Available online at www.sciencedirect.com

ScienceDirect

IFAC PapersOnline CONFERENCE PAPER ARCHIVE

IFAC PapersOnLine 59-33 (2025) 1–6

Development of Control Systems for Drainage in Polder Landscapes: a gap in the process ⋆

Ronald van Nooijen * Alla Kolechkina ** Thomas Berends *** Elgard van Leeuwen ****

* Faculty of Civil Engineering and Geosciences, Delft University of Technology, Delft, Netherlands (e-mail: R.R.P.vanNooyen@tudelft.nl).
** Delft Center for Systems and Control,Faculty of Mechanical, Maritime and Materials Engineering, Delft University of Technology, Delft, Netherlands (e-mail: A.G.Kolechkina@tudelft.nl)
*** Innovation & Impact Centre, Delft University of Technology, Delft, Netherlands, (e-mail: T.Berends@tudelft.nl)
**** Bureau Water, De Bilt, Netherlands and Innovation & Impact Centre, Delft University of Technology, Delft, Netherlands, (e-mail:elgardvanleeuwen@bureauwater.nl)

Abstract: The development of a new RTC system for a polder landscapes whose geography and current management practices developed over a time span of hundreds of years is a complex undertaking. The results to be achieved are generally formulated in terms of policies instead of clear requirements. Both in the literature on controller design and in practice the full process needed to transform policy statements into a control system that best serves those policies is somewhat neglected. Part of the problem is the rapid development of technology in general and resulting new options for automatic control. This is especially problematical in an environment where this path should be traversed together with the stakeholders. An analysis is presented of present Dutch practice and a proposal is made for a new approach that may well be applicable to RTC development for other complex water systems.

Keywords: polders, central control, drainage, optimal operation of water resources systems, real time control of environmental systems.

1. INTRODUCTION

The well-known Dutch polder landscape is the result of nearly a thousand years of drainage system construction. The drainage system co-evolved with a management system based on local democratically governed water authorities. As mechanization and automation progressed, they merged into a complex pre-existing drainage system with an equally complex management system. Currently, automation of these systems is evolving from decision support for the large pumping stations to Real Time Control (RTC) of all actuators in the system. This is likely to have consequences for the planning and design of RTC, especially given the rapid development of new communications and computer technology and infrastructure. This realization led the Dutch water authority Hoogheemraadschap Hollands Noorderkwartier (HHNK) to commission a report on a process for the planning of an RTC system for (a part of) their water system up to and including a functional design. The starting point for this process would be the existing physical situation, stakeholder interests, the legal and regulatory context, and the existing policies. Such an effort fits in well with the mixing of design into regional planning in the Netherlands that started in the 1990s (Kempenaar et al., 2016). The writing of this report is in progress; it will contain a synthesis of approaches from literature and an analysis of reports on past implementations of such systems in a polder landscape context.

In the remainder of this article, a summary of the findings to date will be presented. First, some background will be provided on the physical and the administrative system. Next, a literature review on design is presented, and then placed in context by a review of Dutch water management practice. Based on this, a design methodology is proposed and a number of documents related to existing or proposed RTC systems is analyzed.

2. PHYSICAL AND ADMINISTRATIVE CONTEXT

2.1 The Dutch polder landscape

A typical Dutch polder landscape depends on a system of canals, lakes, and canalized streams, called the “boezem” for its drainage (Fig. 1). It consists of two types of land: “boezemland”, which lies high enough to directly drain to the boezem, and polders, which lie below mean sea level and/or beneath the level of nearby waterways or lakes. In

⋆ This project was made possible through the financial support of Het Waddenfonds, the Province of Noord-Holland, Rijkswaterstaat, and Hoogheemraadschap Hollands Noorderkwartier.

2405-8963 Copyright © 2025 The Authors. This is an open access article under the CC BY-NC-ND license.
Peer review under responsibility of International Federation of Automatic Control.
10.1016/j.ifacol.2025.12.413

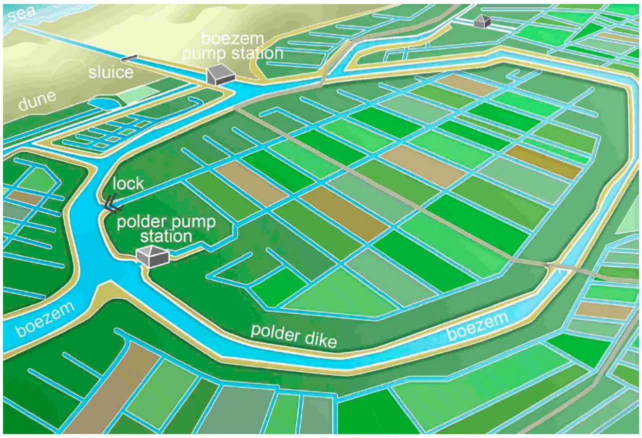

Fig. 1. A polder landscape

general, the water from the boezem cannot be discharged directly into a river or into the sea itself, because the water level in the boezem is too low for that; boezem pump stations are used to discharge boezem water. In some cases, sluice gates can discharge boezem water to the sea at low tide (Breur et al., 2009, van Nooijen et al., 2021, 2024). Excess water due to precipitation is the most obvious source of water to be removed, but there some seepage from deeper groundwater as well. Moreover, in dry periods it may be necessary to let water into the polders from the boezem for irrigation. This water may need to be let into the boezem first from a river or lake. Finally, it can be necessary to let water from the boezem into the polders and then pump it out again to "flush out" brackish groundwater seepage. The total available pump capacity is limited both for each individual polder and for the boezem. During very heavy precipitation, run-off may exceed the polder pump capacity and the combined boezemland run-off, and polder pump discharges may exceed the boezem pump capacity. For short events, this can be compensated for by storage within the normal margins on polder and boezem water levels. If this is no longer possible for the boezem, then management of the system may involve stopping (groups of) polder pumps. It may also involve flooding predefined storage areas. For HHNK an additional challenge is that the boezem has a central part that is linked to the pump stations by canals with zero slope where the length and/or cross section may lead to noticeable level differences between the central part and the canals nearer the pumping stations.

2.2 Dutch water authorities

In the Netherlands, the management of water and water infrastructure is spread over different institutions. For an overview, please consult OECD (2014). In the terminology of that report, HHNK is a regional water authority (the Dutch generic term is "waterschap"). Of the responsibilities listed, the one of interest here is the responsibility for the operation and management of regional water systems with respect to water quantity, water quality, and protection against flooding. Waterschappen are government agencies at the regional level. They are legal entities, whose powers, organisation, governance, and financial resources are determined by the "waterschapswet" (in Dutch "wet" means act of parliament), the existence of which is anchored in the Dutch constitution. Under current law, they are governed by a board consisting of both members elected by the inhabitants of their region and a limited number of members representing the interests of farmers and of nature.

Waterschappen operate within the bounds imposed by national and international treaties and regulations. They are bound by national and provincial policy. Moreover, they are constrained by provincial spatial planning and municipal land use rules. Nevertheless, theirs is the task of translating general principles like "more room for nature" or "retain, store, remove" into policy goals that are somewhat closer to the final technical implementation.

3. SOME REMARKS ON PLANNING AND DESIGN

As stated, what is needed is a process that includes both planning and design. Now in a design process the decisions are taken at different levels of detail and at different stages of the process. In the context of management science, where at least part of the planning process fits best, decisions are usually labeled "strategic","tactical", and"operational" in the literature. Khalifa (2021) showed that the definitions vary and are not always applied consistently. Fortunately, Breur and Leeuwen (1999) provided definitions for these terms in the context of RTC and Dutch water management. They also added the "technical" level. To place the definitions of Breur and Leeuwen (1999) in context, it is necessary to first define the concept of a "strategic decision". Khalifa (2021) does this by referring to the concept of "strategy" as follows: "strategic decisions are actual or potential constituents of strategy", where the definition of "strategy" from Khalifa (2019) is used: "Strategy, rendered as a cohesive core of guiding decisions, is an entity's evolving theory of winning highstake challenges through power creating use of resources and opportunities in uncertain environments". While this may not seem to fit directly into the world of public institutions, a slight reformulation using the guiding principles for a definition of the concept provided in Khalifa (2019) leads to the following definition: strategy, rendered as a cohesive core of guiding decisions, is a regional water authority's evolving theory of how to best perform its assigned tasks with the available resources in an uncertain and changing context, where context refers both to the physical world and social and political factors.

Therefore, when considering a project involving the introduction or modification of an RTC system, the first action to take is to consider how the project relates to the existing water authority strategy and higher level policies as laid down in current policy documents. Note, that indirect stakeholder involvement is always part of the function of a water authority through their representation in the board, but may also be prescribed by waterboard policy. At this *strategic* level it will be necessary to decide how to translate the general strategy into terms that are meaningful and useful for the project. Some, but not all, of the decisions taken here will be strategic decisions. The result should be policy objectives that can in principle be translated into water system behavior. The next level is usually called the *tactical* level (Khalifa (2021) prefers "grand-tactical"). At this level decisions are made on how

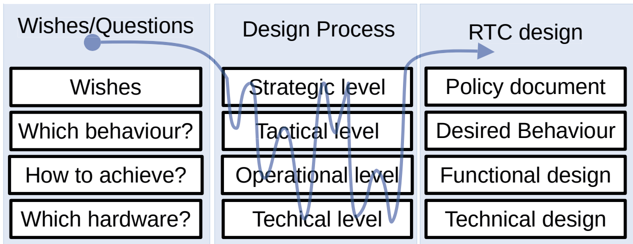

Fig. 2. Decision process trajectory

the policy objectives should be translated into desired dynamical system behavior. Next, an inventory is made of measurable quantities and their relation to system behavior. An inventory is also made of available actuators. Finally, links are established between desired behavior, measurable quantities, and available actuators. Then it is time for decisions at the *operational* level (Khalifa (2021) prefers "tactical") where a functional design for an RTC system is produced that uses the available actuators to realize dynamical system behavior that produces measurement results that, according to the decisions taken at the tactical level, correspond to the desired system behavior. Finally, the decisions at the *technical* level are needed; these concern the hardware and software to be used to realize the functional design.

Breur and Leeuwen (1999) emphasize that, while the above description is sequential, the actual process of decision making is not; frequently it will be necessary to revisit and perhaps revise decisions at a higher level (Fig. 2).

These levels show that, at least for the Dutch situation at the regional level, policy making and policy goal formulation are seen as related to the RTC design process. This suggests that the "RTC design process" is not one monolithic whole, but that there are at least two, interlinked, processes: waterboard policy making and RTC design.

If these levels are taken as a starting point, then most of the literature on design in general starts halfway through the operational level. Specific literature on design of control systems tends to be so specialized that its concerns are not mentioned explicitly in these levels. Soncini-Sessa et al. (2007a,b) consider projects of a much larger scope, but stress the importance of a similar combination of iteration, participation, and decision levels. Schütze et al. (2002) consider the part of the design trajectory where the potential for gain from RTC for sewer specific systems is evaluated.

The large volume of literature on design in general mostly concerns engineering design in a commercial industrial context with a clear product in mind. This limits its applicability in a public sector context. A review of literature on the design process in general can be found in, for example, Wynn and Clarkson (2017).

Some sources nevertheless contain some aspects of interest. Valadares Tavares (1999) proposes the use of "the interactive multi-attribute learning paradigm" for civil engineering projects. In support of the algorithm, a network of actors involved in a typical project is presented and a tree structure for the evaluation of the value of a solution is proposed. The algorithm consists of four steps:

a) generate a set of feasible solutions;
b) simulate the resulting system;
c) assess the solutions in terms of actor preferences;
d) improve the solutions, if necessary, then go back to a).

Valadares Tavares (1999) emphasized that "The applicability of this model requires efficient and effective systems to generate feasible alternatives, to simulate their response, to communicate their features to the major actors and to assess their reactions and their preferences."

Green et al. (2014) is intended as a starting point for the study of the ontology of the design process, but can serve equally well to show how many different approaches there are to formalizing the design process.

Most sources proceeded immediately to the actual design of the control system based on a specification of the system to be controlled, its operational goals, and the constraints on system behavior and control actions. In the previously given hierarchy, that is the operational decision level. However, in the case of polder landscapes, these goals may need to be approved by both regional and national governmental organizations; formal opportunities for appeals by stakeholders are part of the approval process. In case of new technologies or new control techniques, it is likely that the goals and constraints used in the past will need to be adapted. In other words, formulation of new goals and constraints, and assuring their acceptance should be part of the control design process.

In the experience of the authors of this paper, a search for a general design methodology for control systems yields few results that include full iterations from planning to technical details. To illustrate this, consider, for instance, the Web of Science query shown below:

```
"design process" AND "control system"
AND methodology
```

When executed on 20 June 2025 it delivered 132 results. Based on the titles alone, 120 of those papers could be classified as not including the strategic and tactical levels. Examination of the abstracts of the remaining 12 classified 2 as not relevant and a further 7 as skipping strategic and tactical levels. The remaining 3 are discussed below. Liscouët (2021) discusses a design process methodology for flight control systems. It is focused on the technical design, but introduces an ongoing exchange of information between the aircraft manufacturer and the manufacturer of actuators used for flight control that links the two design processes. Pitra (1991) provides a general description of a process, but limits the "participants" to the designer and the system to be controlled. Yurtseven and Buchanan (2011) provides a general design process at a high level of abstraction. It is so general that it could be applied to the design process of almost any system. However, it does not explicitly include room for iteration where models of both system and controller are used to re-calibrate the interpretation of stakeholder wishes.

4. RTC AND HHNK

4.1 Challenges for Dutch water authorities

Dutch waterboards, like HHNK, are governed by a board elected by inhabitants of the region. They are bound by national and international laws and regulations. The draft decisions on surface water management are made public and they need to take into account the response from other stakeholders in the final decision. The presence of the elected board, the need to comply with laws and regulations, the need to acknowledge the view of stakeholders all imply a need for transparency and clarity in all decision processes, including those surrounding RTC design. The same clarity and transparency are needed towards all employees involved with the RTC system. They need to understand its behavior and accept that behavior as "correct". After all, they are the ones responsible for the operation of the water system, the RTC system is just a tool. Therefore, they must decide when to intervene if there seems to be a problem, for instance, if the system displays "incorrect" behavior. As these employees usually live in the area and depend on the waterboard not only for their income, but also for their safety, they too are stakeholders.

The water authority HHNK faces significant difficulties when integrating policy objectives into operational water management and valuating whether the objectives are being achieved. This difficulty stems primarily from the absence of a direct linkage between operational control strategies and overarching policy goals. The missing linkage has two causes: (1) operational control has historically evolved around the management of local, controllable hydraulic structures rather than being guided by a vision of integrated, system-level behavior, and (2) the evaluation of control effectiveness is hindered by the lack of concrete, quantifiable performance indicators (PIs).

HHNK faces persistent challenges in integrating policy objectives into day-to-day operational water management and in evaluating whether these objectives are being met. A key underlying issue is the lack of a direct and explicit linkage between operational control strategies and overarching policy goals. As a result, operational control has historically evolved around the management of local, controllable hydraulic structures, rather than being guided by a vision of integrated, system-level behavior. Furthermore, the absence of concrete, quantifiable PIs makes it difficult to systematically assess the effectiveness of operational decisions in achieving policy outcomes. Currently, the only indirect connection to policy is provided through so-called area specific "peilgrenzen" (lower and upper bounds on water levels). These bounds offer a simplified bandwidth that reflects the desired system behavior. However, they are often either unattainable under varying hydrological/operational conditions or unnecessarily restrictive. In practice, temporary exceedances of these bounds may be acceptable or even desirable to optimize performance elsewhere in the system. The rigid application of these boundaries can therefore reduce the flexibility needed to achieve broader policy goals across the region.

4.2 Analysis of existing HHNK documents

To verify that the levels defined in the method and the definition of the actions in those levels are not only theoretically justified, but also empirically sound, existing HHNK RTC design documents were analyzed. A Large Language Model (LLM) was used in combination with Retrieval-Augmented Generation (RAG) (Zhao et al., 2024). The AI results were manually verified against the documents. For use of LLMs for document analysis see, for example, Fadillah et al. (2024), Jeong (2023), Chen et al. (2025). The procedure used here is still undergoing development, if proven effective, more details and additional results will be presented in a future paper. The procedure consists of the following steps:

0. A knowledge library was constructed by encoding of control system documentation for storage in a vector database;
1. Specific questions (prompts) are converted into vectors (queries) that are used to search the database for relevant information;
2. The data retrieved from the database for a given prompt is combined with the original prompt and fed into the LLM as context injection. The result reflects both the LLM general knowledge with context specific information;
3. The results were manually checked for accuracy to detect any LLM "hallucinations".

This study used Gemini 2.0 Flash as LLM and a Vertex AI text embedding model for text to vector conversion and vice versa. The goal was to compare the contents of the documents with the general process outline given in Breur and Leeuwen (1999). This process is still in progress, preliminary results are as follows. Of the seven documents analyzed, four were descriptions of existing control systems, one was a proposal for a control system for one polder, one was a description of a basic design, and one contained both a description of an existing system and a proposal for change to that system.

Of the four documents that were intended to describe the existing situation, two focused exclusively on the control of a small storage area. In these cases, the absence of an explicit strategic component was not unexpected; however, the tactical component was also missing. Out of the remaining two documents, one demonstrated a clear integration of both strategic and tactical elements, while the other did not. These findings align with the experiences reported by the water authority, indicating that strategic and tactical components are often missing in documentation related to RTC. Instead, the contents deals only with operational and technical aspects, although with varying levels of detail. Although the sample size is too limited to draw definitive conclusions, the preliminary results suggest that in water authority practice control system design frequently begins at the operational and technical level, without adhering to the structured approach outlined by (Breur and Leeuwen, 1999). Note that this aligns with the analysis of control system design literature.

5. THE PROPOSED RTC DESIGN PROCESS FOR WATER AUTHORITIES

For all stages of the planning and design process under development, the purpose of the stage, the method to be used in that stage, and result of the stage are listed in Table 1. In addition to the stages corresponding to the levels in Breur and Leeuwen (1999), there is a stage 0 where the framework for the project is established, and a stage 5, that is not so much a separate stage as an ongoing process, to ensure communication between stages and the revisiting of stages as needed. Workshops at all levels provide opportunities for stakeholders to participate in the process (van Nooijen et al., 2011).

6. DISCUSSION AND CONCLUSION

The results of the preliminary analysis of RTC design documents from water authorities shows an absence of a strategic level and weak tactical levels. This could be explained by a tendency to start design processes at the operational and technical levels, without first considering the broader system-level policy objectives. It is interesting to note that the same happens in the literature on control system design.

In the context of water authorities this approach appears to be rooted in the prevailing focus of water managers on the functioning of individual assets, rather than on the integrated performance of the water system as a whole. This asset-centric perspective is also evident in crisis management practices, which tend to prioritize the continued operation of hydraulic structures over minimizing the overall impact of disruptive events. As a result, opportunities to align operational decisions with higher-level policy objectives may be overlooked, limiting the potential for adaptive and goal-oriented water system management.

From analysis of the literature and of documents on RTC systems from Dutch water authorities it is clear that in existing processes and methods there is a gap in the path from policy to technical RTC design. For water systems, the conceptual distance between policy and both observable and measurable system behavior is large, as is the distance between policy goal and actuator action. This means that during the translation process from policy to RTC, technical information on what is observable and realizable system behavior needs to travel back up to the policy level to re-frame and re-interpret the policy in the context of currently available technology. The process outlineed in Table 1 provides a way to do so.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the support and active involvement of Hoogheemraadschap Hollands Noorderkwartier in this research. We especially thank the many staff members who contributed through their participation in the various workshops, and their thoughtful feedback and engagement throughout the entire project. Their input was instrumental in shaping both the generic design process for control algorithms and its specific application to the Amstelmeerboezem within the project "Enhancement of the wet infrastructure of the Noordkop area".

REFERENCES

Breur, K.J. and Leeuwen, P.E.R.M.v. (1999). *Er zit muziek in watersystemen : een raamwerk voor het ontwerpen van een RTC systeem.* Delft University of Technology.

Breur, K.J., van Nooyen, R.R.P., and van Leeuwen, P.E.R.M. (2009). Computerized generation of operational strategies for the management of temporary storage of drainage water from several polders in a network of small lakes and canals. *Applied Mathematical Modelling*, 33, 3330–3342. doi:10.1016/j.apm.2008.11.002.

Chen, L.C., Pardeshi, M.S., Liao, Y.X., and Pai, K.C. (2025). Application of retrieval-augmented generation for interactive industrial knowledge management via a large language model. *Computer Standards & Interfaces*, 94, 103995. doi:10.1016/j.csi.2025.103995.

Fadillah, A., Athahirah, N., and Lai, K.T. (2024). Chunking strategy for retrieval augmented generation in regulation documents. In *2024 International Conference on Consumer Electronics - Taiwan (ICCE-Taiwan)*, 279–280. IEEE. doi:10.1109/icce-taiwan62264.2024.10674113.

Green, S., Southee, D., and Boult, J. (2014). Towards a design process ontology. *The Design Journal*, 17(4), 515–537. doi:10.2752/175630614x14056185480032.

Jeong, C. (2023). A study on the implementation of generative AI services using an enterprise data-based LLM application architecture. *Advances in Artificial Intelligence and Machine Learning*, 3(4), 1588–1618.

Kempenaar, A., Westerink, J., van Lierop, M., Brinkhuijsen, M., and van den Brink, A. (2016). "Design makes you understand" – mapping the contributions of designing to regional planning and development. *Landscape and Urban Planning*, 149, 20–30. doi: 10.1016/j.landurbplan.2016.01.002.

Khalifa, A.S. (2019). Strategy: restoring the lost meaning. *Journal of Strategy and Management*, 13(1), 128–143. doi:10.1108/jsma-09-2019-0158.

Khalifa, A.S. (2021). Strategy and what it means to be strategic: redefining strategic, operational, and tactical decisions. *Journal of Strategy and Management*, 14(4), 381–396. doi:10.1108/jsma-12-2020-0357.

Liscouët, J. (2021). A model-based design methodology for flight control systems: Global 7500 pitch control case study. *Proceedings of the Institution of Mechanical Engineers, Part G: Journal of Aerospace Engineering*, 236(5), 910–922. doi:10.1177/09544100211024787.

OECD (2014). *Water Governance in the Netherlands: Fit for the Future?* OECD. doi:10.1787/9789264102637-en.

Pitra, Z. (1991). Control system design methodology. *Cybernetics and Systems*, 22(3), 367–387. doi: 10.1080/01969729108902289.

Schütze, M., Butler, D., Beck, M., and Verworn, H.R. (2002). Criteria for assessment of the operational potential of the urban wastewater system. *Water Science and Technology*, 45(3), 141–148. doi:10.2166/wst.2002.0073.

Soncini-Sessa, R., Castelletti, A., and Weber, E. (2007a). *Integrated and Participatory Water Resources Management: Theory.* Developments in integrated environmental assessment. Elsevier, Amsterdam.

Soncini-Sessa, R., Cellina, F., Pianosi, F., and Weber, E. (2007b). *Integrated and Participatory Water Resources Management: Practice.* Developments in integrated environmental assessment. Elsevier, Amsterdam.

Table 1. The planning and design process for polder system RTC under development

Stage	Name	Purpose	Method	Result
0	Orientation and framework formulation	Determination of system boundaries and initial framework for the design process	Analysis of the system. Creation of an inventory of personnel involved, external stakeholders, known problems, and existing plans. Determination for the scope of the project.	Framework that provides a starting point for the determination of geographical, organizational, technical, and policy related boundary conditions for the project.
1	Strategic level: formulation of policy goals and boundary conditions.	Explicit formulation of the policy framework and societal values to be considered in the project; translation into observable system behavior.	Workshops with management, policy advisors and/or program managers, stakeholder and/or policy analysis, scenario analysis.	A situation matrix is drawn up; desired outcomes are entered into the matrix; the desired outcomes are expressed in terms of Key Performance Indicators (KPI) and standards; the goals are given priorities within each scenario.
2	Tactical level: definition of desirable dynamical system behavior.	Translation of policy to design principles and desired system behavior for each scenario.	Workshops with domain experts, analysis of historical data, consulting experts.	The entries in the situation matrix cells are reformulated in terms of desired system behavior. They also form the PIs to evaluate the operational control under the different situations.
3	Operational level: functional design of RTC and user interface.	Determination of the controller algorithm needed to realize the desired system behavior; formulation of a functional design of the control system including functional specifications for data transmission, process control, and user interface.	Workshops with operators. Translation of desired system behavior into RTC terms. Formulation of functional design.	A functional design of the RTC that takes into account properties of the available actuators and constraints on their use, for instance, limits on minimum pump run times imposed by maintenance concerns.
4	Technical level: technical design of RTC or tender document for RTC.	Formulation of a detailed description of the behavior of the controller and its interaction with the actuators; realization of a technical design of hardware and software infrastructure.	Workshop with relevant staff process automation and consultation with IT architects to initiate the conversion of functional design to technical design.	Document that can be used to draw up a detailed technical design.
5	Validation, feedback, and iteration.	The safeguarding of consistency, traceability, and acceptance.	The path from policy goal to choices based on that policy goal is documented at all levels. At each level the findings from the previous level are taken as a starting point, with an option for immediate feedback and clarification. The functional design is submitted to all those involved in the process for feedback. If necessary, additional workshops and/or interviews are organized. As a result it may be decided to revisit certain aspects of the design process.	A functional design that includes the results of the feedback from all parties involved.

Valadares Tavares, L. (1999). A review of major paradigms and models for the design of civil engineering systems. *European Journal of Operational Research*, 119(1), 1–13. doi:10.1016/s0377-2217(98)00362-2.

van Nooijen, R., Kolechkina, A., Berends, T., and van Leeuwen, E. (2024). Situation and ordering based control of drainage of a group of polders. *IFAC-PapersOnLine*, 58(2), 31–37.

van Nooijen, R., Koutsoyiannis, D., and Kolechkina, A. (2021). Optimal and real-time control of water infrastructures. In *Oxford Research Encyclopedia of Environmental Science*. Oxford University Press. doi: 10.1093/acrefore/9780199389414.013.627.

van Nooijen, R.R., Kolechkina, A.G., van Leeuwen, P., and van Velzen, E. (2011). Agile design of sewer system control. *IFAC Proceedings Volumes*, 44(1), 14176–14182. doi:10.3182/20110828-6-it-1002.02356.

Wynn, D.C. and Clarkson, P.J. (2017). Process models in design and development. *Research in Engineering Design*, 29(2), 161–202. doi:10.1007/s00163-017-0262-7.

Yurtseven, M.K. and Buchanan, W.W. (2011). Control system design: A general systems theory perspective. In D.F. Kocaoglu, T.R. Anderson, and T. Daim (eds.), *Proceedings Of Picmet 11: Technology Management In The Energy-Smart World*. IEEE.

Zhao, P., Zhang, H., Yu, Q., Wang, Z., Geng, Y., Fu, F., Yang, L., Zhang, W., Jiang, J., and Cui, B. (2024). Retrieval-augmented generation for ai-generated content: A survey. doi:10.48550/ARXIV.2402.19473.