# Software for public services: replicate, procure or build?

## Strategies to deliver faster and better for less

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# Introduction

The public sector faces increasing pressure to deliver more efficient, faster, and cheaper public services to solve urban challenges and meet citizens' needs as effectively as possible. Digital technologies and data driven solutions have the potential to play a great role in this process of delivering better and faster for less.

For public authorities, determining how to get the best solutions to solve urban challenges can be difficult, but it is of the utmost importance. In the past, authorities used to procure custom-built solutions from large IT service providers that fit specific needs but were limited in terms of standardisation, replication, and interoperability with other systems, resulting in vendor lock-in situations. Larger cities would also have the possibility to build software solutions, tailoring them fully to the user's specific needs. Although very effective, this process requires large investments of R&D time and money, and is often not scalable to other challenges. The Open Source and Open Data movement has evolved in recent years, focussing on open collaboration and sharing software solutions and data. As described in the white paper on ´Open Source for Public Services´, reusing open source software solutions can facilitate cheaper, faster, and better public services. However, this requires replicable-by-design solutions and sufficient knowledge and guidance in the process.

The different routes to work with software solutions have been tested by public authorities with varying characteristics, but no overview of these experiences and best practices exists. As a result, it is challenging for cities and regions to navigate the many different options. When should they choose to replicate, to procure or to build software?

This publication provides decision-making support by presenting strategies and sharing experiences of cities on how to best select software to improve public service delivery. These strategies pave the way through the options of acquiring software solutions that solve urban challenges in a fast and cost-efficient manner, while maintaining a high quality.

# Strategies for authorities

## Replicate

Definition & Process

Successful replication of software solutions requires clearly defined challenges and needs of the authority and the end-users of the solution. Once identified, replication becomes a good option in terms of cost-efficiency for authorities that have capacity for development and maintenance.

Replication can either reuse specific software components or it can reuse the entirety of an existing software. It therefore requires the authority to be well informed about existing and available software solutions, for example by visiting solution catalogues, or by collaborating at a regional, national, or European level with like-minded authorities. Furthermore, replication requires human capacity, most likely developers, to build the new software based on the replication. Being open source licensed makes replication possible as the source code is then accessible and editable publicly.

Although replicating open source software solutions can take time to set up at the beginning, it saves time and resources by not starting from scratch and avoiding mistakes made by others. The likelihood for a replicated software solution to fully match the defined needs is low, but a 90% match that can be tailored by the authority's developers is sufficient to create a high quality, well-functioning solution.

Example of application: Replication of the IoT registry by the city of Ghent, software initially built by the city of Amsterdam

The city of Amsterdam developed an open source online registry that offers citizens information on where Internet of Things (IoT) devices are located in the city, and what information and data they are capturing. This solution helps increase transparency from the authorities towards the citizens.

The city of Ghent was interested in providing its citizens with a similar registry and approached Amsterdam to replicate their application. Despite access to the Amsterdam team of developers, Ghent and their ICT provider District09 were slowed down in the process of replicating as some of the source codes were too tailored to the city of Amsterdam. To overcome the barrier, District09 worked on a more generic open source codebase suitable for replication and application by any other cities.

## Procure

Definition & Process

Due to lack of IT capacity, knowledge, and resources, procuring (open source) software solutions has long been the go-to approach to digitalise and improve public service delivery. Procuring software solutions can have many different forms, ranging from procuring off-the-shelf solutions from large vendors to buying smaller scale, more tailormade solutions from SMEs, and everything in-between.

Procuring a solution as a public authority usually requires an official procurement process. Before starting to draft a tender, authorities must identify the need of organisations and the challenges to target. Once that is established, authorities can move forward with defining criteria for selection and drafting the request for proposal (RfP) or terms of reference (ToR) targeted towards the defined challenge. After distributing these to potential suppliers (number of suppliers depends on national and European legislation), the authorities could interact with the potential suppliers. When the deadline for

handing in proposals has passed, the authorities evaluate the different bids and decide upon a winner based on the criteria as defined. Thereafter, the supplier is contracted and the solution implemented, integrated, and evaluated.

Keep in mind

Procuring a solution can be a relatively easy way to get a fast-working solution. However, authorities are at risk of getting locked-in by vendors, impeding open collaboration and innovation. Maintenance and updates are also not always guaranteed. When buying software solutions public authorities should strive as much as possible for open source modular solutions. This improves the interoperability of the solution and maximises the potential of reusing the solution amongst other departments within the same organisation or with other public authorities.

Example use cases:

The city of Dordrecht - a mid-sized Dutch city with limited internal IT and development capacity - procured open source and open data software solutions to help achieve the city's Green-Blue ambitions. The city aims to have every citizen to visit a green area (such as a park, sport field or nature area) within the city at least once a week. To achieve this, the city has undergone renovations over the years, including a natural playground and new catering facilities. During a workshop, the city's team working on the Green-Blue ambition came together to define and scope the challenge faced. The results focused on the city's need to better understand if and why citizens are (not) visiting the neighbourhood parks. To gather this information, the city decided to look for crowd monitoring solutions. Dordrecht explored similar solutions already used by other cities to monitor crowds. Based on this small market study, they discovered that many other cities monitoring crowds use hardware and software solutions developed by the private sector. Therefore, Dordrecht decided to buy their crowd monitoring solution and dashboard from the market.

When outlining criteria for the RfP or ToR, Dordrecht made sure to include criteria based on the defined challenge and best-practices from other cities with a similar solution in place. Special attention was given to ensure the solution could be scaled up to other green areas around the city and interoperate with other sensors. Additionally, the city included criteria on the open-source characteristic of the solution and the data collected. By doing so, the city of Dordrecht laid the foundations for replication of another open-source solution developed by the city of Ghent; the Dash Data Dialogics. This solution helps Dordrecht to visualise data gathered by crowd flow sensors in the park, and links this with data on weather conditions.

Given the specific characteristics of the city of Dordrecht, such as limited internal IT infrastructure and development capacity, replicating software solutions can be challenging. Therefore, procuring software solutions can be a valuable strategy to take as long as the solutions procured are as modular and open source as possible.

## Build

Definition:

When replication and procurement have been explored and do not fit the unique challenge and/or need, the last option is for the authority to build a solution in house. This requires either internal IT capacity to develop or budget to contract external developers, usually making it the costliest and time-consuming option. Therefore, it should be chosen strategically. Starting a piece of software from scratch gives the authority the opportunity to build generic elements and make the solution replicable-by-design. This ensures the time and resources are not spent only for building one software, instead building the basis for more software in the same authority that can cater to more needs.

Another best practice is to team up with other organisations with the same need for a solution software and co-develop a generic codebase, thereby lowering the cost and time of the solution development while increasing the robustness and replication potential of the solution.
Again, defining the challenge and need for the solution is a crucial step in any strategy, but especially in this one because the investment is higher. Building solutions is also a favoured option to avoid dependency on private providers and vendor lock-in.

Example of application: Signalen, a process system to categorise reports from citizens developed by the city of Amsterdam.

The city of Amsterdam had a system through which citizens could report incidents or issues in the public space that required intervention from the city e.g., nuisance at night, broken lamp post, etc. The back end was difficult to work with due to technical issues, causing the Amsterdam staff a lot of extra time to process citizens' reports. Additionally, the system was not user friendly and hindered citizens' ability to report issues. The Amsterdam OIS/DataPunt decided to build their own new system adding algorithms called Signalen or SIA. Signalen's first version was limited in functionality but had a robust foundation, easily expandable with new functionalities, and overall it improved the reporting process of issues in public spaces for citizens.

Signalen has seen the number of citizen reports skyrocketing, while the citizen satisfaction rate of handling disturbances by the municipality increased from 29% in 2017 to 64% in 2021. The city of Amsterdam and the VNG (association of Dutch municipalities) are maintaining Signalen's code and helping other municipalities in the Netherlands to replicate the code and implement similar reporting systems in their city.

## Conclusion

This paper outlined the three different paths an authority can take with software solutions: replicate, procure, build. We can conclude that reusing (open source) software solutions generally leads to better public services for less - less money, less time, and less trouble. The time required to have a solution up and running depends on many factors such as the available IT capacity of the replicating party, the existing infrastructure and solutions in place, and the replicability of the software solution.

Should replication be impossible, authorities are encouraged to procure software solutions. Although this process can be more expensive, the quality is usually high and the implementation time to get to a working solution low. Procurement can be done in many ways. However, it is important for authorities to start from their identified needs and prevent vendor lock-in by striving for open source solutions and open data.

When reusing and procuring software solutions is not an option, authorities can decide to build the software solution themselves or with help of external developers. This strategy can create high quality software solutions tailored to the specific needs of the authority, but is most often costly and time consuming.

## Recommendations

Digital transformation in the public sector is not easy. Selecting suitable software for challenges is an important step in meeting the goals of better and faster public services for less. In general, authorities are advised to replicate existing solutions as much as possible before deciding to buy or even build software solutions themselves. However, deciding on the best strategy for your authority depends on many factors that are not always clear at the start. Therefore, authorities are recommended to consider the following:

*Dedicate time to identify needs* - Before choosing any strategy, authorities need to ensure they clearly and accurately define the needs of the city. This can be either challenges the public authority is dealing with and/or opportunities the authority identified. Authorities need to continuously keep this need in mind while executing the selected strategy to get a meaningful, high quality software solution. Additionally, authorities are strongly encouraged to take an iterative and incremental approach and continuously adapt the strategy when opportune.

*Consider an exploration phase* - As seen in the SCORE cities' cases, there is a clear need for an exploration phase to choose the best strategy that most efficiently uses taxpayers' money. The exploration phase should include a clear need assessment of the public authority. Additionally, this phase can

be used to explore the authority´s ambitions and internal (IT) capacity.

*Strive for Open Source and Open Data* - Regardless of the strategy

chosen, public authorities should strive as much as possible for open source software solutions and open data. Working Open Source allows anyone to share, replicate, and distribute what has been developed, improving software solutions and speeding up the process of integration. Besides the practicalities, working openly also improves transparency of authorities and creates incentives for collaboration.

*Improve interoperability of IT infrastructure* - To allow fast implementation of a variety of software solutions, public authorities should make sure that their IT infrastructure is interoperable, mature, and open for innovation. Authorities are encouraged to improve the interoperability of their IT systems to maximise integration of software solutions replicated from other cities, but also procured from the market. Improved interoperability prevents lock-in contracts, thereby opening the doors for a diverse range of software solutions.

## References and Resources


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