



Designing a digital citizen-centered service

Catherine Equey^{*}, Athanasios Priftis, Jean-Philippe Trabichet, Vanissla Hutzli

HES-SO/HEG Campus Battelle, Rue de la Tambourine 17, 1227 Carouge, Switzerland

ARTICLE INFO

Keywords:

Service design framework
Digital platform
Social innovation
User-centered design
Stakeholders' interactions
Elderly benefits

ABSTRACT

In this article, we described the framework, methodologies and stakeholders' inclusion methods that should be applied to design a social and digital service. Based on the literature review, we compared existing theoretical models to an ongoing development of a social innovation aiming to improve the current elderly-benefit statement process through citizen-driven digitalization. Theoretical concepts and models were applied to a work in progress project. As a result, we propose a new framework to assist project managers and policymakers who design digital services. The originality of the methodology used is the application of diverse theories such as service design, design-thinking, user-centered design, social innovation and stakeholders' inclusion. The key outcome was the proposal of a comprehensive framework with relevant methodologies depending on the project phases. The stakeholders' involvement and interactions were also linked to the project phases of a citizen-centered service design deployed in a complex ecosystem. The numerous stakeholders' contributions during the service design were also studied, presenting their involvement during each project phase. Finally, we discussed the issues related to the governance of such a service. Its successful implementation and inclusion in an eGovernment platform are deeply linked to the agreement and cohesion of all stakeholders.

1. Introduction

Old-age pensions and retirement capital information given to citizens in Switzerland need to be modernized and digitalized. Even though most of the Swiss population is concerned and there are substantial financial implications, information concerning retirement income given to individuals is currently deficient in Switzerland.

The Swiss old-age insurance system is complex. When people reach retirement age, they receive a pension from a state pension fund and another allowance from a vocational pension fund. These two amounts will constitute their main source of income when they retire. Personal savings can supplement this income, but it is not compulsory.

The old-age and survivors' insurance (state pension) provides partial compensation for loss of income from work due to old age. This is the bare minimum. The average monthly pension received in Switzerland in 2021 was CHF 1863¹ for men and CHF 1886 for women. For comparison, the median salary in Switzerland in 2020 was CHF 6665 (*Office fédéral de la statistique, n.d.*). The number of old-age pensioners in 2021 was a bit less than 2.5 million, and the amount of pensions paid was CHF 46 billion (*Office fédéral des assurances sociales OFAS, 2022*).

The vocational pension plan is also intended to compensate partially for the loss of work-related income due to old age. It complements the state pension to enable people to maintain their previous standard of living after retirement. The average annual pension in Switzerland in 2020 was CHF 34,959 for men and CHF 18,845 for women. More than 840,000 people benefited from this old-age pension, worth more than 42 billion in 2020. It is necessary to specify that this amount includes death and disability benefits (*Office fédéral des assurances sociales OFAS, 2022*).

Old-age retirement is a social and crucial topic. The amounts at stake make this a subject of prime importance. However, in Switzerland, citizens cannot access their information online and it is challenging to estimate retirement incomes. To obtain a benefit statement estimation before retirement age, individuals must request information from different institutions by mail or phone (online for some rare pension funds), which could be a long and meticulous process. Furthermore, running simulations with changes in professional and private lives is even more complicated. In other so-called developed countries (Canada, Germany, and Spain, for instance), public administrations do not provide a user-centered, updated digital benefit retirement or calculation

^{*} Corresponding author.

E-mail addresses: catherine.equey@hesge.ch (C. Equey), athanasios.priftis@hesge.ch (A. Priftis), jean-philippe.trabichet@hesge.ch (J.-P. Trabichet), vanissla.hutzli@hesge.ch (V. Hutzli).

¹ In October 2023, 1 CHF was worth \$1.11.

<https://doi.org/10.1016/j.techfore.2024.123280>

Received 19 May 2023; Received in revised form 27 October 2023; Accepted 16 February 2024

Available online 22 February 2024

0040-1625/© 2024 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

system allowing citizens to plan financially for retirement. On the other hand, England, Belgium, Denmark, and Sweden, for instance, have successfully developed calculation and simulation systems. The digital level of digitalization is not uniform between European countries and certain countries, including Switzerland, are lagging.

The European Commission benchmarked digital government in 36 countries and compared how administrations provide digital public services. The general eGovernment maturity score in Europe is 68 %. In comparison, Switzerland's score is 52 %, putting it in 30th place (European Commission, et al., 2021). This is an awkward situation for a country ranked the most innovative in the world in the Global Innovation Index 2021 (Dutta et al., 2021). Therefore, despite a high level of innovation, the Swiss Government lags in public-service digitalization, particularly concerning social insurance and the estimation of retirement pensions. Nevertheless, this critical issue, although it requires further research and the difference in development between countries, is the context of our research but not the focus of our study.

The research project referred to in this article, "Digital Individual Benefit Statement (DIBS)," is intended to develop a digital platform (called a "service" hereafter) for Switzerland comparable to an online banking system, allowing citizens to

1. Automatically retrieve and collect data concerning their pensions and retirement capital from the state, occupational pension fund, and individual savings
2. And perform accurate retirement income simulations (Equey, 2021).

Developing a citizen-centered service deployed as a digital platform is much more than a technological challenge. The fact that the Swiss government does not yet offer its citizens this service is difficult to understand, especially with the current digitalization trend. We hypothesize that the complexity of the Swiss social security system and the diversity of the stakeholders (government, banks, pension funds, and other institutions), with their vested interests, make this task extremely tedious. Social insurance is a complex and sensitive topic due to the number of people and the many financial transactions involved. At the same time, elderly poverty is also a national priority for government and political organizations. We believe that the field of social innovation with multiple stakeholders, including government, needs to be addressed when developing a digital platform to correctly organize and conduct the design and development of such a service.

Therefore, this article focuses on the framework and the methodologies that should be applied to design a social service. The specific nature of the studied service is that it is a digital platform to be implemented by the Swiss Confederation (e-government) in collaboration with numerous stakeholders. Recent literature asserted that academic authors do not sufficiently describe digitalization in government concerning the conceptualization of e-government with a global vision. New research must consider the numerous stakeholders and involve several dimensions (Malodia et al., 2021). Collaboration between actors of different levels (society/government, company and individual) and their roles influence social services innovations (Aksoy et al., 2019). To better understand the framework, methodologies and stakeholders' inclusion in a social and digital service design are significant subjects pointed out by authors and are the primary motivation of our article.

In this article, we intend to study existing literature and compare theoretical models to the necessary framework of the ongoing project DIBS. The methodology adopted to develop a digital platform to estimate retirement pensions is a critical success factor and must be carefully considered to ensure the project's achievement. Therefore, the final aim of our article is to describe models and good practices for designing a digital service for citizens, focusing on stakeholders' inclusion and collaboration in the context of social innovation. The findings will have a managerial and academic impact.

2. Literature review

The extensive literature concerning digitalization and digital platforms is, a very prevalent research field. Numerous authors have defined digital platforms. For example, Vink et al. (2021) stated, "In general terms, a 'digital platform' is a connected digital system that provides a common set of design and governance rules to facilitate interaction between multiple users" (p. 7). The three essential elements when developing a digital platform to be highlighted in this definition are 1) users, 2) design, and 3) governance rules. This section will present theoretical contributions based on the abovementioned elements: users and design because they are critical success factors for the DIBS project. We also reviewed social innovation and stakeholders' inclusion because they are major components of the DIBS project as described in Section 1.

2.1. How to design a user-centered service?

Service design, as a practice and an area of research, has occupied discussions on innovation, technology, and organizational change. Services are diverse and require relational exchanges to be useful for citizens. They include policies, processes, rules, and infrastructures. They rely on human interaction, including technical, organizational, and legal processes. They are made up of things—places and systems of communication and interaction—but also human beings and their organization (Meroni and Sangiorgi, 2011). People as actors and users are key success factors in developing a digital service, which is well described in the literature. An increasingly common feature of service development is the user's centrality in co-creating service experiences (Edvardsson, 1997). The user's centrality is reflected in how user-centered design (UCD) practices have become synonymous with service design. However, effective service design practices considering users' needs are not enough to develop a digital platform that will be useful and used. Design-thinking theory is recommended to realize a prototype in the real environment and with the platform's future users. Asking about users' needs is not enough, designers must be immersed in users' real lives (Brown and Wyatt, 2010).

As much as the centrality of users has been extensively described in the literature, the modeling of phases and actions to design a digital service is not the same. Very few authors have proposed a concrete and practical framework. However, Ippoliti et al. (2021) provide useful information concerning phases and methodologies to design a Human-Centered digital platform. The main steps and methods these authors used to design their social service are:

1. Research design was realized mainly with qualitative data collected (focus groups, interviews, personas, use cases and co-design activities) and small sample quantitative data (survey);
2. Prototype development and tests conducted with qualitative and quantitative methods (technical prototype, storyboarding, ideation and co-creation for user interfaces, tests and multiple iterations for new functions and improvements);
3. Pilot and implementation developed and conducted with specific qualitative and quantitative methods (with all project's stakeholders);
4. Launch with impact and cost measures.

Effective practices for developing a digital platform are also described in detail in the study of the level of digitalization conducted by the European Commission et al. (2021). In thirty-six European countries, the authors assessed four aspects to describe the government's maturity level regarding digitalization:

1. User-centricity;
2. Transparency;
3. Key enablers;
4. Cross-border mobility.

Again, the importance of the user's centrality is highlighted. The European Commission also highlighted practical factors to evaluate an effective eGovernment online service. The following key success factors are closely related to our project. They should be applied throughout the creation of a digital platform allowing for the estimation of old-age pensions: online access, proactive service, user support (contact details or video, feedback, or complaint section), mobile-friendly service, indication of how long the service will take, delivery timeline, confidentiality and security of personal data, citizens' consultation and participation in the service design, electronic identification solution, single sign-on, paperless and transparent communication from the government, accessing services from abroad, and availability of eDocuments. These aspects are concerned more with the scope and the functionalities of a digital service than the methodologies used during the design phase. But it pointed out (again) the user-centrality need and the kind of points to consider during the development phase.

Many authors have insisted on the necessity of including users in developing a digital platform, but few have explained how to do so. [Abrás et al. \(2004\)](#), like other authors, stated that users must be involved in designing a service, but moreover, they explain at what level and for what kind of tasks. First, they distinguished three levels of users, depending on their level of product use (users, occasional users, and impacted by use) and highlighted that all three kinds of users must be involved in the service design. Then, they discussed how to engage users in the design phases. The most mentioned methodologies are:

1. Testing (user's evaluation) at various stages of development (including afterward);
2. Use of questionnaires (surveys);
3. Interviews;
4. Focus groups.

Finally, frequently applied methods mentioned in the literature ([Farrell, 2017](#)) are:

1. Field studies;
2. Requirements and constraints;
3. Persona building;
4. Task analysis;
5. Others (user stories, card sorting, search-log analysis, usability bug review, and feedback reviews or FAQ reviews).

The methods quoted at least twice are tests, surveys, interviews, focus groups, and persona building. Design sprint or co-design is mentioned only once but is implicitly included in User Centricity. All these methodologies seem pertinent for the DIBS project and will be considered in designing the concerned digital service (see [Section 4](#)).

2.2. How to include multiple-stakeholders in a social innovation design?

The two main characteristics of our research project, DIBS, are:

1. The service developed is a social innovation;
2. The number of partners and organizations working or implied in the service development.

Developing a digital service as a social innovation initiative impacts the level of interactions between stakeholders, especially when the stakeholders are numerous, as is the case in the social insurance system. Thus, collaborations and agreements among all parties to develop a new service could be more challenging.

Social innovation is "innovative activities and services that are motivated by the goal of meeting a social need and that are predominantly diffused through organizations whose primary purposes are social." ([Mulgan, 2006](#), p. 146). Such projects are often undertaken to fill an institutional gap ([Nicholls and Murdock, 2012](#)). The goal is to create

innovative solutions that address unmet social needs ([MaRS., 2007](#)). The lack of information concerning retirement pensions is the social problem to be discussed by DIBS. Developing a digital service for social innovation practices has shown that co-created services now include more sustainable patterns of human interaction and more distributed forms of social organization ([DESI Network and Manzini, 2013](#)), which should be considered in the methodology selected.

[Aksoy et al. \(2019\)](#) claimed that it is not possible to consider all stakeholders involved. They proposed a three-levels conceptual framework for social innovation in service with broad categories of actors: micro-level (individual), meso-level (company) and macro-level (society, government). These main participants in developing a service linked to social innovation have been classified separately because their roles and influences are diverse.

In the same trend, a significant theoretical background concerning social innovation is the social innovation triple and quadruple-helix models, which allow for the organization of multi-stakeholder collaboration in the service design. As [Aksoy et al. \(2019\)](#), the triple helix model classifies actors by large category. The triple helix includes academia, industry, and government as the main actors in social innovation ([Etzkowitz and Leydesdorff, 2000](#)), and the quadruple helix adds civil society as the fourth actor ([Carayannis and Campbell, 2017](#)). [Carayannis and Campbell \(2021\)](#) positioned the quadruple helix as directly dependent on knowledge democracy because knowledge and innovation evolution depend on democracy, but ([Etzkowitz and Leydesdorff, 2000](#)) claimed that civil society is not an institutional sphere on the same level as a university, industry, or government but can be integrated into their interactions. Other authors affirmed that the triple helix includes, by default, civil society as a key enabling condition of triple helix interactions ([Cai and Lattu, 2021](#)). Triple helix theory provides collaboration and organization structure between partners for developing a social innovation. Triple helix arises from the interaction among representatives of different institutional spheres, systematically collaborating to provide a solution or innovation, which has proved impossible until now ([Brem and Radziwon, 2017](#)). This is the point of departure for the initiation of the triple helix. Following [Repo and Matschoss \(2019\)](#), we sustain that in the triple helix system and its quadruple helix parallaxes, the solution should be accompanied by the invention of a new organizational format to address the issue while each institutional sphere reinforcing the other's contributions by extending from their primary area to others. A comprehensive and integrated perspective and comprehension of the framework that enables social innovations firms create for social change is essential to service design success. This comprehension needs to draw from the triple helix, solution-based, innovation approach, and the quadruple helix method of highlighting the importance of civil society contributions to the project.

The above literature review highlighted theoretical models and effective practices that authors have proposed to consider when developing a user-centered digital service for citizens. The review must cover diverse academic foundations, including digital platforms, centered service design, and social innovation. Literature unanimously pointed out the necessity of involving users in the service design and some authors indicated how to include them. Finally, the use of frameworks and methodologies during the development is scarce in the literature and our research intended to contribute to enhancing structuring service design in a social innovation context. The proposition of model and methodologies for the DIBS project is hereafter based on the abovementioned theoretical foundations.

3. Methodology

The DIBS project is a social innovation initiative led by the Haute école de gestion of Geneva (HES-SO) and co-financed by the Swiss Confederation (Innosuisse, a state-based innovation fund) as well as private (software editors) and public partners (Agencies of the Swiss Confederation). The final project aims to develop a service (digital

platform and governance) to provide individuals with information about their comprehensive old-age pension benefits.

At the beginning of the DIBS project (2022), we imagined that the following structure) would be needed to achieve the project's objectives: 1) Definition, validation and realization of the platform architectures in the form of a Proof of Concept including description of the technical state of the art, description of business scenarios (use-cases), description and validation of architectures, internal and user interfaces (code), web platform development for retirement income estimation; 2) Specification and implementation of APIs (Application Programming Interfaces) between the various project stakeholders including adoption of a technical standard and development results for a central API (report and code), API for state pension requirements (specification/declaration), API for vocational pension requirements (specification/declaration), central API parameterization for personal savings requirements (code), proposition of legal bases modification, and central API governance model; 3) Finalization of the digital service (operational prototype) including validation of the Proof of Concept, design sprint, and publication of the service as an operational prototype; 4) Activities required for operation as operational plan, user guide (text and videos), plan and content for a new course for Bachelor students; 5) Organization and project management (steering committee minutes, Gantt charts, ...), scientific reporting, and financial management and reporting.

After an extensive literature review, the first significant choice concerning the DIBS research approach was to initiate a triple helix space, including quadruple helix methods for collaboration and documentation. To include the following actors in the project's design: academia (Haute école de gestion de Genève, HES-SO), industry (software editors, social insurance experts as banks, insurance, etc.), government (Federal Social Insurance Office and Central Compensation Office), and civil society (mainly the future DIBS users, who will be insured people represented as individuals through civil society organizations).

Following the literature on the topic, we adopt the term "quadruple helix collaborations" (QHCs), constituting a dynamic environment with the participation of civil society (Arnkil et al., 2010) to include future users. QHCs aim to provide problem-solving capacity to address complex societal problems (Head and Alford, 2015). In this sense, they go beyond the triple vs quadruple helix discussion, to focus on the intra-organizations' collaboration practices. The defining characteristic of the research presented in this paper is that all these stakeholders should work together to develop the digital individual-benefit statement service. This is simultaneously an advantage and a challenge. As Teece et al. (2022) stated, the "inter-organizational interactions" (p. 6) should be carefully studied and organized. Thus, quadruple helix collaborations allow us to ask several questions: how do partners interact between them, how do they consider the role of citizens, who will make the final decision, and what contributes to the success of such interactions?

We then decided, still based on our literature review, to apply user centrality (UCD) in co-creating our service. With our approach, we consider that quadruple helix collaborations and UCD go hand in hand. Hence, the project design also applied UCD practices (Edvardsson, 1997) throughout the project design. This complementarity between quadruple helix collaborations and UCD is expressed and documented throughout the project's collaborative design activities (co-creation event, surveys, comments collected directly on the platform), and equally importantly, during the strategic decisions (legal and technological) mainly regarding old-age pensions and retirement data ownership and reuse.

Therefore, to deal with numerous and diverse stakeholders, the DIBS project comes with a methodology that gives an important place to partners and users in all project phases, decisions, and developments. Two committees were created: the steering committee and the coordination committee to include all stakeholders. The steering committee is the decision-making body, and the coordination committee is the consultation body. Both were also used as expert focus groups.

Finally, the social innovation frameworks and the best practices studied in the literature review were used to build the project's phases. We believe that social innovation process should be tailored towards citizen-centered service design and policy implementation. To define the main steps and methodologies of the project, we drew inspiration mainly from the work of Field Abras et al. (2004); Farrell (2017) and Ippoliti et al. (2021).

Thus, the DIBS research methodology is based on qualitative and quantitative methods. In order to design the new service, a range of approaches were proposed. A triangulation approach, which involved utilizing various methods and viewpoints from different stakeholders, was used to enhance the results of qualitative studies and avoid inaccurate generalizations (Patton, 1999). However, since the goal of the article is to suggest an accurate procedure for developing a digital platform, more information about the methodologies applied is provided in the following section.

4. Implementation and initial results

4.1. DIBS context

The e-rentes.ch² initiative (launched as the DIBS project) involved a multitude of collaborating actors: public organizations, private sector entities, professional associations, and research institutions. Their participation was organized in two functional circles linked to different levels of responsibilities and contributions: a) a partners' circle (steering committee) involving project partners cooperating at all levels of decision-making, design, and implementation, with five entities involved (two public sector, two private sector, and one research institution), and b) a coordination circle (coordination committee), a multi-actor federating space comprising approximately 25 entities, such as professional associations, banks, insurances, and various business, with a continuous opportunity to participate, comment, and make proposals in all project decisions and phases.

This work was coupled with monthly working groups in 4 distinct project areas (state of the art, use cases, legal basis, information and technology development, and data sources) and several bilateral meetings documented in a collective documentation repository. All these activities illustrate the aforementioned triple helix space and the "quadruple helix collaborations" theory. Working with governmental organizations, we had to apply their project management method, HERMES³ (used for information and technology service and development). Coordination of all these activities has been based on the principle of seeking to listen to, document, and address diverse opinions while sticking to the project's citizen-driven and social-innovation approaches.

The results presented below should be understood through two important elements. First, partners have an established common interest in this issue beyond the project's launch and duration. This allowed us to co-author the initial proposal and integrate all partners seamlessly into the consortium. Second, project partners have been co-investing to meet the project's needs with funding and human resources. Our social-innovation approach is perceived as an opportunity to propose and establish new collaboration standards and practices in the area.

4.2. Framework and methodologies selected to design e-rentes.ch

Bearing in mind the above-described DIBS context and using the results of our literature review, we carefully chose the methodologies

² e-rentes.ch is the name of the digital platform developed during the DIBS project: <https://e-rentes.hesge.ch/>

³ Swiss confederation. (n.d.). Method overview. Method Overview. Retrieved 19 October 2023, from <https://www.hermes.admin.ch/en/project-management/understanding/overview-hermes/method-overview.html>

used to develop e-rentes.ch. First of all, the steering committee worked on the project structuration. The initial breakdown proposed in the grant application has been revised, considering the realities of the project (mainly time and resources available) and the most frequent or important items found during the academic and professional literature review. Finally, the project's partners proposed 8 phases, constituting the framework or spine. The phases allowed all participants to align our understanding of the aims with the mission in general. The main project's steps defined by the steering committee were:

1. Identification of the stakeholders and mapping of the ecosystem;
2. Definition of the service's scope, functionalities, and targeted user;
3. Assessment of legal basis and service of early governance mechanism;
4. User's needs analysis and testing;
5. Drafting of persona and use cases;
6. Application programming interface (API) design;
7. Proof of concept (tests and iterations included);
8. Prototype (tests and iterations included) with a collective governance action plan.

Depending on the project phase, we decided to apply and combine various methodologies (see "Methodology used" in Table 1), being careful always to include users and their needs in our study (Edvardsson, 1997; Brown and Wyatt, 2010; Meroni and Sangiorgi, 2011; DESIS Network and Manzini, 2013). Inspired by Abras et al. (2004); Farrell (2017) and Ippoliti et al. (2021) we selected survey, interview, focus group, and design sprint or co-design as the main methodologies to be used for DIBS. We also added specialized documentation, a literature review (continuously used in our project), and "others" for those who don't fit into any category (see Table 1). Therefore, we proposed several methodologies for the DIBS project, depending on the project phase, and we were cautious to include the various stakeholders in the quadruple helix collaborations, as described later in this section. Table 1 below presents the most pertinent methods selected.

This analysis shows how the project's phases and methodologies were combined. The fact that various methodologies during all project phases were necessary is clear. However, we noted that during phases with more IT (Information Technology) components, more (different) methods were needed. More precisely, specialized documentation analysis and focus groups were used most during the technical phases (i. e., service development and design). The main finding was that mainly qualitative methodologies were used during the project. Quantitative methods were used only twice during the scope and functionalities definition phases and during determining users' needs.

Examining the research methods is the first step to understanding the challenge of developing a digital platform and how to solve it more clearly. Still, designing a pertinent digital service is not enough because

stakeholders' roles and responsibilities are not considered. The next subsection study in which project phases each project actor must contribute.

4.3. Multiple-stakeholders' participation in a social innovation design

The interactions between project stakeholders should be wisely organized in the project's methodology Teece et al. (2022). This need is amplified in a social innovation process context, particularly in the quadruple mentioned above helix collaborations. Moreover, social-innovation practices have shown that co-created services now include more sustainable patterns of human interaction and more distributed forms of social organization (DESI Network and Manzini, 2013). To emphasize that mixed and how numerous stakeholders—project partners, coordination committee, external experts, and targeted user populations—are involved and how they participated in the project, we studied which partners were involved in which phase. To do so, and according to the literature review, we grouped stakeholders into broad categories (Aksoy et al., 2019) and used the categories proposed by the quadruple helix of the social innovation model (Carayannis and Campbell, 2021). We summarized the interventions and interactions by project phases and group of actors in Table 2.

The intervention of almost all partners in numerous phases characterized the stakeholder's implication in designing a digital citizen-centered service through social innovation and certainly explained the process's complexity. Surprisingly, the table conception showed that users were uninvolved in each phase. In certain phases, such as assessing the legal basis and drafting of use cases, the non-involvement of the users is understandable because users' implication is postponed later, after the project completion. Furthermore, Table 2 highlighted the considerable number of interactions between stakeholders, and we affirmed that it contributed to intensifying the project's complexity. In conclusion, particularly during the last steps of the research, the high level of stakeholders' implication is central to the project's organization and, perhaps, to the project's success.

The stakeholders' participation and interactions during the project showed that almost all participants were involved during all the study's phases. All stakeholders review and project results, including user needs, use cases, user-system interfaces, and prototypes, giving the quadruple helix collaborations concrete content and context. This finding emphasizes the high level of complexity of a social innovation service design.

Combining the theoretical background developed in the literature review and the experience of the e-rentes.ch ongoing project allowed us to propose the above new framework to design a social innovation service with numerous stakeholders.

5. Discussion

Based on the statement that literature needed to be enhanced

Table 1
Research methodology type used in each project phase.

Methodology used							
Project phase	Specialize documentation analysis	Literature review	Interview	Focus group	Survey	Design Sprint / Codesign	Others
Identification of the stakeholders and mapping of the ecosystem	X		X	X			
Definition of the service's scope, functionalities, and targeted user	X	X	X	X	X		
Assessment of legal basis and service governance	X			X			Federal-law study
User's needs analysis and testing	X	X		X	X	X	
Drafting of persona and use cases	X	X	X	X			
API design	X	X		X		X	
Proof of concept (tests and iterations included)	X	X		X		X	
Prototype (tests and iterations included)	X	X		X		X	

Source: Table created by the authors

Table 2
Stakeholders' participation and interactions during each project phase.

Quadruple helix of social innovation (Carayannis and Campbell, 2021)						
Project phase	Government	Academia	Industry (core business, banks, insurances, experts)	Industry (software editors)	Civil society (users)	Others
Identification of the stakeholders and mapping of the ecosystem	X	X		X		
Definition of the service's scope, functionalities, and targeted user	X	X	X	X	X	
Assessment of legal basis and service governance	X	X	X	X		
User's needs analysis and testing	X	X	X	X	X	
Drafting of persona and use cases	X	X	X	X		
API design	X	X	X	X		
Proof of concept (tests and iterations included)	X	X	X	X	X	Co-design professionals
Prototype (tests and iterations included)	X	X	X	X	X	

Source: Table created by the authors

concerning eGovernment development in the case of multi-stakeholders involved (Malodia et al., 2021), the DIBS case has contributed various ways to reduce this shortcoming. The main findings are summarized and debated hereafter.

Concerning the **framework and methodologies** to be used in a digital service design, Table 1 (Section 4) specifies a combination of phases and methodologies to achieve the project successfully. Inspired by the few scientific articles on the subject (mainly Ippoliti et al. (2021)), we proposed a model of 8 phases well suited for developing a social and digital service to be encompassed in eGovernment tools. Moreover, we pointed out that qualitative approaches were more suited than quantitative. The main finding was undoubtedly the fact that the use of numerous different methodologies was necessary to complete the platform development. The methodologies proposed (interviews, focus group, co-design, etc.) conformed to the literature (Abrás et al. (2004); Farrell (2017); Ippoliti et al. (2021)), but we needed to add specialized document analysis and literature review, which were not mentioned in the literature. A key value added to our analysis is to specify which methodologies are appropriate for each phase of a digital service design.

Concerning the **stakeholders' involvement** in a social innovation design, one result is to highlight how public and private partners engage in a multi-stakeholder state service design and legal decisions for the development and implementation of the e-rentes.ch service. This engagement is described in Table 2 (Section 4), which was created using literature review findings (mainly Carayannis and Campbell (2021)). Some partners (government, academia, and the software industry) were more involved than others, which was a new finding. We specifically pointed out that the centrality of the users remained a critical success factor of a social innovation design. Still, we demonstrated that users' implication does not necessarily concern all project phases. We were able to assert that numerous partners working together to define and develop a service is a must. However, efforts to do so are complicated and must be cautiously organized during the project. Thus, the main result is an actual application of the quadruple helix theory, grouping the project's participants in broad categories proposed by both the triple and quadruple helix models and linked to the project phases, moving beyond the triple vs quadruple helix discussion, to focus on the intra-organizations' collaboration practices. We have also highlighted the interactions between partners during each phase. The high level of complexity of this kind of project due to numerous partners and their interrelationships is observable in Table 2. To our knowledge, this finding was never pointed out in the literature.

The fact that the technological development required various methodologies or that numerous stakeholders must be involved were important findings but were not enough per se. All the propositions made in Section 4 (see Tables 1 and 2) concerning the framework, the methodologies, and the multiple stakeholders are more than the sum of the two. To make a digital service design efficient, framework,

methodology and stakeholder analysis must be considered together to design a digital service in a social innovation context effectively. This statement was, to our knowledge, not previously mentioned in the literature.

Despite the multitude of new elements added to the literature, one essential element must be discussed to have a comprehensive picture of the key success factors in a social and digital service design. This critical element concerns governance decisions on the future of the service regarding what type of entity should take over the current structure and with what objectives. During the evolution of the DIBS project, we studied the type of service governance that should be put in place at the end of the project (to continue the prototype development after the end of the DIBS project). We pointed out that a governance proposal must require drafting and adopting a new legal-basis structure at the national level. Financial interests in social insurance are so huge (see Section 1) that they could postpone the service's development. Some stakeholders could lose privileges or financial profit with a digital service, and only legal obligation could force them to adopt it to inform citizens about their old-age pension. The main barrier in setting up the digital service that we discovered was that specific stakeholders have difficulty giving up control over their data and systems. Access to insured personal data is yet the cornerstone of the digital service implementation and only governance mechanisms (and new law) could make the digital service prototype become an effective service.

The DIBS governance mechanism was not the focus of our article, but it could explain the differences in old-age pension digitalization development among the countries mentioned in Section 1. Furthermore, the specificity of a federal state (Switzerland is a federal state) makes the design, proposal and adoption of a social innovation initiative complex. We did not explicitly present the governance needed in this article as it was not the article's subject. Nonetheless, this is a major issue as accurate governance should make stakeholders more efficient, primarily when the quadruple helix of social innovation is used as a guiding model or a theoretical foundation because many actors are de facto implied. The future service's governance is a challenging and demanding part of the service design, mainly because of the political and financial impacts of such a service.

6. Conclusion

This article used the case of the DIBS service approach as a meaningful mechanism for designing and implementing citizen-centered services. This effort was based on a social-innovation approach and is meant to introduce new ways to articulate user-centered digital service design. When implementing a new service, the social-innovation approach plays a crucial role in making technological. Information infrastructures, such as shared evolving and an open, standardized, and heterogeneous installed base of systems, data, processes, and

technologies are essential components of information and communication technology innovations (Hanseth and Lyytinen, 2010). This new stage includes both technological components and social aspects as discussed in the work of Tilson et al. (2010).

There is much room for improvement in policymakers' efforts to use alternative "tools of government", particularly from a social and design perspective. DIBS is situated at this point: creating a meaningful mechanism for designing and implementing citizen-centered digital services based on a social innovation approach while introducing eGovernment development and governance. The DIBS mechanism is co-designed and deployed in the large Swiss retirement pension ecosystem and will provide meaningful contributions to an applied social innovation context.

The main contributions are twofold. First, the comprehensive study of the framework, methodologies and stakeholders' inclusion together gives a new recommendation for social and digital service design. This is an organizational finding which has a specific practical implication. This new model could be used by the project manager to support the organization and the development of a digital service development. Then, this article also adds to existing knowledge the input of an ongoing project, adding a new framework to the theoretical foundation for user-centered digital service design, consequently in the case of a social innovation.

Concerning the limitations of our study, it is important to note that the DIBS project is not yet finished, and that the platform developed is a prototype (not the final service). Therefore, we present preliminary results concerning the methodology that could be modified after the service implementation. Furthermore, only one case study in a specific field (social insurance) cannot validate that all necessary components were encompassed in our framework.

We suggested conducting further research in social and digital user-centered service design. First, the framework proposed in this article will benefit from inputs from more projects (supplementary case studies). Findings from projects in different domains (other than social insurance) would also enhance the framework proposed in this article. Research must be done concerning the governance of a digital platform because it is a major obstacle that certainly hinders the development of the service design. The number and variety of stakeholders involved resulted in numerous interactions and led to adopting a specific governance mechanism. In the elderly-benefit ecosystem, governance is a major and critical issue involving decision-making for the service organization and access to citizens' data and the appropriate information infrastructure.

More specifically, this process addresses governance decisions regarding the service's future, regarding what type of entity should take over the current research partners. We found that an improvement for users, when using a digital service instead of a traditional service, will also provoke a power or financial loss for other organizations. This is a critical phenomenon that needs further research. Finally, to our knowledge, no scientific study has shown why developing a service for retirement pension purposes is so difficult in some countries, including Switzerland. Thus, the difference in the maturity level of digitalization in the social insurance ecosystem between countries could also be an interesting new track for further research.

Funding

This work was supported by Innosuisse, Swiss Innovation Agency. Project number: 45156.1 IP-SBM.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

Acknowledgments

The DIBS project is co-funded by Innosuisse, public and private partners. The aim of Innosuisse is to promote science-based innovation in the field of economy and society. The authors thank the members of the DIBS steering committee: Leila Lamti, PhD (Federal Social Insurance Office), Jean Ossmann, PhD (Central Compensation Office), Gilles Renevey (Central Compensation Office), Nicolas Thevoz (Globaz SA), and Yves Bongard (Neosis Solutions SA).

References

- Abras, C., Maloney-Krichmar, D., Preece, J., 2004. User-centered design. In: Bainbridge, W.S. (Ed.), *Berkshire Encyclopedia of Human-Computer Interaction: [when Science Fiction Becomes Science Fact]*. Berkshire Publishing Group, pp. 445–456.
- Aksoy, L., Alkire (Née Nasr), L., Choi, S., Kim, P.B., Zhang, L., 2019. Social innovation in service: a conceptual framework and research agenda. *J. Serv. Manag.* 30 (3), 429–448. <https://doi.org/10.1108/JOSM-11-2018-0376>.
- Arnkil, R., Järvensivu, A., Koski, P., Piirainen, T., 2010. Exploring Quadruple Helix. *Outlining User-oriented Innovation Models*. 85, 131 (doi:978-951-44-8208-3).
- Brem, A., Radziwon, A., 2017. Efficient triple Helix collaboration fostering local niche innovation projects – a case from Denmark. *Technol. Forecast. Soc. Chang.* 123, 130–141. <https://doi.org/10.1016/j.techfore.2017.01.002>.
- Brown, T., Wyatt, J., 2010. Design thinking for social innovation. *Stanf. Soc. Innov. Rev.* 7.
- Cai, Y., Lattu, A., 2021. Triple Helix or quadruple Helix: which model of innovation to choose for empirical studies? *Minerva*. <https://doi.org/10.1007/s11024-021-09453-6>.
- Carayannis, E.G., Campbell, D.F.J., 2017. Les systèmes d'innovation de la quadruple et de la quintuple hélice. *Innovations* n° 54 (3), 173–195. <https://doi.org/10.3917/inno.pr1.0023>.
- Carayannis, E.G., Campbell, D.F.J., 2021. Democracy of climate and climate for democracy: the evolution of quadruple and quintuple Helix innovation systems. *J. Knowl. Econ.* 12 (4), 2050–2082. <https://doi.org/10.1007/s13132-021-00778-x>.
- DESIS Network, Manzini, E., Staszowski, Eduardo, 2013. Public and collaborative: Exploring the intersection of design, social innovation and public policy. <https://docs.google.com/file/d/0BOLvpg4Bi212TfPQJFodXJIRLE/edit?usp=sharing&pli=1>.
- Dutta, S., Lanvin, B., Wunsch-Vincent, S., León, L.R., World Intellectual Property Organization (Eds.), 2021. Global innovation index 2021: tracking innovation through the COVID-19 crisis (Fourteenth edition). In: World Intellectual Property Organization. <https://doi.org/10.34667/tind.44315>.
- Edvardsson, B., 1997. Quality in new service development: key concepts and a frame of reference. *Int. J. Prod. Econ.* 52 (1–2), 31–46. [https://doi.org/10.1016/S0925-5273\(97\)80765-7](https://doi.org/10.1016/S0925-5273(97)80765-7).
- Equey, C., 2021. Digital individual benefit statement: the use of a triangulation methodology to design a digital platform for Switzerland. *Int. J. Econ. Manag. Eng.* 15 (2), 6.
- Etzkowitz, H., Leydesdorff, L., 2000. The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university–industry–government relations. *Res. Policy* 29 (2), 109–123. [https://doi.org/10.1016/S0048-7333\(99\)00055-4](https://doi.org/10.1016/S0048-7333(99)00055-4).
- European Commission, Capgemini, Sogeti, IDC, Politecnico di Milano, 2021. eGovernment Benchmark 2021: Entering a New Digital Government Era: Insight Report. Publications Office. <https://doi.org/10.2759/55088>.
- Farrell, S., 2017, February 12. UX Research Cheat Sheet. Nielsen Norman Group. <https://www.nngroup.com/articles/ux-research-cheat-sheet/>.
- Hanseth, O., Lyytinen, K., 2010. Design theory for dynamic complexity in information infrastructures: the case of building internet. *J. Inf. Technol.* 25 (1), 1–19. <https://doi.org/10.1057/jit.2009.19>.
- Head, B.W., Alford, J., 2015. Wicked problems: implications for public policy and management. *Adm. Sci.* 47 (6), 711–739. <https://doi.org/10.1177/0095399713481601>.
- Ippoliti, N., Sekamana, M., Baringer, L., Hope, R., 2021. Using human-centered design to develop, launch, and evaluate a National Digital Health Platform to improve reproductive health for Rwandan youth. *Glob. Health Sci. Pract.* 9 (Supplement 2), S244–S260. <https://doi.org/10.9745/GHSP-D-21-00220>.
- Malodia, S., Dhir, A., Mishra, M., Bhatti, Z.A., 2021. Future of e-government: an integrated conceptual framework. *Technol. Forecast. Soc. Chang.* 173, 121102. <https://doi.org/10.1016/j.techfore.2021.121102>.
- MaRS., 2007, April 12. MaRS names community advocate to lead new social innovation initiative. MaRS Discovery District. <https://www.marsdd.com/media-centre/seo-12042007/>.
- Meroni, A., Sangiorgi, D., 2011. Design for Services. Gower.
- Mulgan, G., 2006. The process of social innovation. *Innov. Technol. Govern. Glob.* 1 (2), 145–162. <https://doi.org/10.1162/itgg.2006.1.2.145>.

- Nicholls, A., Murdock, A., 2012. The nature of social innovation. In: Nicholls, A., Murdock, A. (Eds.), *Social Innovation: Blurring Boundaries to Reconfigure Markets*. Palgrave Macmillan UK, pp. 1–30. https://doi.org/10.1057/9780230367098_1.
- Office fédéral de la statistique. (n.d.). Salaires, revenu professionnel et coût du travail. Retrieved 19 April 2023, from <https://www.bfs.admin.ch/bfs/fr/home/statistiken/arbeits-erwerb/loehne-erwerbseinkommen-arbeitskosten.html>.
- Office fédéral des assurances sociales OFAS, 2022. Assurances sociales en Suisse – Statistique de poche 2022, p. 32.
- Patton, M.Q., 1999. Enhancing the quality and credibility of qualitative analysis. *Health Serv. Res.* 34 (5 Pt 2), 1189–1208.
- Repo, P., Matschoss, K., 2019. Social innovation for sustainability challenges. *Sustainability* 12 (1), 319. <https://doi.org/10.3390/su12010319>.
- Teece, D.J., Pundziene, A., Heaton, S., Vadi, M., 2022. Managing multi-sided platforms: platform origins and go-to-market strategy. *Calif. Manag. Rev.* 64 (4), 5–19. <https://doi.org/10.1177/00081256221109961>.
- Tilson, D., Lyytinen, K., Sorensen, C., 2010. Desperately seeking the infrastructure in IS research: Conceptualization of 'digital convergence' as co-evolution of social and technical infrastructures. In: 2010 43rd Hawaii International Conference on System Sciences, pp. 1–10. <https://doi.org/10.1109/HICSS.2010.141>.
- Vink, J., Koskela-Huotari, K., Tronvoll, B., Edvardsson, B., Wetter-Edman, K., 2021. Service ecosystem design: propositions, process model, and future research agenda. *J. Serv. Res.* 24 (2), 168–186. <https://doi.org/10.1177/1094670520952537>.

Catherine Equey, PhD, is a management accounting associate professor at HEG (HES-SO). Her research areas are Open Innovation, ERP systems, social insurances and digitalization. She led a project to develop a simplified ERP cost accounting module. She was also the Swiss representative for a European Project (<https://oi-net.eu/>). In 2015, Prof. Equey was a Visiting Research Scholar at UC Berkeley in the Open Innovation field. She was awarded

funding to led a European INTERREG research project “Open Innovation in SMEs” (<https://www.accelerateur-iop.org/>). She currently leads a project which aims to develop a digital service allowing individuals to collect data concerning their old-age pensions <https://dibs.hesge.ch/>.

Athanasios Priftis is a researcher - lecturer at HES-SO and director of the Ynternet.org Foundation. The current activities of the foundation can be found here. During the last few years, he has coordinated several applied research projects. A list of related articles is to be found here. He has previously worked as an independent ICT system analyst, collaboration expert and project coordinator. During the period 2011 - 2015 he acted as a researcher for the World Bank (<https://www.worldbank.org>), the Water Global Partnership (<https://www.gwp.org>) and the Open Government Partnership (<http://www.opengovpartnership.org>).

Jean-Philippe Trabichet is the acting Dean of the Information Systems department at HES-SO (HEG), since 2004. He launched the Information Technologies Laboratory that has an important record of IT projects implementation at a national and international level. Jean-Philippe's research deals mainly with the impact of technologies and social media for individuals and organizations. His full list of articles is available here. Jean-Philippe is the acting President of Caritas Genève (<http://www.caritas-geneve.ch>).

Vanissla Hutzli is particularly interested in the new challenges of Industry 4.0 such as digitalisation, use of new technologies and automation. She has a master's degree in business administration with a specialisation in foresight. She is a PhD student. The aim of her thesis is to identify the new digital skills required by employers in the accounting and finance fields to adapt university curricula.