

## PRACTICE ARTICLE

# Introducing an Electronic Identity: The Co-design Approach in the Canton of Schaffhausen

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Because of the Schaffhausen population's needs regarding more flexibility of authorities, an augmented importance of online services and increases in (cyber) security awareness, the e-government committee (eGov-Kernteam) of the Canton of Schaffhausen decided to pilot the electronic identity *Schaffhauser eID+* to ultimately allow for efficient and effective Smart Government processes.\* The aim of this practice article is to show how the Canton of Schaffhausen adopted a co-design approach to introduce its electronic identity and to set out key findings regarding the introduction of a technology-based public service innovation. Based on the strategic approach of a 'testing laboratory', co-design methodology was used through conducting usability tests and semi-structured interviews with selected individuals. The optimization suggestions collected were subsequently evaluated and reintegrated. Furthermore, the collected data were used to analyze the acceptance of the *Schaffhauser eID+*. This piloting procedure in cooperation with citizens unites several advantages: modest budgets, rapid and more targeted product changes and, in the sense of co-design, positive spillovers with regard to acceptance and legitimacy. In reference to Smart Government and to ensure ongoing civic participation, the co-design approach should also be considered in the further development of any E-ID or Smart Government project.

**Keywords:** Electronic Identity; Co-Design; E-Government; Smart Government; Public Service Innovation; Technology Acceptance; Participation; Schaffhausen

## 1 Introduction

Digital transformation has influenced the citizens' expectation of public services (Frey, Rogg & Schmid 2017; Gil-Garcia, Helbig, & Ojo 2014). In consequence, the development and the supply of digital public services and processes, generally referred to as E-Government, have become critical challenges for Europe's public administrations (Torres, Pina & Acerete 2005; Marche & McNiven 2003). However, the concept of E-Government is already changing. The emergence of new information and communication technologies that can be networked intelligently, promotes the further development of E-Government towards Smart Government (Harsh & Ichalkaranje 2015; von Lucke 2017). In contrast to E-Government, Smart Government not only stands for the digitization of current processes and services, but also for the development and establishment of completely new processes and public services in a participatory manner (Savoldelli, Codagnone, & Misuraca 2014; Schöll & Schöll 2014). In a Swiss context, a key enabler for the further development of E-Government is the electronic identity (Engels, Wallner, Ammann & Schnell 2018; Buess, Iselin & Bieri 2017). The electronic identity (E-ID) is the passport of the digital state and acts as a secure key to the digital service platform. The Swiss Canton of Schaffhausen already offers its residents an electronic identity called *Schaffhauser eID+* (Kanton Schaffhausen 2018).

After its development from heavy industry in the 20th century to a more international, high-tech and diversified HQ location in the early 2000s, the Canton of Schaffhausen is now entering a new era with an exploratory project approach focusing on R&D innovation projects. With the goal of adapting processes to the digital world, the basis for the (digital) future shall be set. In the so-called *testing lab* approach consisting of various verticals, future-oriented technologies are being piloted. The goal is to develop them under the general idea of positioning

\* Generis AG is entrusted by the Canton of Schaffhausen with the management of the economic development agency on a mandate basis.

the Canton of Schaffhausen as a leading region for the application of future-oriented technologies. Companies and start-ups are encouraged and supported to pilot their innovations in Schaffhausen and to further drive their growth from their headquarters in the canton. Derived from the Schaffhausen local businesses' and population's needs with regard to innovative, timesaving and secure public services, the E-Government committee (eGov-Kernteam) of Schaffhausen decided to pilot an electronic identity while using a co-design approach to ultimately allow for efficient, effective and widely accepted Smart Government processes and services.

The aim of this practice article is to show how the Canton of Schaffhausen introduced its electronic identity by using a co-design approach. It is important to note that the *Schaffhauser eID+* is not a standalone project, but that it is rather embedded in a broader strategy, which will also be presented in this article. Thus, other organizations (cantons, municipalities etc.) will get practical insights regarding the implementation of a Smart Government strategy. Finally, 13 lessons learned are derived from the experience gained during the planning and implementation phase.

The relevance for this practice article stems from the circumstance that Swiss administrations have to react to the emergence of new technologies and changing demands of citizens (Engels et al. 2018; Frey et al. 2017; Buess et al. 2017; Brüesch, Mertes, Flick Witzig, Giger & Steinbrecher 2017). Meanwhile, practical hints on how to implement an electronic identity so that the technology also gains public acceptance are missing in Switzerland to the present day. It is important to be mentioned that this article aims at being decidedly practice-oriented and the knowledge gained relates to the experiences made in the Canton of Schaffhausen.

In the following chapter, the case of Schaffhausen is presented. Furthermore, the concept of Smart Government is briefly defined. Afterwards, we present the Smart Government strategy of the Canton of Schaffhausen and the reasons for developing this strategy. It is then clarified what an electronic identity is and why Schaffhausen has decided to introduce such a technology-based public service. Subsequently, it is shown how the pilot phase was designed and how the usability tests and surveys were conducted. The results of the surveys are only briefly discussed, as the article focuses on the innovation process from a practitioner's point of view. In chapter 4, the 13 lessons learned for upcoming related projects are presented. In the conclusion part, the collected findings are critically discussed and classified in the context of administrative action.

## 2 Smart Schaffhausen: Digital Future Based on Citizens' Needs

Aspects and expectations towards an attractive location are manifold. Depending on the respective target groups, assessments vary and range from attractive taxation on an individual or corporate level to extended leisure activity offers to efficient and effective government processes, i.e. an agile administration. While the latter, in the past, meant regular opening hours, citizens nowadays expect a whole new concept of service, which they are familiar with from the private sector: anyplace and anytime service (Frey et al. 2017). Since both financial and human resources, also in the public sector, are scarce, still remaining paper-based processes cannot be extended indefinitely.

Deduced from above-mentioned needs and expectations, it is evident, that a digital shift needs to happen for government processes. This is not a new finding. Digital pioneers such as Estonia or Scandinavia as a whole have an extensive track-record and productive and running processes that meet mentioned needs (Anthes 2015; United Nations 2018). In late 2016 the Swiss Federal Administration announced a nationwide solution for 2020 (E-Government Schweiz 2016). For the Canton of Schaffhausen, this meant too much time lost in the process. The mentioned digital shift, i.e. translating (E-Government) or even better transforming (Smart Government) paper-based processes, is assumedly a time-consuming matter that also includes human resources and the recipients of the services offered.

### Smart Government

The transformation of public administration to Smart Government is considered a further development of E-Government (Savoldelli et al. 2014; Harsh & Ichalkaranje 2015). The intelligent networking of new information and communication technologies enables the rethinking of administrative processes and the development of innovative administrative services that can be tailored to the diverse needs of citizens (Schedler & Demaj 2017). The use of such new digital technologies in public administration serves the objective of increasing the benefit for the population while at the same time being sustainable in dealing with existing resources (von Lucke 2017). In order to achieve this goal, the various organizations must cooperate with each other and citizens should be able to participate in administrative action (Savoldelli et al. 2014; Gil-Garcia 2012). Smart Government therefore stands for more efficient and effective public management by using intelligently networked technologies, involving as many stakeholders and social groups as reasonably possible.

Regardless of the type of services that shall be changed, in the Canton of Schaffhausen, one common denominator always prevails: the introduction and the implementation of an electronic identity (E-ID) combined with mature and non-isolated approaches.

#### Electronic identity (E-ID)

Hansen and Meints (2006: 543) describe electronic identities as *“collections of digital information that belong to an individual or an organization.”* Accordingly, electronic identities represent parts of the entire identity of a person (Hansen & Meints 2006). The FDJP of Switzerland (EJPD 2017: 7) describes the electronic identity less technically and writes vividly: *“If in the physical world the sovereign passports such as passport or identity card are the means for the trustworthy proof of one’s own identity, then it is in the digital world the electronic identification means (E-ID). An E-ID allows trusted parties to identify and authenticate individuals before providing a trust service. Trusted E-IDs are thus necessary components for the implementation of electronic business processes.”* For the organization E-Government Switzerland, which is entrusted with the implementation of the E-Government Strategy Switzerland, it is clear that the electronic identity is an elementary infrastructure element on which future digital services such as e-health, e-education or e-voting depend (E-Government Schweiz 2018). In addition, users of the E-ID can, after a single authentication, gain access to the digital services and information of the respective public administration (Brüesch et al. 2017: 3-4). Consequently, the electronic identity plays a key role in the digital transformation of the public sector (E-Government Schweiz 2018; Brüesch et al. 2018: 3).

It is because of these needs and megatrends as well as implications on the general attractiveness of the location that the Canton of Schaffhausen decided to tackle the challenge and decided the execution of a pilot project together with representatives from the private and the public sector. Such close cooperation with the private sector is common in state innovation projects (Akhmetshina & Mustafin 2015; OECD 2012) and is the very basis of the project *Schaffhauser eID+*.

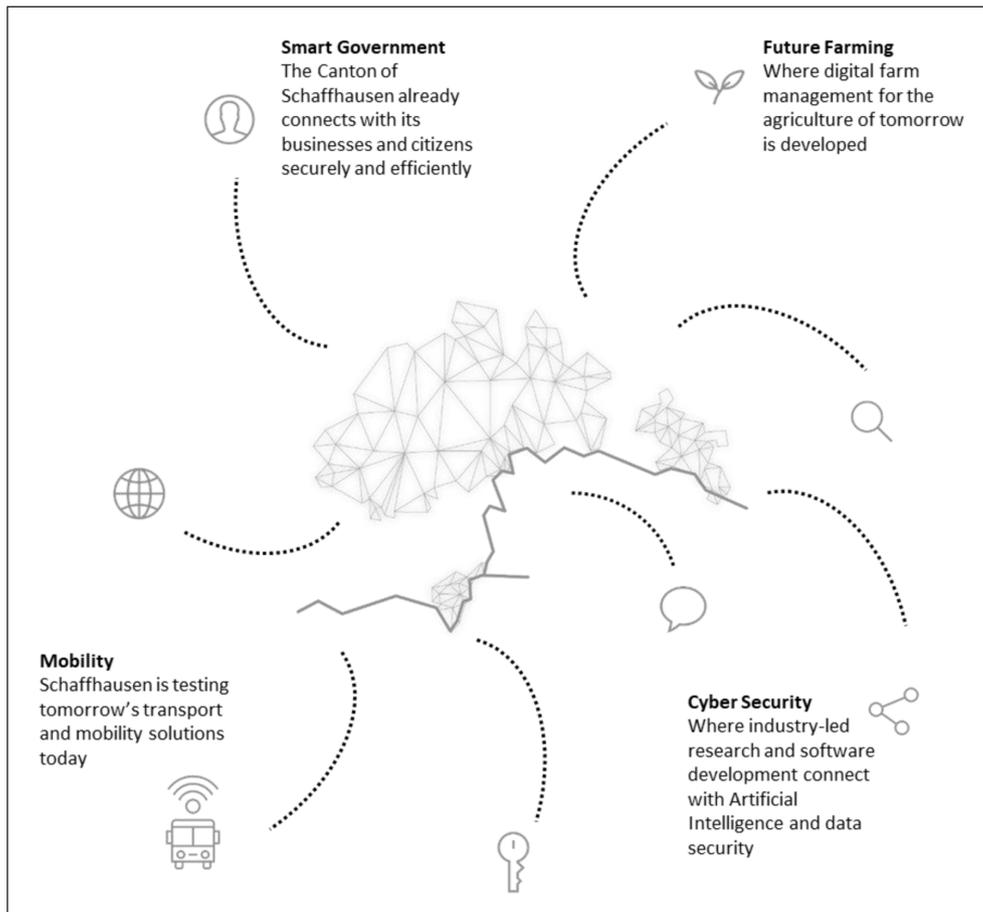
#### Schaffhauser eID+

Together with the tech startup Procvivis AG, the canton Schaffhausen developed and implemented the electronic identity *Schaffhauser eID+* (Kanton Schaffhausen 2017). The *Schaffhauser eID+* is a smartphone-based application (Procvivis AG 2018) and is supported by the operating systems iOS from Apple and Google’s Android (Kanton Schaffhausen 2017). The *Schaffhauser eID+* aims to provide secure and easy access to the digital public services of the Canton of Schaffhausen (Kanton Schaffhausen 2017). According to the provider, the personal data of the users are stored encrypted on the smartphone and data sovereignty always remains with the users of the *Schaffhauser eID+* (Kanton Schaffhausen 2018). The activation of about 40 different digital public services is to follow until the end of 2018. These 40 planned services are mainly online forms that can already be obtained today via the online counter in the Canton of Schaffhausen. Until end of 2018, access to these forms should also be possible via the *Schaffhauser eID+*.

Nonetheless, it is crucial to note that mentioned pilot project was not solely derived from businesses’ and citizens’ needs and contemporary megatrends, but deeply rooted within the cantonal vision of transforming itself into a leading region for the application of future-oriented technologies. Thus, via offering entrepreneurs, start-ups and companies the opportunity and support to pilot and apply their innovations and technologies in Schaffhausen, they are incentivized to relocate and further drive their projects in the Canton of Schaffhausen. In short: The *Schaffhauser eID+* is one of said projects within the testing lab where opportunities can be seized and where openness and willingness towards innovations materialize. In the next chapter, the overarching theme and set-up will be described in more detail.

### 3 The Project Schaffhauser eID+ within the Testing Lab Approach

To be able to benefit from the necessary political support to execute and operate such a pilot project, it needed and still needs to be part of a bigger picture. As stated in the previous chapter, unique selling points (USPs) for locations and regions have undergone a change in the past decades (Friedrich 2009). So called ‘hard location factors’ such as existing infrastructure, proximity to airports, attractive costs and tax rates remain important for investment decisions. However, in a more and more global and digital environment, innovation and technology aspects gain importance to maintain and develop an internationally attractive business and residential location (World Economic Forum 2018).



**Figure 1:** Different projects in the overarching vision of the Schaffhausen Testing Lab Approach (Wirtschaftsförderung Kanton Schaffhausen 2018).

Due to increased importance of innovation and technology aspects from the point of view of an attractive future location, the Canton of Schaffhausen has complemented its strategic activities in promotion and development with the initiative of the testing lab. Project endeavors happen in the light of meeting these changed expectations.

In a niche between fundamental research and market entry, innovative and strategy-fitting institutions can make their contributions to a connected future. One main goal is collecting practical learnings in an agile trial and error format for both the technology companies and the region with its inhabitants. Other verticals the canton has targeted, for example, include the mobility of tomorrow or technology-based farming (see **Figure 1**). Embedded in the other identified building blocks of a prosperous region, namely an active promotion, attractive infrastructure, competencies, know-how and entrepreneurial mind-set, the necessary governmental frame conditions for a Smart Schaffhausen complete the introduced bigger picture.

In order for the *Schaffhauser eID+* to be successful, it must meet with acceptance by future users. Acceptance is defined as a positive, individual attitude. This positive attitude manifests itself in a corresponding behavior that can be described as approved, endorsed or tolerated (Kistler & Jaufmann 1990). In relation to Smart Government, the early inclusion of various stakeholders and citizens in the sense of increased participation is considered as supportive for the acceptance of E-Government initiatives and increases the quality of public services (Savoldelli et al. 2014; United Nations 2014; McDermott 2010). Thus, a common denominator of mentioned projects above is an active involvement of end-users, i.e. citizens in the *Schaffhauser eID+* project, in a stakeholder or co-design process, to ensure a solution design that benefits the public stating the needs in the first place.

#### 4 E-ID for Citizens: Using Co-Design to Introduce the Schaffhauser eID+

Based on the testing-lab approach and the strategic decision to enable public participation in the development and implementation of the *Schaffhauser eID+*, a pilot phase was first carried out and a co-design approach was used during this time. According to Loeffler (2015: 331): “Co-Design offers a structured approach to

*harnessing the best ideas from the people who will ultimately use and deliver the service*". In other words, co-design is a way for public administrators to participate in the knowledge and experiences of potential users in order to improve the quality of services (Deakin, Lombardi & Cooper 2011). Steen, Manschot and De Koning (2011) assume that *"co-design is critical to service design because different perspectives, and a productive combination of different perspectives, are needed in order to understand both a service's demand side, i.e. users' and customers' needs, and its supply side, i.e. technologies and processes, in order to develop successful services"*. The decision for using co-design in Schaffhausen was also supported by the fact that in the private sector early test phases with users (e.g. SCRUM) are state-of-the-art in the development of technology-based applications (Axelsson, Lindgren & Melin 2010).

The overarching goal was to gain initial experience with the application and to get usable feedback from early adopters in order to assess and improve the acceptance of the technology.

Today, user acceptance of technologies is often explained using the Technology Acceptance Model TAM developed by Fred Davis (Lee, Kozar & Larsen 2003). Based on the behavioral theories Theory of Reasoned Action TRA and Theory of Planned Behavior TPB, Davis (1989) has defined two influencing factors that have a positive influence on the attitudes of a person regarding the use of a technology. On one hand, the perceived usefulness of a technology influences positively the attitude towards using. On the other hand, the attitude towards using a technology is influenced by the perceived ease of use (Davis, Bagozzi & Warshaw 1989). However, different social groups associate different benefits and problems with a particular technology (Lunceford 2009). TAM is criticized for neglecting these social groups in assessing user acceptance, some of which adopt a negative attitude towards the technology being tested (Lunceford 2009; Bagozzi 2007).

As soon as the beta version of the *Schaffhauser eID+* application was ready for use, the application was presented to a broad audience during the Schaffhauser eGovernment Day 2017. The political decision-makers were also present at the kick-off. Thus, the newly developed application received the necessary media coverage on a regional and national scale (see KSD Schaffhausen 2018). Interested citizens were then able to download the *Schaffhauser eID+* onto their smartphone, enter their personal data and have the *Schaffhauser eID+* validated in the residential registration office (Einwohnerkontrolle).

At the beginning of the pilot phase, the Institute for Public Management of the Zurich University of Applied Sciences ZHAW was consulted for the conception and implementation of the co-design approach (see Kanton Schaffhausen 2018). As part of this collaboration, usability tests, semi-structured interviews using standardized questionnaires and ABC analysis were conducted on three separate days in February 2018. On these days, a total of 30 people participated in the co-design of the *Schaffhauser eID+*. These 30 individuals involved 25 interested citizens who tested the front-end version and five administrators who worked on the back-end version of the application. The focus of this chapter will be on the front-end version of the *Schaffhauser eID+* and the relating components of the conducted approach.

Focusing on which public services should first be made available through the *Schaffhauser eID+*, participants began with the ABC analysis, which asked them to prioritize selected current public services. The various services available to choose were already available through the Canton's website and were organized by service departments. The results show that the services of the tax administration should be integrated into the electronic identity first. Followed by the services of the residential registration office, the passport office and the road traffic office.

The findings from the ABC analysis are used as a decision-making aid, so that the services, which are most in demand, will also be available first via the electronic identity. After the subjects participated in the ABC analysis, the first semi-structured interview was conducted with a questionnaire serving as support. The questions mainly referred to the e-services presented in the ABC analysis. On the one hand, the robustness of the findings from the ABC analysis were to be examined, and on the other hand it was to be determined whether, from the point of view of the participants, important services were not taken into account in the selection. The completed questionnaires show that the results from the ABC analysis can be assessed as robust and that, in addition to the services included in the ABC analysis, the security service providers (police, fire brigade, etc.) should also be taken into account when developing e-services for the *Schaffhauser eID+*.

As soon as the first semi-structured interview was completed, the subjects were asked to take part in a usability test. During the usability test, the subjects registered as application-users on their own and validated

Starting page of the application	Input of personal data
 <p>Use free space with further information on the first steps:</p> <p>e.g. For the use of the eID + now the personal data must be validated once.</p> <p>Enable landscape format (applies to all following fields)</p> <p><u>Application Error:</u> Regularly the application skips the PIN entry and leads directly to the data input.</p>	 <p>Language selection at the beginning: Mask automatically changes to the selected language (especially English version important)</p> <p>Note on mandatory fields at the beginning of the entry (not at the end of the form)</p> <p>Mark required fields differently: e.g. Start not at input field, but at default field (left-aligned)</p> <p>Note: Personal data must be recorded analogous to passport / ID, e.g. Enter second name</p>

**Figure 2:** Selection of collected improvement suggestions based on the statements of the participants during the usability test.

the *Schaffhauser eID+* application using a test system that simulated validation through the residential registration office. The method of thinking-aloud was used, during which subjects should constantly express their thoughts verbally (Fox, Ericsson, Best, 2011). Subjects continuously commented on their actions and gave their ratings on various user interfaces of the application. These comments were logged and condensed in the form of suggestions for improvement as shown in **Figure 2**.

The second questionnaire was distributed after the usability test and related to the *Schaffhauser eID+* in general and specifically to the experience gained during the usability test. The questions also focused on acceptance of the *Schaffhauser eID+*. The user acceptance was examined using the technology acceptance model TAM developed by Fred Davis (Lee, Kozar & Larsen 2003). The perceptions of the two influencing factors usefulness and user-friendliness were evaluated. In addition, the evaluation of data security and the general acceptance of digital public services were surveyed in order to gain insights into the social acceptance of the *Schaffhauser eID+* and to counter the criticism of the technology acceptance model TAM.

The results show that there is a high demand for digital public services (e-services). 22 participants (88%) would like to see a wide range of digital services. Trust in the data security of the *Schaffhauser eID+*, considered as one factor of social acceptance, is also high. 15 individuals (60%) trust the technology and 16 participants (64%) believe that their data is adequately protected when using the *Schaffhauser eID+*. When using the electronic identity, eleven individuals (44%) have no concerns about data protection. Six participants are indecisive and eight people have concerns about data protection. One person did not know an answer to this statement.

The results show that the user acceptance of the *Schaffhauser eID+* can already be rated as very high. The great majority of the participants (96%) perceive the *Schaffhauser eID+* as very useful. 20 persons (80%) think that using the electronic identity saves them time and 21 participants (84%) would recommend the *Schaffhauser eID+* to others. The *Schaffhauser eID+* also scores very well in terms of user-friendliness. 23 persons (92%) perceive the application as well structured and 24 participants (96%) agree with the statement that the *Schaffhauser eID+* is easy to use. In addition, 21 (84%) persons consider the application to be self-explanatory. It can be assumed that the user-friendliness of the application can be significantly increased thanks to the feedback from the usability tests.

## 5 Introducing a Public Service Innovation: 13 Lessons Learned

In this chapter, the 13 lessons learned from the introduction of the *Schaffhauser eID+* are presented. The findings are intended to help other organizations realize their own innovation projects, which are accepted by the public and, at the same time, implemented as effectively and efficiently as possible. These findings are not exhaustive and are limited to the experience gained in Schaffhausen.

1. To receive necessary support and resources, it is imperative to ensure political backing from highest levels of authorities; furthermore, the endeavor should be rooted within the overall strategy to give context;

2. Before eventually applying a new procedure, technology or process, the *Schaffhauser eID+* project showed a pilot phase to be viable; thanks to an agile and cost-effective character, it also bears less risk and can be tested both for the front and the back end;
3. Open laboratory settings such as mentioned projects within the Schaffhauser testing lab also influence the mind-set of the location it is based in (positive spillover effects);
4. As outlined, it is of utmost importance to not only convince possible users, but also possible providers of said services; including the governmental administration staff from the beginning delivered important insights into possible pitfalls;
5. Generally, Switzerland and Schaffhausen in particular have made great experiences with close cooperation between the public and the private sector; On the one hand, both parties do have particular strengths that can be combined advantageously, while, on the other hand, levelling weaknesses;
6. Involving academia turned out to be another success factor. Thanks to the conceptual and scientific know-how, the technology acceptance could be investigated and optimization potential was uncovered;
7. To identify crucial learnings and deduct correct and important measures, it is recommended to put innovations into practice at an early stage – just as it is customary in the private sector;
8. Also, results have shown that acceptance seems to rise with exposure to the treatment;
9. The official launch of the pilot project was put into practice in the context of the e-government day in the Canton of Schaffhausen, leading to several beneficial effects: firstly, the solution was presented to an early well-informed user basis; secondly, it also received media attention, boosting user numbers from the get-go;
10. What still needed to be accentuated at the time of the record of this article was the number of services offered within the app; the more possible uses a service has, the more probable the actual use will be;
11. As for the beta-testing that was done in cooperation with academia: It is highly recommended to have voluntary test subjects due to better feedback and rigor of the answers;
12. Should the whole approach deliver the main aspects of why it got set-up in the first place, i.e. a happy audience, working services and efficient processes, the pilot should be converted into normal operation;
13. However, as soon as this decision is made, a reasonable amount of resources shall be allocated to the implementation; following this approach, the original momentum can be used as a benefit.

## 6 Conclusion

The Canton of Schaffhausen has accepted the challenge of digitalization and is intensifying the transformation of its own administration towards a Smart Government. One project of Schaffhausen's Smart Government strategy concerns the introduction of an electronic identity called *Schaffhauser eID+* and associated e-services. In doing so, the canton wants to distinguish itself as a competitive and innovative business location. In addition, the introduction of the *Schaffhauser eID+* and the associated e-services is intended to meet the changed expectations of citizens.

This practice article has shown that the Canton of Schaffhausen has adopted a testing lab approach and is developing and implementing its electronic identity in cooperation with the private sector and academia. The introduction of the *Schaffhauser eID+* was preceded by a pilot phase. During this time, potential users were able to participate in the development of the application. A co-design approach was worked out for this purpose. In addition, the acceptance of the application was determined.

In the spirit of the mentioned testing lab approach, the main goal was and continues to be collecting practical learnings in an agile trial and error format. Regarding the development and introduction of technology-based public service innovations, participation in the design process is seen to be crucial for meeting the expectations of potential users. In addition, the pilot process in cooperation with citizens and other stakeholders combines several advantages: modest budgets, fast and targeted product changes and user-oriented optimization of services due to co-design as well as positive spillovers regarding technology acceptance. In reference to Smart Government and to ensure ongoing civic participation, the co-design approach during a pilot phase is recommended for the development of any electronic identity or digital public service innovation.

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## Competing Interests

The authors have no competing interests to declare.

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