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PUBLIC CLIENTS' TRANSITION TOWARDS CIRCULAR PRACTISES IN INFRASTRUCTURE PROJECTS

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Transforming the resource intensive construction sector is vital for the transition to circular economy. Incorporating changes to transition from linear to a circular way of working place significant demands on client organisations. The primary objective of our study is to develop a conceptual change model that provides recommendations on what internal changes can be implemented within public clients, to accelerate their transition to circular practises in infrastructure projects. A literature review indicates that models incorporating both process and content aspects are most effective in addressing comprehensive organisational change. Empirical data was gathered through case studies among public clients, being Dutch regional water authorities. The initial organisational change framework was validated and refined through expert interviews. The developed change model serves as a guiding tool for facilitating public clients' transition from their current state to the desired state through structured and achievable steps. The framework identifies four key areas of change: people, work process, structure, and external. For each of these four aspects, change measures are presented in the unfreeze-transition-refreeze steps, adopted from Lewin's change model for planned organisational change.

Keywords: change model; circularity; organisational change; public client; water authority

INTRODUCTION

In 2016, the government-wide program for a circular economy identified 'construction' as one of the five priority areas to be addressed first, given the sector's resource-intensive nature (Ministry of Infrastructure and the Environment and Ministry of Economic Affairs, 2016). The transition agenda 'Circular Construction Economy,' crafted collaboratively by various public and private stakeholders, outlines the Dutch strategy to achieve full circularity in the built environment by the year 2050.

Infrastructure projects are majorly procured by public entities. Public clients can directly shape market demand for circular products and services through the implementation of strategic purchasing policies (Hanemaaijer et al., 2023). Nevertheless, changes like the transition to circular construction practices place great demand on client organisations. Many circular initiatives are still in their initial phases, with limited scaling up or break- through activities. At this point, substantial market demand for and supply of circular products and services is still lacking

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(Hanemaaijer et al., 2023). This might indicate that public clients need to alter their strategic, tactical, or operational approaches to facilitate the transition.

One significant group of Dutch public client organisations is the Dutch Regional Water Authorities (water boards), responsible for regional water management. The 21 Dutch Regional Water Authorities build and manage huge numbers of infrastructure works like flood defenses, navigable waterways, pumping stations, and wastewater treatment plants. These authorities hold an independent position in the democratic system in the Netherlands with autonomous governance over the activities assigned to them (Havekes et al., 2017).

Lately, the water boards have been busy tackling climate change and shifting towards sustainability mainly in three areas: climate adaptation, energy neutrality, and circular economy (Unie van Waterschappen, 2021). While the water boards have set targets of achieving 50% circularity by 2030 and 100% circularity by 2050, the specific actions required to shape these goals have not yet been completed or crystallised (Besseling *et al.,* 2020). The Union of Water Boards indicates that the water boards have made progress in the circular economy domain. All 21 water boards have developed a circularity policy, with over 17 of them having already adopted it administratively. However, it remains largely experimental and exploratory (Unie van Waterschappen, 2021). Given the nature of their work, water authorities understand employing a linear approach to material usage is unsustainable. They directly deal with the consequences of climate change such as heavier rains and prolonged periods of drought. Being major clients in the infrastructure sector, they have the resources and opportunities to make a substantial difference in the transition to a circular economy.

While the urgency for change is present, the water boards struggle to progress beyond pilot projects, increase maturity levels throughout the organisation, and align new policies with daily practices. It is currently perceived as an additional task for a select few within the organisation but rather should evolve into a norm for the entire organisation of the water boards. This transition brings about a change in decision-making, design, purchasing, use and logistics, among other things. To achieve a rapid and significant transition to circular construction practices, public client organisations, such as water boards, must move beyond standardised, traditional methods of working. Thus, for the implementation of such transitions, these organisations must adapt their internal organisation to incorporate the changes.

This study explores the pressing need for robust strategies related to the internal organisation of public clients, aiming to facilitate the transition to a circular way of working. This was achieved by examining Dutch regional water boards. The guiding research question is: What changes in the internal organisation of a public infrastructure client could facilitate the transition to circular construction practices?

LITERATURE REVIEW

Organisational change is defined as the empirical transformation observed in the form, quality, or long-term state of an organisational entity. This change typically arises from the introduction of new styles of thinking, acting, or operational approaches, aimed at adapting to the environment or enhancing performance (Pardo-del Val *et al.,* 2012: 1845). According to Errida and Lotfi (2021), change management models support and act as guiding frameworks to facilitate change efforts by outlining specific processes or steps that can be followed. It also depicts the various factors influencing

change and identifies the levers necessary for success in the change management process.

Transition to circular constructions is often initiated deliberately. Planned organisational changes are deliberate activities to move an organisation from its current state to the desired state (Stouten *et al.,* 2018: 752). While reviewing the existing literature, it can be found that several planned organisational change models are available. For instance, Joseph Galli (2018) did a comparative analysis of five major change models and identified the advantages and disadvantages of each. Errida and Lotfi (2021) identified 37 change models through extensive literature reviews and analysed the selected models to identify the factors influencing change management success. Planned organisational change models mainly fall into two categories: (1) processual and (2) descriptive models (Parry *et al.,* 2014; Errida and Lotfi, 2021).

Processual change models outline the unfolding of the change process and determine the steps for conducting and managing change. Some renowned processual change models include Lewin's 3- stage model, Kotter's 8-step model and Prosci's ADKAR model. (Parry *et al.,* 2014; Errida and Lotfi, 2021). While there are several other processual models available, many of them are variations of Lewin's 3-stage model, often dividing the three stages into more steps (Errida and Lotfi, 2021). Within the three most used change models mentioned above, the ADKAR model focuses on an individual's change adaptation, while Lewin's and Kotter's approach guides and facilitates organisation-wide change (Joseph Galli, 2018). In this study, since the focus is on organisational change, Lewin's and Kotter's models are explored further. Lewin's 3-stage model of change is called the classical model by some authors (Talmaciu, 2014) and widely regarded as the cornerstone of planned change management (Errida and Lotfi, 2021). Most subsequent theories and models are founded on Lewin's fundamental principles (Yli- Kerttula and Varis, 2023). This model splits the process of change into three stages or phases, namely: unfreeze, moving and refreeze (Talmaciu, 2014). Kotter's 8-Step Change Model builds upon Lewin's initial change theory, giving an expanded view to managing organisational change (Joseph Galli, 2018).

While processual models refer to 'how' change can occur, descriptive models focus on content and describe 'what' changes in the organisation. Some common descriptive change models include Burke and Litwin's model of organisational change and Nadler and Tushman's congruence model (Errida and Lotfi, 2021). There is disagreement in the literature regarding the selection of the most suitable model to steer change within an organisation (Errida and Lotfi, 2021). Several authors think that using a single model may not provide a full description and may neglect certain important factors. Besides, one model for all cases may be inappropriate to the particularity of the change (Joseph Galli (2018); Al-Haddad and Kotnour (2015)). While literature may provide some direction, it is ultimately the organisational environment that should determine a suitable change framework that fits (Joseph Galli (2018); Al-Haddad and Kotnour (2015)). Existing change management models are not specific enough for the needed transitions to circular practises by public construction clients. Therefore, this research intends to develop a tailor-made framework for organisational change that addresses circular transitions in public client organisations such as the Dutch regional water boards.

METHOD

The first phase of the study consists of a literature review, document review, and three unstructured exploratory interviews. The objective of this phase is to identify the essentials for a change framework that comprehensively captures the different aspects of change that need to be addressed in the organisation for circular transitions. For this purpose, it was imperative to initially understand the current ways of working at the organisation under consideration. This is done by commencing with a review of documents available within the organisation on governance aspects. The understanding is further solidified through exploratory interviews. This procedure helped understand what areas of internal organisation should be prioritised in the change framework in later parts of the study. The subsequent step was a thorough literature review on available organisational change literature. Considering the inputs from the previous step, this step involved the identification of some components essential in a change framework. These findings formed the theoretical basis for the rest of the research. Next, a specific set of goals are defined according to the desired state post-change for each organisational aspect. For this purpose, a detailed literature survey was conducted as extant literature is fragmented on how a 'circular' organisation should function.

The second phase of the study focuses on empirical investigation. Since the extant literature on internal organisational change to transition to circular construction practices is scarce, analysis of multiple case studies was an apt methodology for this part. The multiple case study is a qualitative research methodology that enables us to attain substantial, contextual, and in-depth insights into the subject of focus (Yin, 2017). A minimum of two case studies were utilised to eliminate the possibility of deductive theory confirmation. The individual case studies must predict similar results (literal replication) to allow the possibility to generalise findings (Yin, 2017).

The following criteria were used to identify suitable water boards for the study: (1) Water boards with recognisable initiatives for transitioning towards circular constructions. The first and crucial criterion for selection was to check if a water board had already formulated its own goals and translated them into policies. Furthermore, it should had taken actionable steps towards achieving these ambitions like implementing pilot projects, steps for sustainable commissioning, or other ongoing initiatives; (2) Water boards with an established organisational structure and process maturity. This criterion emphasizes the importance of selecting water boards that possess a mature organisational structure and well-defined processes, as these characteristics are conducive to effectively implementing organisational change strategies related to transitioning to circular construction practices; (3) Water boards of varying sizes and scope of tasks.

Based on the criteria listed above, two Dutch regional water authorities were chosen, both front-runners in sustainability transitions. A background study into these organisations, their working and their circular initiatives was done prior to semi-structured interviews through documents retrieved from publicly available websites. Criteria that were set for the selection of interviewees are: (1) Role and position. The interviewee should hold a position relevant to infrastructure management, strategic planning or change management within the organisation. They must have varying positions to bring as many perspectives as possible. (2) Experience. Professionals with substantial experience (min. 5 years) and must have participated in completed/ongoing circular construction initiatives of the organisation.

Following to the above criteria, three to five interviewees were selected for each case. Case A: department manager, policy advisor (asset management), asset manager, program manager sustainability and circularity and technical manager. Case B: project leader, advisor circular economy and manager sustainable innovation.

In-depth analyses of the data collected during the case studies were performed to identify the emerging themes and perspectives discussed, using both deductive and inductive approaches. The guiding theoretical framework was utilised to categorise the findings into four main aspects, namely, people, work process, structure and external. The data collection and analysis within a predetermined framework gives the analysis a deductive nature. At the same time, themes and patterns within these categories emerged directly from the data through thematic analysis, without any preconceived notions, thereby giving it an inductive nature.

In the third phase of the research an organisational change framework for transition to circular construction practises was developed based on the empirical findings from Phase 2. This framework was validated and refined for improving its applicability through expert interviews with three interviewees from prominent Dutch public infrastructure client organisations. These experts were: Advisor circular economy, policy advisor circular economy and senior advisor circular economy and innovation.

FINDINGS

Multiple change models could be combined to align with the specific needs of a change initiative or the context of an organisation (Errida and Lotfi, 2021). It is found that models that incorporate both process and content aspects demonstrate the most promise in addressing the change holistically (Barnett and Carroll, 1995). Keeping this in mind, the change model for this study includes components of a processual model as well as organisational-specific variables and factors from descriptive models.

Figure 1 provides a visual representation of the theoretical framework used in the study. This model primarily consists of two parts. First, it adopts one of the most utilised processual models, namely, Lewin's 3-stage model consisting of unfreeze-transition-refreeze steps. The Kotter's 8-step model is often seen as a detailed version of Lewin's model. The second part involves the variables or factors targeted for change within the organisation as found in various descriptive change models. The four content aspects identified are people, work process, structure and external. The initial three aspects, or their modified forms, are present in various descriptive models such as Burke-Litwin's model, Nadler-Tushman's congruence model, and McKinsey's 7S Framework. The fourth aspect -external -was identified during validation interviews of this model framework. 'People' relates to the different individuals who are part of the organisation. The main aspect that could be considered in this component is the organisational culture. According to Bertassini *et al. (*2021), organisational culture to support the transition to a circular economy consists of five building blocks- mindsets, values, behaviours, capabilities and competences. 'Work Process' relates to the operations of the organisation and how they are performed. It includes aspects related to the adaptability of the processes in place and its financial management. It also includes how strategies are devised and formed into work assignments. 'Structure' refers to the way the organisational structure is set up, the span of control of the roles and functions, accountability, and management practices to name a few. For changing to circular ways of functioning, organisations must also learn from the external environment. Absorbing technological

advancements, collaborating with external stakeholders, knowledge sharing and policy development are some crucial aspects of this component.

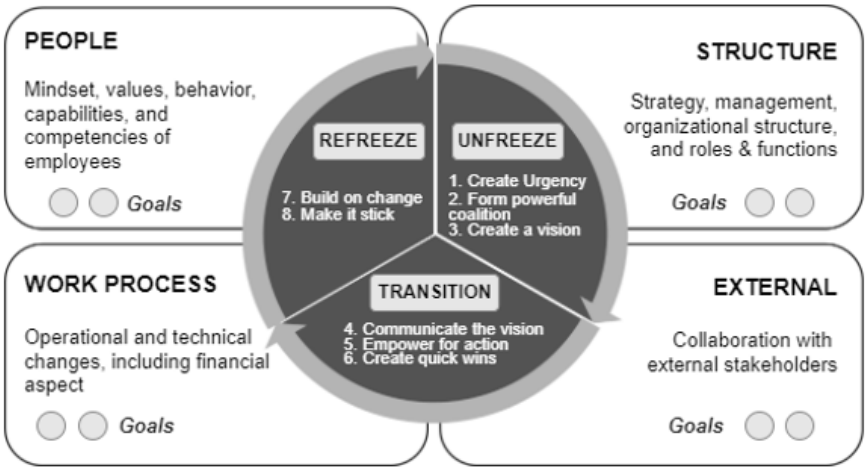

Figure 1: Theoretical framework showing the essential components for an effective organisational change framework (own work)

A critical gap in the existing literature was the absence of insights into the internal functioning of a 'circular' public organisation. It was thus necessary to identify a set of goals that define 'circular' functioning and communicate the desired state of functioning of the organisation post-change. Defining these goals, in turn, would help identifying the procedural changes required to achieve the desired organisational state. A literature review was conducted to identify relevant goals, resulting in the selection of eight goals across four change aspects. These goals were derived from academic sources on general circular business transitions and a review of documents from the Union of Water Boards.

Table 1: Desired goals for a 'circular' organisation for each change aspect

Goal	Literature	Interviewees
People		
i. Exhibit a supportive and shared mindset	(1) (2) (3)	A2, A4, A5
ii. Possess capacity essential for transition	(3) (4)	A1
iii. Institute a culture for innovations		
Work Process		
i. Make decisions using value cases in place of business cases	(3) (11)	
ii. Have redesigned processes that incorporate circular practices	(5) (6)	
Structure		
i. Improved intra-organisational collaboration and accountability	(5) (7) (1) (8)	A2,B2
ii. Ensure managerial commitment (leadership and political)		
External		
i. Establish best practices in knowledge sharing	(3) (10)	
ii. Effectively collaborate with external stakeholders	(3) (9)(10)	

von Kolpinski et al., (2023), Diercks et al., (2023), (3) Unie van Waterschappen (2021), (4) Bertassini et al., (2021), (5) Graessler et al., (2024), (6) Barros et al., (2021), (7) Hofmann and Jaeger-Erben (2020), (8) Unal et al., (2019), (9) Salvioni and Almici (2020), (10) Jäger-Roschko and Petersen (2022), (11) Hoogheemraadschap van Delfland (2022)

Subsequently, case study interviews were conducted to validate these goals within the context of public organisations. This validation process assessed their applicability, leading to the identification of additional goals and modifications to the initial set, as detailed in Table 1.

The interviewees pointed out common barriers and drivers for change. A main barrier is that a linear way of working is ingrained within the water boards' tasks. Tasks that have been performed for 40-50 years have undergone extensive optimisation in design and engineering to achieve maximum effectiveness. Another main barrier is the risk-averse nature of water board. The tasks of the water boards are crucial to keep the inhabitants safe. When new work processes are adopted to transition to circular practices, the effects of the changes are (partly) unknown. This includes aspects such as safety requirements, quality guarantees for circular products, availability of circular materials and components, and their costs. How employees manage these risks is crucial during transitions. The literature review identified eight goals across four key aspects of change, outlining how a 'circular' water board should ideally operate. Interviewees were asked whether they found these goals particularly necessary for accelerating the transition to circular practices. The interviewees acknowledged the importance of all eight goals in facilitating the organisation's transition to circular practices. Furthermore, they proposed additional goals and modifications to the existing ones.

Overall, the interviewees found it hard to clearly outline the steps for achieving each goal. This difficulty is likely because of the ongoing nature of circular economy transitions, which cannot yet be delineated as a straightforward, black-and-white blueprint. The impacts of different processes in these transitions are still unclear. Therefore, the key themes that emerged from interviews were analysed and classified into 'unfreeze-transition-refreeze' steps for each of the four change aspects.

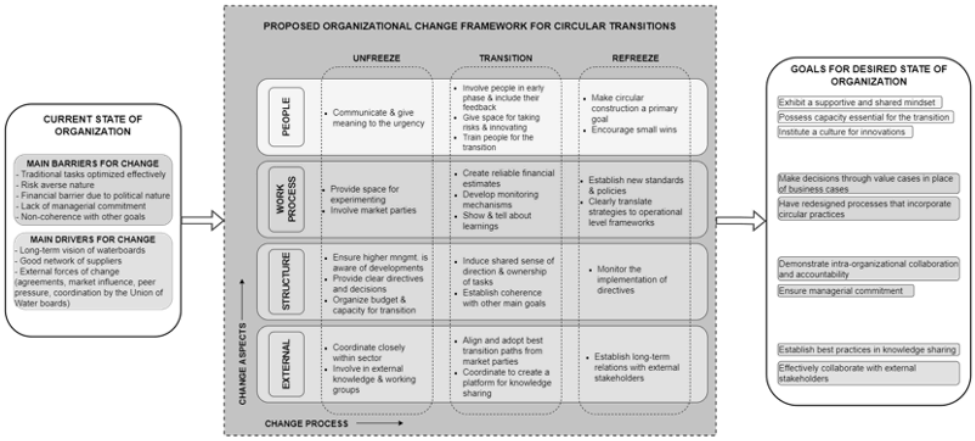

Figure 2: Organisational change framework for transition to circular construction practises (own work)

The validation process that followed confirmed the applicability of the identified themes and provided additional change measures. It also allowed for re-arranging identified measures within 'unfreeze-transition-refreeze' steps. The final change framework was developed by incorporating these changes for all four change aspects. See Figure 2. The change framework assists organisations to transition from its current linear working to a desired state of circular working by addressing the four key aspects. By including both the areas of change and the process for change, the framework becomes an effective tool to negotiate change.

CONCLUSIONS

The objective of this research was to develop measures for adjusting the internal functioning of public clients, such as Dutch regional water boards, to enable the

integration of circular construction practices in the management of their infrastructure assets. The proposed change framework outlines the internal organisational changes that public infrastructure clients like the water boards, can implement. These changes, if implemented proactively, are intended to facilitate the transition to circular infrastructure. The validation process, which included expert interviews, was crucial for confirming the initial findings and refining the framework, ensuring the proposed measures are both effective and feasible. This makes the framework a valuable tool for public construction clients.

The framework makes a significant scientific contribution by focusing on change management specifically for public construction clients aiming to transition to a circular economy, a focus that is absent in existing change management models. The study's focus on organisational change aspects that can be integrated into the daily operations of water boards makes it particularly novel. Internal organisational dynamics of circular economy transitions for public clients have been less explored but are now recognised as a high-priority issue. This framework provides a structured approach to navigating these organisational complexities.

It is recommended that the change measures specified for the four areas within the organisation be proactively implemented by change managers, programme managers, and/or the lead sustainability team. The framework enables them to adopt change measures to meet the specific needs of their organisational environment by considering the most significant barriers faced by their team or organisation.

Traditionally, water boards focus on technical solutions for issues due to their technical nature. However, further technical advancements in circular transitions are already possible than what is currently incorporated in the water boards. Therefore, water boards should emphasize managerial and organisational strategies to overcome human barriers to transition. The framework's change measures support this shift.

This study has certain limitations that should be acknowledged. The proposed framework has been developed and evaluated within the context of water boards, and its applicability to other public organisations remains untested. Further research is necessary to assess its relevance across different institutional settings, considering potential contextual differences.

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