term focus, and a more long-term strategic asset management logic (Frederiksen *et al.,* 2021), which is concerned with management, maintenance, and renewal of the asset portfolio, like roads or bridges (Schraven 2015).

METHOD

Institutional logics come into being through material and immaterial symbols, practices, and language (Reay and Jones, 2016), which is why a qualitative research design was chosen. The paper builds on a multiple case study of two public client organisations, housing companies and an infrastructure agency, in two geographical contexts, Sweden and the Netherlands. This approach allows for a more comprehensive view and provides an opportunity to compare and distinguish the finer mechanisms governing two different types of organisations in two different contexts.

The first case study was conducted by the first author and is of Swedish public housing companies and their FM operations, i.e., organisations that own and/or manage residential housing for rent (>4000 apartments) of different kinds (high and low-income housing, old and new building stocks). These housing companies are trying to transform their daily FM operations to become more sustainable and efficient, partly through the addition of new technologies and 'proptech'. To get both breadth and depth to the results, 2-3 people from each housing company were interviewed, resulting in a total of 14 interviews (see Table 1). The interviewees were purposefully chosen because they worked on a strategic level within their respective organisations and thereby were overseeing and setting the strategic direction of FM and development work within their organisations. The interviews lasted approximately one hour and were conducted over Teams or Zoom in the winter and spring of 2021-2022. Observational data from three FM industry conferences was also collected. The conferences took place during the winter of 2021, 2022, and 2023, and had speakers from both industry and government organisations.

Table 1: Interviews from the public housing companies (PHC) in the Swedish case study

Organisation	Interviewees	Anonymous codes
Public housing company A	Business manager; CEO; FM manager	PHC A 1-3
Public housing company B	Property manager; Property developer; FM manager	PHC B 1-3
Public housing company C	FM manager; Sustainability manager; CEO	PHC C 1-3
Public housing company D	Business manager; CEO; Energy manager	PHC D 1-3
Public housing company E	Development manager; Chief project manager	PHC E 1-2

The second case study was conducted by the second author and is of the largest public infrastructure agency in the Netherlands. The principal data set was comprised of observations conducted at the start of a process to adopt a new digital platform which was meant to streamline and collect the organisation's core activities (project management and asset management) into one space. The observations followed the adoption process from its start in late 2019 and lasted until its end in late 2022. In total, 190 hours of observations of meetings were conducted, and secondary document data, such as digital archival material, emails, memos, and presentations were collected. Also, four managers that oversaw the technology adoption were chosen for observation and interviews, as they had both the strategic overview and operative responsibility of adopting the new digital platform. In total, four managers were interviewed 20 times (see Table 2). The interviews lasted approximately one hour and were conducted over MS Teams. The field notes are labelled FN#.

Table 1: Interviews from the public infrastructure agency (PIA) in the Dutch case study

Organisation	Number of interviews	Interviewees	Anonymous codes
Dutch public infrastructure agency	8	Project information manager	PIA1
	7	Managerial executive	PIA2
	3	Innovation manager A	PIA3
	2	Innovation manager B	PIA4

The multiple sources of data enabled triangulation and validation of the results, both within and between each case (Denzin 2009). The data were collected similarly, where observations were documented in detailed field notes and interviews were recorded and transcribed verbatim. Interviews were semi-structured for interview flexibility (Kvale 2007), and the interviewees were purposefully sampled based on their influential position and overview of technology adoption activities.

Both cases were thematically analysed (Braun and Clarke 2006) to identify patterns and themes in the data. The initial inductive coding round was conducted by each author respectively, due to the language barrier of the data sets, to identify excerpts in the data that described and explained the underlying mechanisms of technology adoption. These codes were given English labels that described their content. After this first coding round, a joint analysis to find common patterns across the two data sets were conducted jointly by the authors in person in a collaborative manner. After this, a more abductive analysis began where the themes identified in the data sets were compared to and contrasted with the theoretical framework of institutional logics in an iterative manner (van Maanen *et al.,* 2007). This produced more theoretically informed themes that were used to structure the Findings chapter. After writing up the findings, a final joint comparative analysis was conducted to find similarities and disparities between the two cases, moving abductively between the empirical data and theoretical framework. This final comparative analysis is presented in the Discussion chapter.

Findings from the Swedish Case

New resources and unfavourable institutionalised norms and practices

One major reason for why technology adoption is difficult in the Swedish housing sector is that the sector can be change resistant and technologically immature. According to the interviewees and speakers at the industry conferences, different types of 'proptech', i.e., digital solutions like AI-run buildings, BIM (building information modelling), digital twins, sensors to monitor building performance, and apps to

communicate with tenants, is an exciting, but complex, future development of the sector, but current systems, technologies and tools are under-developed, inefficient, and difficult to use. To change this negative situation, investments like technical and digital infrastructure, knowledge, time, and staff are inevitably required.

One necessary resource that is lacking relates to knowledge. Those working in the sector are unfamiliar with working with newer technologies and systems and are more used to working manually to manage the housing stocks: "We need skills to train our staff because newer buildings are very technical, so we need competence in how to actually manage these buildings and understand how they work" (PHC B3). Many of the more prominently discussed technologies, like BIM or digital twins, provide a magnitude of data that housing companies do not know how to interpret: "We have AI, and then we have a ton of data. And when we have all that data, we need to know what to do with all that data. Because we collect a bunch of data, but we don't know what to use it for" (PHC D2). The sector is thus technologically immature.

One speaker at the second industry conference emphasized that understanding how to manage buildings using digitalisation and tenants' digitalisation needs is one of the most vital issues for the future of FM. Unfortunately, in a survey taken during the third industry conference, client competency and experience were believed to be the foremost barriers to digitalising an existing building. This analogue and manual way of working is widespread, and because there is a lack of knowledge on how to manage complex technologies and digital systems, this can cause stress for employees who are not used to, or uninterested in, working more digitally. Another necessary resource relates to infrastructure to implement newer technical solutions. Most housing stocks are older, analogue buildings, that are not prepared for more technical solutions. For example, there is no use in installing a smart, more efficient heating system if the ventilation does not support it in the first place.

Another major barrier brought forth by the interviewees and industry speakers is the inability for many housing companies to scale up different initiatives: "This is where our industry is absolutely terrible, to scale up, because all we have are projects" (PHC C1). The interviewees express how housing companies are positive to test things out, but very bad at making it a permanent part of their organisation. Further aggravating the situation is that some housing companies have such a large housing stock: "Firstly, it becomes an insurmountable task. Secondly, its bloody expensive when you tabulate everything together. So that's when we say that we just won't do it, not in a single building" (PHC D2). There is also a fear to install new technologies before they have proven their usefulness. For example, older more manual features, like manual locks, may last for 50 years or more, while a digital lock requires service every few years. There are thus many practical and institutionalised barriers to technology adoption.

Trade-off between cost and sustainability

Adopting new technologies leads to a conflict between different goals, like sustainability, economy, and efficiency. Adopting new technologies means embedding new materials and energy consuming systems within the building stock, like digital twins, digital locks, or security cameras. In effect, it can be difficult to know if the technologies are more socially and environmentally sustainable, so it is important to think about the life-cycle impact of such technologies. A speaker at the second industry conference emphasized how using IT systems that in detail maps the housing stock also means new risks like cyber security. So, there can be a trade-off between efficiency and security, an unintended negative outcome of new technologies.

Another goal conflict relates to what tenants want and what housing companies want: "You think that tenants will demand a lot of digitalisation. But tenants don't ask anything about digitalisation, it's a non-issue, but housing companies think digitalisation is really exciting" (PHC C3). Also, public housing companies often provide housing to low-income demographics, who are sensitive to rent increases. Because technology adoption can be costly, this may negatively affect price sensitive tenants, who may be forced to find housing elsewhere if investments are too steep.

Cost vs. technology adoption is said to be a major trade-off. Despite many housing companies having good financial status, investing in technologies is expensive with uncertain value for money, especially if certain technologies are newer on the market or under development: "Development costs money. It's a catch 22 really, because we are not willing to pay for something that isn't yet developed, but you have to have money to develop something" (PHC B3). Technologies that are well-developed, like BIM or digital twins, is often seen as financially risky investments anyway, because there is a lack of business models substantiating such solutions: "We have a lot of smaller buildings, where it is difficult to get any financial gain. If we have a high-rise, it's very simple, but in three story houses it's more difficult, because digitalisation costs a lot" (PHC C1). This financial discourse centred on value for money, costs, and business models is a central theme of the Swedish study.

Findings from the Dutch Case

Segmentation of construction and maintenance practices

The Dutch public infrastructure agency faced challenges in adopting sustainable digital technologies mainly due to division of resources between a project-based sub-unit that was responsible for construction of infrastructure assets, and an asset management sub-unit that was responsible for the maintenance of infrastructure assets. Each organisational sub-unit made use of information systems that were specific to each and did not support communication with each other. The segmentation of resources for projects and for asset management have led to a lack of coherence in user needs, which hindered the adoption of digital technologies.

These two organisational sub-units represented conflicting strategic imperatives. Digital innovation managers struggled to adopt technologies that meet the needs of both project teams, who prioritise short-term project efficiency and deadlines, and asset managers, who prioritise long-term asset resilience and conservation. A digital innovation manager expressed in an email: "In addition to [the asset management] need, we see various developments around [digital technologies], the impact of which, timing, ownership and, above all, coherence, is not clear to us, so that we cannot estimate whether and how these initiatives provide a timely solution for [the] projects" (FN112). These conflicting user needs led to a split, where some actors pursued the needs of projects, while others pursued the needs of asset management. This conflict was evident in the year-long discussions regarding the goals of a pilot project, where users were unable to generate a consistent representation of their expectations.

Via email, one of the digital innovation managers emphasized that they should start from the bottom up: "Which organisational goals do we aim to contribute to? For whom do we [adopt digital technologies] and are our priorities right? … Who does the request come from and which 'higher purpose' is being pursued?" (FN112). Another digital innovation manager disagreed and expressed this in a reply: "On the first point we clearly have a disagreement. I understand that you approach your work from an asset management perspective. I also think that these are things that eventually must

happen. But I just think that we're not doing it in the right order, and then we won't have a product that we can implement on projects. If this is ultimately not your goal, we should look at alternative ways of solving this" (FN42). The conflicting goals and logics of the two sub-units thus caused open conflicts between organisational members, who struggled to reconcile their differences.

Trade-off between efficiency and flexibility

Conflicting logics of efficiency and flexibility also hindered the adoption of digital technologies. Pilot projects are commonly used to test new technologies and determine their added value. However, the agency often demanded guarantees of added value, leading to reluctance to try out new technologies in complex infrastructure projects. This became apparent when one of the projects withdrew from the pilot: "[Withdrawing] takes the risk away from the contractor. At the moment, there will be no more investments from the project to work on [a digital technology]. Data exchange will occur in the way that is the standard at this time within [the organisation], starting with the traditional working method" (FN508). The organisation thus quickly reverted to their old, established practices.

Also, digital technologies continued to evolve even after adoption, as it was relatively easy to edit code and add new features to the software. The organisation found it difficult to understand the consequences of the ongoing modifications, which could result in changes to work procedures and project contracts vulnerable to contractor opportunism. As a digital innovation manager stated: "The contractor must come up with a transition plan for the moment that [the agency] is ready to migrate to the new [version of the digital platform]. But when is this moment?" (FN34). Project managers aimed to specify clear deliverables for contractors to estimate associated costs and capacity accurately, while the adoption of digital technologies demanded flexibility and adaptability from contractors, resulting in tension between striving for efficiency and allowing for flexibility. This conflict contributed to weak technology adoption.

DISCUSSION

It is clear from the two cases that both are struggling with technology adoption due to constraining and conflicting institutional logics that limit the ability to change, although the basis for these struggles somewhat differs. The institutional contexts are similar in the two cases, so what mainly differs is the section of the sector (housing vs. infrastructure) and size of the client (small vs. large). The Swedish case legitimise technology adoption mainly by claiming that the technologies will contribute to sustainable development, and operations will by default become more efficient. The Dutch case instead legitimise technology adoption by claiming that the technologies will be more efficient when the organisation shares one digital platform, and by doing so infrastructure assets can become more sustainable as asset management knowledge can be embedded in construction projects. The Swedish case thus focuses on sustainability, with efficiency as a positive by-product, while the Dutch case focuses on efficiency, with sustainability as a positive by-product. A reason for this difference may be because the housing companies are so much smaller; they may not have efficiency of scale to tie into. The infrastructure agency is on the other hand large enough to benefit from efficiencies of scale.

Another difference is how the Swedish case is very focused on the financial bottom line and cost of technologies, while the Dutch case is more focused on efficiency and coherence across the two sub-units. A reason for this may also be due to the smaller

size, and thereby budget, of housing companies. Another reason may be because there are private equivalents that work very similarly to public housing companies. This means that there is a commercial business model that public housing companies can model themselves after. In contrast, there is no private equivalent to the infrastructure agency, so they do not have a private organisation or business model to imitate.

There are also similarities between the two cases, especially in terms of how they struggle to reconcile conflicting institutional logics. Housing companies are driven and shaped by an ideal to be more profit driven, and the infrastructure agency is driven by an ideal of being more professional and efficient. Both these ideals can be seen as part of a market logic (Fred 2020), albeit representing different features of this logic. Both cases also display signs of uncertainty avoidance, in terms of not adopting untested technologies or withdrawing from pilot projects. The introduction of a new technology can be an exogenous force causing institutional instability and pluralism (Martin *et al.,* 2017; Reay and Hinings 2009). As organisations prefer to be in status quo, disrupting the institutional environment by adopting a new technology may be something that organisations consciously or subconsciously try to avoid supressing conflict and uncertainty in the field.

Both cases share the tendency of projectification, where technologies are tested in projects but rarely embedded in the whole organisation, with a short-term perspective dominating planning activity. In addition, both cases show reluctance in abandoning old practices in favour of new ones, where there is hesitation to make the necessary knowledge, financial, and infrastructure investments to support technology adoption (Modell *et al.,* 2007). Smaller clients have the flexibility to test new technologies in individual housing stocks but fail to commit financial resources and scale up successful technology adoptions. Vice versa, the larger client can more easily secure resources for wider technology adoption but are unable to adopt the technology cohesively throughout the organisation's two sub-units. Both cases also share a problem with time horizons. Housing companies and the project sub-unit of the infrastructure agency both tend to overemphasize short-term goals, but to construct for the future a much more long-term perspective must be adopted, even in projects.

The collective struggle with adopting digital technologies also stems from the conflict between dominant logics in facility/asset management (Maine *et al.,* 2022; Schraven 2015) and the logics embedded in digital technologies. Both cases deal with managing tangible assets and physical space, and, although there may be exceptions in both cases, much of the facilities and assets are timeworn. The management of existing buildings and infrastructure are associated with logics that prioritise values such as stability, continuity, and preservation (Nielsen *et al.,* 2009; Schraven 2015). These are reflected in the use of familiar building materials and techniques, and the adherence to established building codes and regulations (Kadefors 1995). On the other hand, digital technologies are intangible and occupy virtual space, and are associated with logics that promote innovation, flexibility, and adaptability. These are reflected in the malleability of digital technologies, in which software code could be easily edited and features could be added or removed, where the opposite is true for existing buildings and assets. Due to these differences in logics, the public client organisations in the two cases found it difficult to adopt digital technologies.

CONCLUSIONS

This paper sought to investigate how public client organisations adopt new technologies to become more efficient and sustainable, by applying an institutional

logics framework to two cases of public client organisations (housing companies and infrastructure agency) in Sweden and the Netherlands. It is clear from the findings that regardless of geographical context and organisation type, public client organisations struggle to change to enable the adoption of new technologies. This failure to adopt new technologies thereby becomes a failure to innovate and makes sustainable and efficient construction and operation under-institutionalised.

The findings show how there are many similarities in why technology adoption is limited in public client organisations. The main issues relate to institutionalised norms, values, and physical infrastructure that limits change that is necessary for adopting new technologies. In addition, the organisations struggle to reconcile conflicting institutional logics of cost vs. sustainability, efficiency vs. flexibility, and short-term project-related corporate market logics vs. long-term bureaucratic asset management logics. Hesitation to forgo old practices and invest in new, potentially costly, technologies limits adoption through actors' uncertainty avoidance.

The paper makes several contributions to construction management research and practice. For construction management research, the paper contributes an understanding of how and why technology adoption is limited in public client organisations. This is especially pertinent as housing and infrastructure are so closely tied to public values, individual well-being, and public accessibility (Frederiksen *et al.,* 2021; Nielsen *et al.,* 2009). Public clients need to drive innovation and lead by example to construct for the future to contribute to a more sustainable and efficient built environment. By applying an institutional logics framework, the paper illustrates underlying mechanisms that hinders change for technology adoption. If public clients fail to lead by example and fail to adopt new technologies, sustainable development in the sector may be diminished, which is problematic considering the sector's considerable detrimental impact in the environment (Nielsen *et al.,* 2009; Ahmed *et al.,* 2022). For practitioners, the paper highlights what challenges must be addressed and what change is needed for effective technology adoption. Future research could more closely look into how organisations prioritise between conflicting logics, and what consequences this has for innovation and sustainable development.

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