Designing a co-creation tool for an innovation platform in the Dutch e-government

Master thesis
Management of Technology
by Koen Meijer

DIGICAMPUS TUDelft

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Faculty of Technology, Policy and Management
Jaffalaan 5, 2628 BX, Delft, The Netherlands

by

Koen Meijer

K.Meijer-1@student.tudelft.nl
Student number: 4270916

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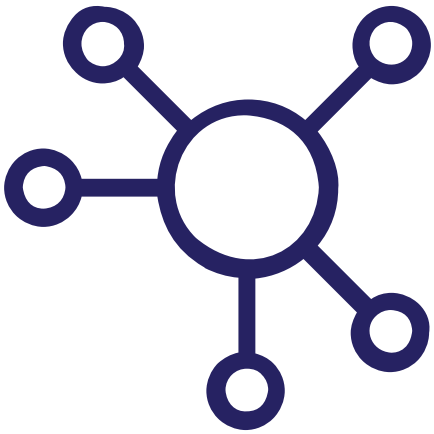
Graduation committee:

Form: Full professor as first supervisor (option #2)

Full professor/first supervisor:	Prof. dr. ir. Marijn Janssen, Section ICT
Second supervisor:	Dr. Haiko van der Voort, Section O&G
Daily supervisor/external supervisor:	Dr. ir. Nitesh Bharosa, Section ICT
External supervisor:	Drs. Sélinde van Engelenburg, Section ICT
External supervisor:	Drs. Thanim van Dokkum, Logius & Digicampus



Preface

"I love fools' experiments. I am always making them"
- Charles Darwin, 1896 [1]

Dear reader,

With this document, I proudly present my thesis for the master's program Management of Technology of the Technology, Policy, and Management Faculty of the TU Delft. My graduation project is the final chapter of my student life at the TU Delft. When I look back, I see the end of a happy and challenging period in my life. I learned a lot about myself during my study at the TU Delft, and in the process, I think I grew as a person. The final project was a challenging but fun project to do. Even though towards the end I put a lot of hours into the project, I enjoyed performing it.

Also, I am grateful to be able to have done my graduation project for the Digicampus. I would like to thank everybody from the Digicampus. In my opinion, the Digicampus is an exciting place with great ideals. The Digicampus changed my perspective about working for the government. It gives a lot of satisfaction to work for an organization that aims to create a better society. I hope my results will contribute to the success of the Digicampus.

Next, I would like to thank everybody who contributed to my work in completing my thesis. With that, I want to give special thanks to Bas Kaptijn and my peer reviewers. Bas Kaptijn collaborated with me in realizing the prototype, which is described in chapter 6. Bas Kaptijn, employed at ICTU, is responsible for the further development of the concept. A lot of his ideas were used to create the prototype. Also, without my peer reviewers, I don't think I would be so proud of the current result.

Finally, I hope that everybody enjoys reading my thesis. I think a lot of exciting insights are present about innovating in the public sector. With the insights, I hope that I can contribute to foster innovations for society to improve it.

Kind regards,

Koen Meijer

Delft University of Technology

[1] https://en.wikiquote.org/wiki/Charles_Darwin

Executive summary

Digitization often comes with its challenges. The Dutch government is an interesting case of paradox. The Netherlands is ranked 4th in the Digital Economy and Society Index (DESI) in its report of 2018, which measures the digital performance of European countries. But the governmental innovations involving IT have also led to failure and high costs in the Netherlands. Innovation in the public sector encounters public sector specific innovation barriers, hampering the innovation process. Innovation in the public sector is still a little researched topic in the innovation literature. These aspects make for a need for further research.

This thesis focuses on a new approach to innovating digital public services in the Netherlands. In a new policy agenda, the NL Digibeter agenda, the Dutch government is developing a new approach to foster innovations based on Information Technology (IT). From this agenda, an experimental strategy is realized to improve the current innovation processes involving IT. The new approach is called the Digicampus. The goal of the Digicampus is to foster innovations for digital public services. Within the Digicampus, an experimental service is set up, called the co-creation lab. The co-creation lab is a proposed solution to overcome the innovation barriers through collaboration for innovation and experiments for innovation. Both of these have proposed benefits. Collaboration for innovation increases innovativeness and aids in creating ideas that are prone to adoption. Experimentation for innovation creates learning opportunities, increases the effectiveness of innovation processes, and proposes a solution to overcome governmental innovation barriers.

While the potential benefits of the co-creation lab are understood, it is unclear how the co-creation lab should be operationalized. This is the basis for the main research problem: *Although experimentation and collaboration for innovation are adopted to overcome the government's innovation barriers, it is not clear how to make those concepts operational in the co-creation lab.* A tool is designed to support the co-creation lab's operations. The design of the tool is the goal of the main research question: *How can a co-creation tool be designed for a governmental innovation platform in which experiments are conducted with governmental IT infrastructures to foster innovation in the Dutch e-government?* The co-creation tool is a tool that supports the co-creation lab in its operations to enable collaborations and to perform experiments. The main research question aims to solve the six challenges that are attached to the research problem: meager research into innovation in the public sector, the adoption of the quadruple helix model, enabling co-creation, requirements to perform experiments, the conditions of the technology used in experiments, and enabling use and reuse of already existing knowledge. The main research question is broken down into six research sub-questions as follows:

1. How do the literary subjects elaborate on the challenges that are attached to the research problem?
2. What are the expectations of the people close to the Digicampus using the co-creation lab as a platform for performing experiments?
3. What are the different governmental IT infrastructures that are eligible for the experimentation in the co-creation lab?
4. How are potential users of the co-creation lab interacting with one another and accessory IT infrastructures to perform experiments?
5. How can the co-creation lab be supported through a co-creation tool to improve its experimental processes involving users?
6. What do potential users of the co-creation tool think about the created prototype in this research?

The research is based on the design science research methodology of Peffers, Tuunanen, Rothenberger, & Chatterjee (2007), which focuses on design research of Information Systems (IS). This thesis alters the activities to create three research phases: discovery, utilization, and design. The alteration is done

to focus more on the underlying substantiations of the design. Justifying the tool's design is considered vital in this research.

Research phases	**Peffers et al. (2007) activities**
1. Discovery	1. Problem identification and modification
2. Utilization	2. Define objectives for a solution
3. Design	3. Design and development 4. Demonstration 5. Evaluation 6. Communication

For the discovery phase, a review is carried out of relevant scientific literature related to the research challenges. Also, semi-structured interviews are conducted with five people close to the Digicampus to discover the current innovation journey for digital innovations in the Dutch government. The utilization phase is carried out by creating use cases about the process of the experiments according to the UML standard. From the use cases, functional requirements are derived. The design phase is carried out by creating a prototype of the co-creation tool. The UX program Sketch is used to create the prototype. The prototype is evaluated in an interactive workshop.

The outcome of this research is a UX/UI design prototype of the co-creation tool. The tool's design is a website that discloses the required information to support the innovation journey of innovators in the public sector. Required information differs for each helix in the quadruple helix and is scoped through user stories. The required information is divided into three axes: discover, innovate, and apply. 'Discover' focuses on providing information for orientation for innovators. 'Innovate' focuses on innovators who actively want to start up experimentation projects. 'Apply' focuses on providing access to existing technology and methodologies for innovation. Combined with a specified search-engine that allows users to search according to their needs, users are guided to the right information. Users of the tool can contribute back by growing the total information offered by the tool when they upload or provide access to their content. The other features are the decentralization of storage, a log-in tool, and continuous screen scraping. Decentralized storage takes the burden away from the co-creation tool to govern all collected information. The linkages to the content of involved parties are the only information that will be stored. A login tool is required to see what belongs to which party and that a party can edit their added content. Also, using a login tool is a safeguard against non-usable content uploaded to the site by users. Continuous screen scraping is helpful to collect standard information and keep it up to date, such as contact information, brief descriptions about a specific party, or current projects.

The reception of the prototype in the interactive workshop from the people close to the Digicampus is positive. The evaluation results are used to create further recommendations for the implementation of the co-creation tool. The following recommendations are made to the Digicampus and for further development of the co-creation tool:

- *Create relationship management for incoming innovators and internal capability to set up experimentation teams*. The human element is essential in performing the experiments in the co-creation lab. Relationship management of incoming innovators is vital to enable operations in the co-creation lab. Also, the Digicampus needs to have capabilities to set up teams to help the incoming innovators to perform experiments.
- *Assess new parties joining experiment trajectories*. New parties joining an experiment trajectory require an assessment to develop trust among the involved stakeholders in experiments.

- *Improve the positioning of the co-creation lab towards the other services of the Digicampus*. The operations of the co-creation lab as an experimental platform also touch the other services of the Digicampus, matchmaking, and guidance. This sparks a discussion on what the positioning is from the co-creation lab within the Digicampus.
- *Hire professionals to develop the UX/UI design of the co-creation tool*. The current UX/UI design of the prototype is a minimum viable product. The UX/UI design needs further development if the co-creation tool is implemented further.
- *Create a strategic proposal for disclosing the required information to innovators*. Within the Dutch government, there are existent platforms that share information on specific topics. Also, there are quality considerations about the contribution of uploaded content by users. A strategic proposal of the type of information the Digicampus wants to disclose should be made.
- *Define the 'fourth' helix in the Digicampus*. The Digicampus claims to adopt a quadruple helix model, but this might not be the case in reality. The exact role of the 'fourth' helix in the Digicampus is still unclear. Changing to a better suiting helix model helps the Digicampus to define its position within the government and focus better on whom it wants to serve.

Lastly, the researcher suggests further research into the following literary concepts that were involved in the research.

- *The application of innovation concepts to the public sector*. Most innovation literature focusses on the corporate environment, not the public sector. The innovation concepts this research encourages for the application in the public sector are digital innovation, service innovation, and recombinant innovation.
- *The differences in innovation barriers between governments*. The researcher discovered that the literature does not elaborate on the individual government differences for innovation. Each government around the globe is different. Research should discover what the differences are in innovation barriers between governments.

Keywords:

Co-creation, Open innovation, Innovation platform, Experimentation, Experimental platform, E-government, Quadruple helix, Governmental IT infrastructures.

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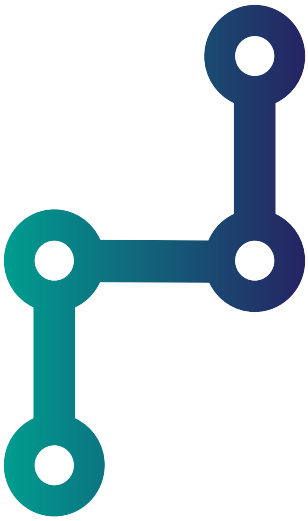


Chapter 1: Introduction

In the first chapter, the introduction, the initial problems and the research context will be explained.

Chapter content:

1 Introduction

1.1 GPT and Trends

Information Technologies (IT) can be considered the General-Purpose Technology (GPT) of the 21st century (Basu & Fernald, 2007; Bresnahan & Trajtenberg, 1995). This is because, similar to other GPTs such as the printing press, the steam-engine, and the fossil-fuel-engine, IT solutions have changed the global prosperity. IT has changed how we consume our media, communicate with each other, and design our business processes (Brynjolfsson & McAfee, 2014).

The current pace of innovations incorporating IT is relentless. A great example to illustrate the pace is 'Moore's law'. Moore's law describes that the number of components that can fit onto an integrated circuit doubles every two years (Moore, 1965). The exponential function characterizing Moore's law precisely resembles the computation power of IT. As a result of the significant increase in computation power enabled by the underling hardware, an explosive growth of possibilities with IT has resulted. Inventions such as the personal computer or the smartphone are examples of side effects of the exponentially growing computation power (Brynjolfsson & McAfee, 2014). In 2019, 'Moore's law' is still in effect despite numerous predictions that it will slow down (Khan, Hounshell, & Fuchs, 2018). The hyper-fast pace of the exponential function, not only led people struggling to keep up, but also led to wide dispersion of new utilities.

The usage of IT in almost every aspect of everyday life has caused most communications to run through digital platforms. A digital platform is a collection of hardware and software elements that enable value-creation interplay among various groups of consumers, e.g. buyers and sellers (de Reuver, Sørensen, & Basole, 2018; Parker, Van Alstyne, & Choudary, 2016). The full availability of these platforms has led to a widespread usage of digital communications. Service recipients and service providers predominantly communicate via digital platforms. People not only communicate digitally with each other but also with their local grocery store, taxi drivers, public transport, news media, etc. An example is the dispersion of communication through digital platforms in the private sector. Almost every utility has its communication platform. For personal communications, people use Whatsapp, LINE, iMessage, Facebook messenger, or build-in chat tools within apps (e.g. Tinder and Instagram). This extends to the other communication means as well; each grocery store has a corresponding app, for taxi drivers there are multiple competing apps differing per country (e.g. Uber, Lyft, Grab, MyTaxi), and each differing news medium has its own platform as well (e.g. NY times, Dailymail, Nu.nl).

The trend of digital platform usage for services is starting with the government as well. In the EU, 64% of all citizens used public services online in 2018, increasing from 52% in 2013 according to the Digital Public Services report from the Digital Economy and Society Index (DESI) from the EU (DESI - European Commission, 2019). Communication through digital platforms changes the way in which services are provided to citizens. Services are being reimagined to be built around the goals of the individual citizens as users (Eggers, 2019; Buchholz, 2019). In doing so, user-centered design is of increasing importance for digital platforms. User-centered design is an overlapping definition for design processes where the end-user is taken as means for design decisions (Abras, Maloney-Krichmar, & Preece, 2004). User-centered design helps an organization achieve its strategic goals, improve its new product development process, and provide maximal utility to the identified user (Veryzer & Borja de Mozota, 2005). An Accenture survey shows that 66% of the public service leaders prioritize personalization of the citizen experience as top three in their work, where more than 53% are seeing positive returns on investments in personalization (Accenture, 2015). Visions of the future often portray local governments with smooth functioning digital services (Anttiroiko, Valkama, & Bailey, 2014). Despite this very positive image, however, digitization often comes with its challenges.

1.2 Governmental problems

The public sector institutions are traditionally known as static organizations where ideas are not fully utilized, thus creating a less fruitful ground for innovation (Borins, 2001; Windrum & Koch, 2008). Innovation research has focused in the past on the business world, but innovation is not only beneficial for businesses. Innovation is beneficial for governments as well, as it can increase their effectiveness, satisfaction of service recipients, efficiency, and citizen involvement (De Vries, Bekkers, & Tummers, 2016). In the last two decades, governments around the globe are trying to 'reinvent' themselves to perform innovations (Kamarck, 2004). In doing so, new possibilities promised by utilizing IT to create solutions are not forgotten.

This thesis focuses on the innovation of digital services provided by governments, specifically the Dutch government. The relentless pace of IT development promises new heights in societal welfare due its GPT classification (Basu & Fernald, 2007). Each new solution proposedly adds value to society. Current promising technologies that are in development are artificial intelligence, internet of things, data analytics, and blockchain. Fostering innovation in public service area can lead to increased performance, increased public value, better response to user needs, and increased service efficiency (Mulgan & Albury, 2003). As governments are 'reinventing' themselves, numerous national initiatives are set up, creating a dispersed landscape of services as is seen in the private sector.

The Dutch government is an interesting case of paradox. The Netherlands is ranked 4th in the Digital Economy and Society Index (DESI) according to its 2018 report, which measures the digital performance of European countries (DESI - European Commission, 2019). But the governmental innovations involving IT have also led to failure and high costs in the Netherlands. Examples are the failures of 'Speer' by the Dutch Ministry of Defense costing 900 million euro, the new population register of BRP (Freely translated: Basic Registration Persons) costing 100 million euro, and the Dutch tax authorities creating a system that automatically processes transaction costing 203 million euro (Stokmans & Lievisse Adriaanse, 2019). IT innovations not only cause problems within the Dutch government. Examples are the failures of the NHS (National Health Service) in the United Kingdom costing 10 billion pounds the MP called it even one of the 'worst fiascos ever', or the German IT failure with the Bundesagentur costing 60 million euro (BBC, 2013; Süddeutsche Zeitung, 2017). There is even an individual Wikipedia page on overbudgeted custom software projects [2].

The Dutch government is doing well compared to other European countries according to the DESI, but failure is still present. A partly explanation is its capricious nature, which inevitably causes failures (Van der Panne, Van Beers, & Kleinknecht, 2003). Research on each failure would be required to unravel the causes of each specific failure. However, that would be a huge effort. Therefore, in this thesis, the primary assumption is made that innovation in the public sector is different than in the private sector. The assumption extends from the notion that the failures result from innovation barriers specific to the public sector. However, innovation in the public sector is a topic that is little researched in the innovation literature (De Vries, Bekkers, & Tummers, 2016). The little research makes it hard to overcome the innovation barriers and create sound policies to advance in the digital society.

[2] https://en.wikipedia.org/wiki/List_of_failed_and_overbudget_custom_software_projects

1.3 A new approach in the Netherlands – The Digicampus

This thesis zooms in on a specific approach currently being set up within the Dutch government. Innovation in the public sector requires a different approach than in the public sector due the different involved factors (see *3.1.6 Innovation in the public sector* for details). The Dutch government recognizes this. In a new policy agenda, called the NL Digibeter agenda, the Dutch government is developing a new approach to foster innovations involving IT [3]. From this agenda, an experimental strategy is pursued to improve current innovation processes involving IT. The goal of the Dutch government is to create an open development platform where IT infrastructures can be developed and tested, aiming to improve the current digital public services (Bharosa, van Dokkum, Spoelstra, & Janssen, 2019). The new platform is called the Digicampus.

The Digicampus is a collaboration between four parties: Logius, ICTU, NLDigital, and the TPM (Technology, Policy and Management) Faculty of the TU Delft. Logius is the public administration that maintains of the Dutch e-government and is part of the Ministry of Internal Affairs. ICTU is an independent advisory organization that helps the Dutch government with societal challenges using Information Technology [4]. NLDigital is an industry association for the ICT-sector in the Netherlands [5]. The Digicampus was officially launched in 2019 by the four collaborating parties and the Dutch secretary of state Knops of Internal affairs (Digitaleoverheid.nl, 2019). The Digicampus has passed the initial phase and has received budget from the ministry.

The Digicampus aims to help innovators in the public sector improve their innovation journey. An innovation journey is the pathway of an innovation from its creation to a working implementation (Cheng & Van de Ven, 1996). To do that, the Digicampus plans to implement a quadruple helix model. The quadruple helix model is a model to collaborate between government, businesses, the scientific community, and users/civilians for innovations (Carayannis & Campbell, 2009). These four parties can be seen as the stakeholders in the Digicampus. The operating model of the Digicampus with the quadruple helix is portrayed in *Figure 1: Operating model of Digicampus (Bharosa, van Dokkum, Spoelstra, & Janssen, 2019)*.

[3] https://www.digitaleoverheid.nl/nldigibeter/

[4] https://www.ictu.nl/

[5] https://www.nederlandict.nl/

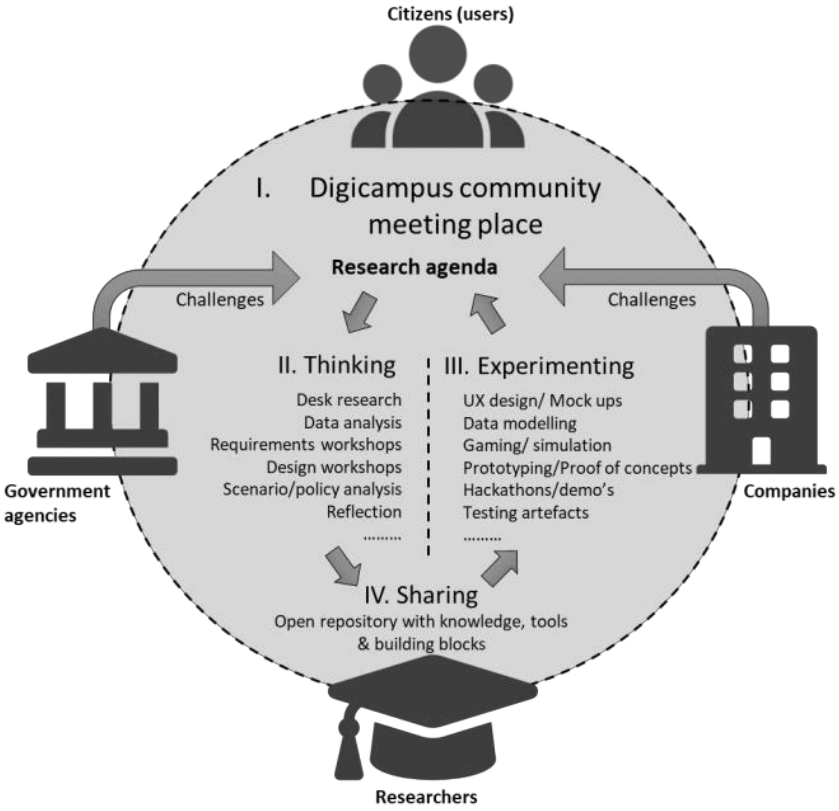


Figure 1: Operating model of Digicampus (Bharosa, van Dokkum, Spoelstra, & Janssen, 2019)

Why is the adoption of the quadruple helix model helping the innovation journey? Involving multiple stakeholders to collaborate for innovation increases the innovativeness (Ahuja, 2000), and facilitates the creation of ideas which are prone for adoption (Dahl, Lawrence, & Pierce, 2011). While collaborating for innovation, existing ideas from multiple sources can lead to new paths in the innovation process (see *3.1.2 Recombinant innovation*). As such, collaborating for innovation results in co-creation of innovations. Co-creation helps to create added value to new/improved products, services, and processes, as well as legitimizes created solutions to the involved stakeholders (Voorberg, Bekkers, & Tummers, 2015). Furthermore, it promises a faster innovation process (Frenken, Izquierdo, & Zeppini, 2012). IT is exceptionally suitable for this recombination because of its re-programmable, homogenous, and self-referential nature (Yoo, Henfridsson, & Lyytinen, 2010). An enabler for collaboration is thus needed to take advantage of the proposed benefits. The enabler currently adopted is a platform for innovation. As described before, platforms can enable value-creation interplay among various groups (de Reuver, Sørensen, & Basole, 2018; Parker, Van Alstyne, & Choudary, 2016).

The goal of the Dutch government has similarities with the concept of 'lean government' of Janssen & Estevez (2013). The lean government concept is specifically focused on transforming the e-government (electronic government). The e-government makes use of IT to improve governmental organizations (Janssen & Estevez, 2013). Janssen & Estevez argue that lean government is about 'doing more with less' by streamlining organizational processes and at the same time stimulating innovation by stakeholder involvement. Stakeholders in the Janssen & Estevez paper are citizens, users, and developers. Platforms can be used as communication means to involve all stakeholders in the lean government concept (Janssen & Estevez, 2013).

To foster innovation and realize the platform, the Digicampus offers three services: matchmaking, guidance, and experimentation. With matchmaking, the Digicampus aims to connect innovators with labs, ongoing experiments, building blocks, tools, research agendas, papers and other innovators.

Guidance is needed after matchmaking. Besides connecting the right people, the Digicampus also aims to help innovators in their innovation journey by providing the right methodology for innovation as well as the knowledge to develop an idea further. The last service, experimentation, is where solutions and innovations are designed and tested. The experimentation service is called the co-creation lab. The co-creation lab serves as a basis for overcoming challenges involved in the usage of different/combined IT infrastructures. Exemplary experiments are the usage of DigiD for a prototype application of the Dutch social insurance bank or JavaScript Object Notation (JSON) for reports sent between municipalities. The Digicampus and co-creation lab structure are portrayed in *Figure 2: Digicampus structure overview*.

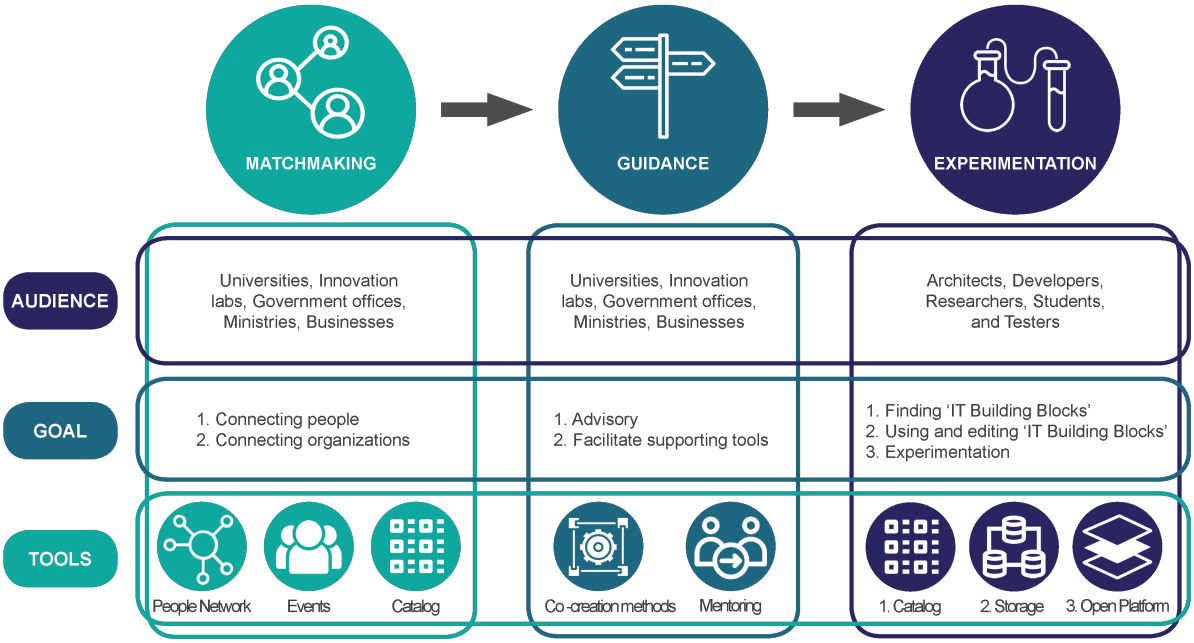


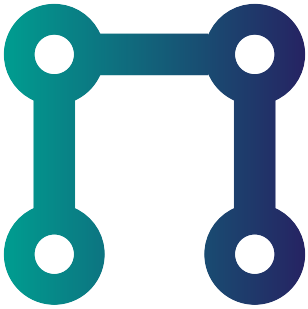
Figure 2: Digicampus structure overview

This thesis zooms in on the co-creation lab to research how the chosen approach can be supported. The experimental service is considered interesting for research, as the approach has proposed benefits to improve the current innovation journey for innovations involving IT. The proposed benefits are that experimentation enhances learning opportunities (Thomke, 2003), increases the effectiveness of innovation processes (Thomke, Von Hippel, & Franke, 1998) and is a proposed solution to overcome innovation barriers in the public sector (Borins, 2001; Mulgan & Albury, 2003). Performing experiments is also considered crucially for successfully adopting the lean government concept and utilizing the benefits of the concept (Janssen & Estevez, 2013). Also, there is an urgent need from the Digicampus to perform experiments with stakeholders for innovation. From January 2019 to August 2019, 91 applications from Dutch government organizations were sent to the Digicampus to make use of its services [6]. However, as the experimental service is still in its infancy, proper research to support the service is of urgent needed to fulfill those requests. The approach of the co-creation lab as part of the Digicampus is interesting for research because it is a new application of an innovation approach in the public sector. Innovation in the public sector is still a little researched topic (De Vries, Bekkers, & Tummers, 2016). The co-creation lab, as a new approach, may serve as a means to bring new innovation-related concepts to the public sector. Research in this case can generate new knowledge for the global scientific community. If the new approach of the Digicampus is successful, it may be suitable for other countries to implement.

[6] Undisclosed source





Chapter 2: Research approach

This chapter explains the research approach. Leading parts of this master thesis are introduced, such as the research problem, research question, and research methods.

Chapter content:

2.1 Problem definition & Research objective

2.1.1 Problem definition

The first part of this chapter defines the research problem. As described in the introduction, the Dutch government is doing well compared to other European countries according to the DESI, but failure is still present. This can partly be explained by its capricious nature, which inevitably causes failures (Van der Panne, Van Beers, & Kleinknecht, 2003). The co-creation lab is an approach to perform experiments and collaboration for innovation in the public sector. However, in the execution of that approach, two problems arise. The primary problem is that innovation takes place in the public sector, which is a different environment than the private sector (see *3.1.6 Innovation in the public sector*). Additionally, while experiments for innovation and collaboration for innovation both have proposed benefits, it is still unknown how these can be combined to foster innovation. These two considerations make up the research problem: *Although experimentation and collaboration for innovation are adopted to overcome the government's innovation barriers, it is not clear how to make those concepts operational in the co-creation lab.* This problem must be tackled because the government's innovation barriers cannot be overcome without utilizing the proposed benefits of experimentation and collaboration for innovation. The proposed benefits are previously described in the *1* Introduction.

There are multiple challenges attached to the research problem. First, research on innovation in the public sector is still meager (De Vries, Bekkers, & Tummers, 2016). Second, the co-creation lab is new and still in development. Applying a new method for fostering innovation inevitably has doubts attached to it as there are no historical references. Third, it is still unclear how parties can be brought together to collaborate and co-create for innovation. The quadruple helix is a collaboration model portraying four parties which differ from one another. The differences lead to unpredictability (Leydesdorff, 2000). Next to the third challenge, collaboration is needed to perform the experiments. Therefore, collaboration for innovation and experimentation for innovation are related. Fourth, the kind of experimentation taking place is still unclear. Now, experiments have a technology implication (which will be addressed in the fifth challenge) as well as an implication that the involved parties need to collaborate in a quadruple helix. Therefore, what is required to perform experiments, needs discovery. Fifth, the technology involved while innovating in the e-government is IT. Experiments will be conducted with IT, thereby bringing specific IT characteristics to the innovation process. How the specific characteristics influence the experimental processes propose a challenge. Lastly, due to the IT characteristics, existing ideas can be recombined and applied to different contexts leading to new paths in the innovation process (see *3.1.2 Recombinant innovation*) (Yoo, Henfridsson, & Lyytinen, 2010). To visualize the previous text, an issue tree is created in *Figure 3: Issue tree research*. Note that the third challenge is split into two as it addresses two literary topics: quadruple helix, and co-creation. The second challenge is not included in the issue tree as it is uninfluenceable by the researcher. Something cannot be made not new.

As the approach of the co-creation lab is new, research on its approach is necessary to contribute to the scientific community. To solve the primary problem, the researcher chooses to support the co-creation lab by creating a co-creation tool. This will not only contribute to the co-creation lab itself but also give insight into the innovation approach of the proposed solutions. The insight gives a contribution to the scientific community as the innovation approach applies and combines different innovation definitions, such as experimentation, collaboration for innovation, and innovation in the public sector, in a new way. The challenges that are attached to the research problem in the application are also novel and require research to make an attempt to tackle these challenges. The co-creation tool that is created for the co-creation lab can be insightful on how the approach can be realized. Thereby, the co-creation tool supports the co-creation lab in its operations to enable collaborations and to

perform experiments. A successful design of the co-creation tool can be of importance to other governments in the world to learn from to be used to foster their government's innovation processes.

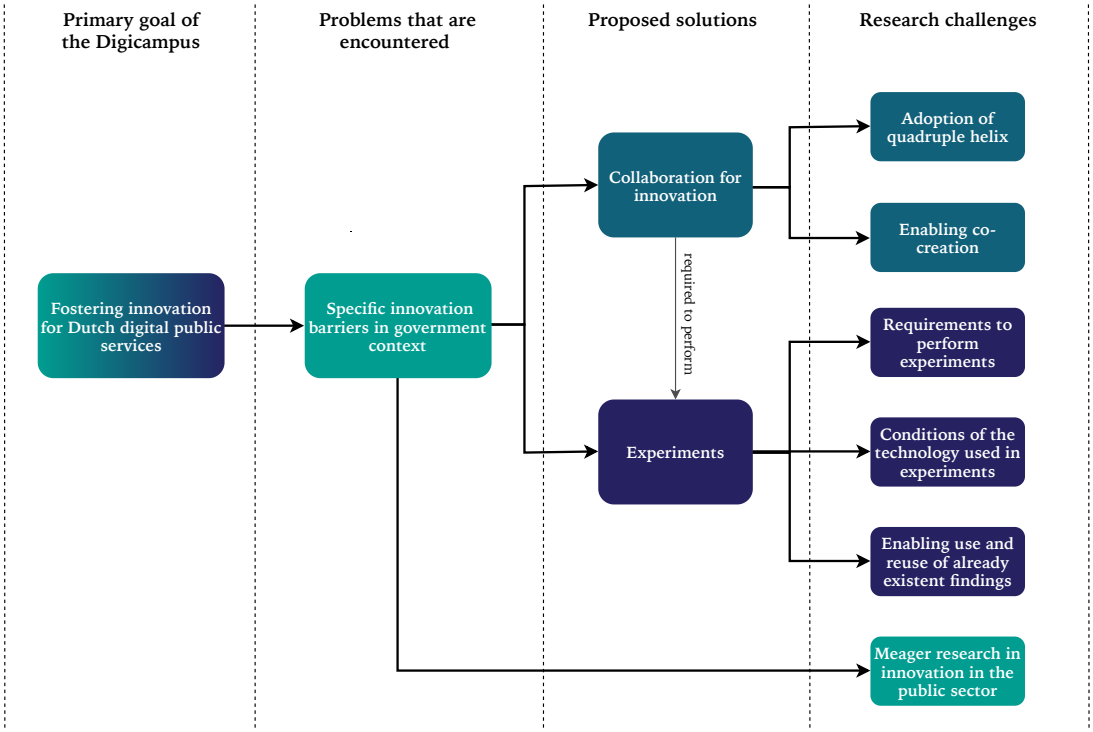


Figure 3: Issue tree research

The researcher deliberately chose to include the term 'co-creation' within the tool's name because co-creation involves the collaboration of stakeholders to generate extra value (Voorberg, Bekkers, & Tummers, 2015). After designing the co-creation tool, the tool is implemented to help to realize the proposed benefits of experimentation and collaboration for innovation. In doing so, a solution will be proposed as a first attempt to solve the research problem.

2.1.2 Research objective

The Dutch government wants to implement a new approach to foster digital innovation performed by government institutions. Fostering innovation in the public sector is considered important as benefits from successful adoption lead to increased governmental effectiveness, satisfaction of public service recipients, increased efficiency, and more citizen involvement (De Vries, Bekkers, & Tummers, 2016). In order to foster innovation, the Dutch government initiated the creation of the Digicampus. The Digicampus is an innovation platform which allows interplay between stakeholders in a quadruple helix for co-creation. An important part of Digicampus operations is performing experimentations to test new innovations. This is done through its experimentation service, called the co-creation lab. Experimentation creates learning opportunities (Thomke, 2003), increases the effectiveness of innovation processes (Thomke, Von Hippel, & Franke, 1998), and proposes solutions to overcome governmental innovation barriers (Borins, 2001; Mulgan & Albury, 2003). The co-creation lab aims to synthesize discoveries of experiments into better solutions for the Dutch e-government (e.g. better integral usage of IT systems within the Dutch government). The goal is to realize the promises from successful adoptions of digital innovations in the public sector. This thesis aims to discover how such an experimental platform can be realized and supported. As a result, a co-creation tool is created to support the co-creation lab in starting up experiments, performing experiments, and communicating experiment results. Outcomes of this research should help to improve the already existent design of the co-creation lab and help its implementation. A successful co-creation lab can show an example to other governments globally how to improve their digital innovation processes.

2.2 Research questions

2.2.1 Research question

How can a co-creation tool be designed for a governmental innovation platform in which experiments are conducted with governmental IT infrastructures to foster innovation in the Dutch e-government?

2.2.2 Research sub-questions

The main research question is broken down into six parts. These parts are the 'building blocks' to answer the main research question. This process created six sub-questions. First, the research reviews literary subjects that apply to the co-creation lab. As can be derived straight away from the main research question, literary subjects such as co-creation, governmental innovation, and innovation platform are reviewed. Second, as people familiar with the Digicampus are already involved in the creation of the co-creation lab, their existent expectations of the co-creation lab need to be understood. Third, the implications of using governmental IT infrastructures needs to be discovered in order to understand the technology behind the experiments. Fourth, knowing how experiments are performed and which stakeholders are involved in the experiments are essential to creating requirements for the design of the co-creation tool. Fifth, the co-creation tool is designed. Lastly, the prototype of the co-creation tool is evaluated by potential users for its ability to foster innovation. The following sub-questions are created:

1. How do the literary subjects elaborate on the challenges that are attached to the research problem?
2. What are the expectations of the people close to the Digicampus using the co-creation lab as a platform for performing experiments?
3. What are the different governmental IT infrastructures that are eligible for the experimentation in the co-creation lab?
4. How are potential users of the co-creation lab interacting with one another and accessory IT infrastructures to perform experiments?
5. How can the co-creation lab be supported through a co-creation tool to improve its experimental processes involving users?
6. What do potential users of the co-creation tool think about the created prototype in this research?

The next part of this chapter explains the research approach and links the research questions to appropriate methods. A quick view of the research process displayed in *Figure 5: Research flow diagram* located under the header *2.4 Research Flow Diagram* helps to understand the next part.

2.3 Research Approach & Methods

The research is based on a design research methodology. A co-creation tool is created as a result of this research. The co-creation tool that is created finds its root in the Information Systems science. This thesis uses methods that fit this specific research field.

To use the appropriate design research methodology and guarantee the scientific value of this master thesis, the researcher consulted the papers of Hevner (2007) and Peffers, Tuunanen, Rothenberger, & Chatterjee (2007). Hevner (2007) argues that three research cycles – relevance cycle, rigor cycle, and design cycle – are essential for obtaining a high-quality design research project. The paper builds upon a previous paper by Hevner et al. (2004) entitled *'Information systems research framework'*. The relevance cycle is needed to remain in touch with the practical utility of the design. This cycle is vital in this research as the findings of the initial research may be the most valuable for further research. The rigor cycle of Hevner et al. (2004) depicts the usage of scientific methodologies to ground the research in a scientific foundation. The last cycle is the design cycle, which incorporates the design process and is dependent upon the two previous phases. Peffers et al. (2007) create a design science methodology specifically for Information Systems design creation and is rooted in previous literature on design science. Peffers et al. (2007) argue that design science research projects consist of 6 activities: problem identification and motivation, define objectives for a solution, design and development, demonstration, evaluation, and communication. Applying the Peffers et al. (2007) design science framework will contribute to the understandability of the process of designing the tool, as well as the rigor and relevance of the tool.

The 6 activities of Peffers et al. (2007) are used as guidelines to structure the current research. However, this thesis alters the activities to create three research phases: discovery, utilization, and design. The alteration is done to fit the research scope for a particular reason. The reason is that the initial problem and the main idea for what the tool should become is somewhat known beforehand. Therefore, the underlying substantiations, to justify the tool's design, are considered the most important in this research. Because of this, the first three steps of the methodology of Peffers et al. (2007) are considered the most essential. The three research phases bring the focal point of this thesis towards the first activities of the methodology by Peffers et al. (2007). The reasons for why activities 4, 5, and 6 of Peffers et al. (2007) are considered less contributable to the underlying substantiations is explained in *2.3.3 Phase 3: Creation*.

Research phases	**Peffers et al. (2007) activities**
1. Discovery	1. Problem identification and modification
2. Utilization	2. Define objectives for a solution
3. Design	3. Design and development 4. Demonstration 5. Evaluation 6. Communication

Table 1: Research phases vs. Peffers activities

In phase 1, interviews with an approach rooted in the scientific literature are executed to comply with the rigor cycle and relevance cycle of Hevner et al. (2004). Certain scientific methodologies in the interviews are utilized to ground the research in the scientific foundation as depicted by the rigor cycle. The data from the interviews are collected in a way to be compliant with the relevance cycle as findings from the interviews are directly correlated to the parties identified within the quadruple helix model. Interviewees are selected carefully based on their expertise in the field of the Dutch e-government. The information in phase 2 is then used to create use cases, according to the UML guidelines of use cases described in the book entitled '*UML distilled*' (Fowler & Kobryn, 2004). The use cases are used to create

functional requirements for the third and last phase called 'design'. In phase 3, the last steps of the design cycle activities of Peffers et al. (2007) are performed. The 'design' phase incorporates the actual design of the tool and iteration upon the created tool through evaluation. *Figure 5: Research flow diagram* located under the header *2.4 Research Flow Diagram* displays a complete overview of the research process. The three phases are further described in the following paragraphs.

2.3.1 Phase 1: Discovery

The first phase consists of a discovery of the initial concepts. Also, the initial problem statement is put into deeper scientific context. This complies with the first activity of the Peffers et al. (2007) methodology in which is prescribed that the complexity of the problem should be captured and the justification for the solution should be found. The first phase is executed in two steps.

First, a literature review is conducted about the core concepts of the research and broader scientific context. The goal of the literature review is to elaborate on the challenges attached to the research problem and also on the approach of the co-creation lab by defining core concepts. The researcher aims to consult existing literature about corresponding concepts to these challenges and the approach of the co-creation lab such as; innovation in the public sector, the quadruple helix model, co-creation, innovation through use and reuse, experimentation for innovation, collaboration for innovation, innovation platform, experimental platform, and technologies applicable to the co-creation lab. Reading about these topics helps the researcher to understand the research topic better and define core concepts in the research. The resulting base of knowledge is used to develop the rest of the research, find literary relations with the co-creation lab innovation approach, find inspiration for the interview questions, and answer the first research sub-question.

Secondly, the interviews are conducted. There are three definable goals for the interviews. First, to discover the expectations of the co-creation lab and its experiments from the people close with the Digicampus. Second, to explore different IT infrastructures suitable for experimentation and of importance to potential use cases. Third, to identify use cases and provide a knowledge basis to formulate use cases. In this process, it should become clear what the primary users of the co-creation lab are going to be. In combination with the previous literature review, the interview results serve to answer sub-question 2 and 3.

To perform the second step, the researcher will organize semi-structured interviews with the people who working on or are involved with the Digicampus. These stakeholders are known from the beginning of this research. The combination of structured and unstructured interviews is needed as there is a clear goal on what topics should be discovered while the direction is still unclear. It is chosen to do face-to-face interviews to collect as much in-depth data as possible. Because the exact nature of the problem area is still unclear, adjustment of questions might be needed during the interviews, which suits face-to-face interviews better (Sekaran & Bougie, 2016, p. 120). Data collected from the interviews will be qualitative. As the data to be obtained is very specific, a sampling strategy will be chosen accordingly. Judgment sampling is selected as the sampling strategy, allowing the researcher to choose subjects according to their qualification to the research problem (Sekaran & Bougie, 2016, p. 255). 4-5 participants are selected for interviews based on their experience and suitable knowledge to the co-creation lab and from other Dutch governmental digital innovations. The target group consists of technical developers and business developers who are directly involved with the Dutch e-government. For more information on the interview participant choice see: *4.1.3 Interviewee identification and justification.*

The process of conducting interviews is as follows. The interviews are recorded only if the interview participants grant permission. From the recordings (or directly if the participant refuses the recording), an interview transcript is created. The interview transcripts are coded in order to find overarching

themes. ATLAS.ti is used to support the codification and analysis of the interview transcripts. First, an insight is made on what the expectations are from the people close to the Digicampus for the co-creation lab. Second, a list is compiled of all the IT infrastructures relevant to potential use cases with their basic properties included. Third, potential use cases are identified, and primary users in the use case are listed. The users in the use case are a small scoop of all the potential primary users of the co-creation lab. All the gathered data should be sufficient to create use cases for phase 2.

Results Phase 1:

- Literature review of core concepts
- Interview transcripts
- Expectations of the people close to the Digicampus
- List of IT infrastructures relevant to potential use cases with basic properties
- Identified use cases
- List of users in the use case

2.3.2 Phase 2: Utilization

Phase 2 resembles activity 2 of the methodology by Peffers et al. (2007), which is comprised of defining objectives for a solution. This step makes objectives from the problem definition and discovers what is achievable in designing the co-creation tool within this thesis project. The initial discovery has taken place, resulting in knowing the people who are directly involved, what the expectations are from the main stakeholders, which IT infrastructures are open for development and their basic properties. This information is to be synthesized in the objectives and requirements for an innovation platform, complying with activity 2.

The other information gathered in phase 1 is used to make use cases. The conclusions from the use cases from phase 2 answer sub-question 4. The guidelines to make use cases are taken from the standard UML (Fowler & Kobryn, 2004). Use cases describe how users interact with a system in a set of scenarios. Discovering the interactions between the user and the system is a technique to create functional requirements. Mapping the interaction also explores opportunities for collaborations between users. Collaboration is important for experimentation, as collaborating in knowledge sharing is one of the foundations of open innovation (Chesbrough, 2006). With collaboration also comes the question of when a user is allowed to be a user. The entry and exit of different users are important for clarity for the collaboration and safety concerns of the government. Therefore, entry and exit rules are incorporated in the requirement list.

The goal is to create two different use cases from the data resulting from the qualitative interviews. Analyzing two use cases creates two perspectives of the experiments that are conducted in the co-creation lab. Synthesizing from two perspectives generates a picture of what is required to enable the co-creation lab. This leads to a complete list of functional requirements. The use cases must have different set-ups in order to achieve a view of two different perspectives. The use cases are visualized through use case diagrams according to the UML standard (Fowler & Kobryn, 2004). *Figure 4: Exemplar use case diagram (Figure 9.2., Fowler & Kobryn, 2004, p 81.)* displays an exemplary use case diagram.

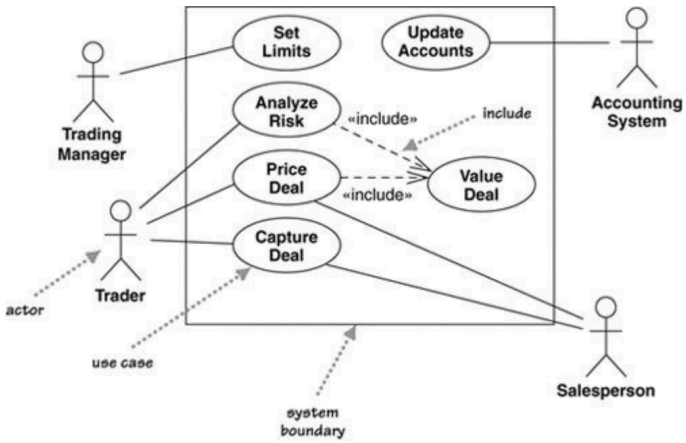


Figure 4: Exemplar use case diagram (Figure 9.2., Fowler & Kobryn, 2004, p 81.)

The last step is to derive functional requirements from the use cases. The requirement analysis is essential to set the design objectives from the Peffers et al. (2007) activity 2. The objectives should solve or partly solve the initial problems that are previously identified.

Results Phase 2:

- Use cases of users in the innovation platform
- Use case diagrams of scenarios
- Functional requirements of the innovation platform

2.3.3 Phase 3: Creation

In the last phase, the tool is created and tested. This process embodies 4 activities of the Peffers et al. (2007) methodology. The most important activity is the design and development, which resembles the creation of the tool. Here all research findings are incorporated into the first version of the prototype. This phase answers sub-questions 5 and 6.

In activity 3 by Peffers et al. (2007), design and development, a prototype of the tool is created that follows the functional requirements developed in phase 2. The main idea is to create a co-creation tool that supports the co-creation lab in its operations to enable collaborations and to perform experiments. In addition, the tool is designed to fit in the use cases. New collaboration opportunities are also taken into consideration for experiments. Because the co-creation lab is still in development, the exact form of it and which future experiments will be performed are still unclear at the beginning of this research. Due to these uncertainties, the goal is to create the first version for a prototype of the co-creation tool. Creating a fully functioning tool for the innovation platform is considered to be to resource extensive for one student's master thesis. Therefore, a prototype that helps to achieve the goal of the innovation platform (partly) is also be taken into consideration. The design of the prototype answers sub-question 5.

The next two activities from Peffers et al. (2007), demonstration and evaluation, are combined and performed in one evaluation round. The demonstration activity has the core function of solving the defined problem with the prototype, and the evaluation is the test of how well the tool fulfills its requirements in solving the problem (Peffers et al., 2007). The evaluation round is an interactive session to gather feedback for evaluation. The feedback allows judgment of the prototype to the functional requirements and its fit in the use cases. The evaluation round is an interactive workshop that answers sub-question 6.

During the workshop, the prototype is considered as a case in the evaluation. The consideration requires the incorporation of case study research methodology. The purpose of this case study is to improve the prototype. This complies with Robson's classification of 'improving' from the case study research purposes (Robson, 2002). The 'improving' case study should have a critical character and should be based on qualitative information (Runeson & Höst, 2009). The scientific method to perform the evaluation with the stakeholders is required to remain faithful to the three cycles of Hevner (2007). Peffers et al. (2007) describe that the results of the evaluation activity can be used to iterate back to activity 3, design and development. The Runeson & Höst (2009) and Peffers et al. (2007) papers have a distinct similarity here on the topic of iterating and improving. The only difference is that Peffers et al. (2007) uses a designed object as a foundation, and Runeson & Höst (2009) use a case study as a foundation. In this thesis, the evaluation of the prototype is considered a case. Peffers et al. (2007) does not prescribe specific methods for evaluation, hence the combination.

The basic setting of the evaluation process is that the prototype is presented, followed by a discussion between the presenter and the participants. The presenter is the researcher who created the prototype. The participants that evaluate the prototype are its potential users defined in the previous use cases. The workshop can be perceived as a semi-structured interview but with multiple participants. To prepare for the discussion, questions are developed by the presenter for the participants on the usage of the prototype. This method complies with Runeson & Höst (2009, p. 146) that argue that semi-structured interviews can be used to discover *"how individuals qualitatively and quantitatively experience the phenomenon"*. Besides gathering qualitative feedback during the discussion, a questionnaire is also given to the participants to gather quantitative data. The researcher is aware that in an interactive group session, some individuals might not be able to express their feedback fully. A questionnaire allows each participant the opportunity to individually give his/her opinion.

Before conducting the workshop, the researcher will practice performing the workshop in a pre-evaluation with close collaborators in the design phase. The results of the pre-evaluation are used to improve the workshop in general and gain pre-insights for improvements of the prototype. The aim of this small iteration before the real evaluation is to improve the quality of the workshop with participants performed. There is no further elaboration on the pre-evaluation in the rest of this thesis report; only the outcomes are silently incorporated in the report.

Lastly, the carrying out of the evaluation also incorporates the communication activity of Peffers. Here the communication of the problem and its solution through the designed tool takes place (Peffers et al., 2007). The primary communication of the problem will be performed in the presentation of the graduate, but gaining feedback is also part of the communication activity. The last feedback round will communicate the importance of the solution to potential users. With that, the feedback round becomes part of the communication activity of Peffers. The feedback round is the final part of the research. The prototype will not be finished after the finalization of this thesis and will probably be continued to be developed. Therefore, the feedback gathered is helpful for further research. The results of the workshop are used to improve the prototype.

Results Phase 3:

- First version of the prototype
- Feedback on prototype through pre-evaluation
- Feedback on prototype through workshop
- Improved version of the prototype

2.4 Research Flow Diagram

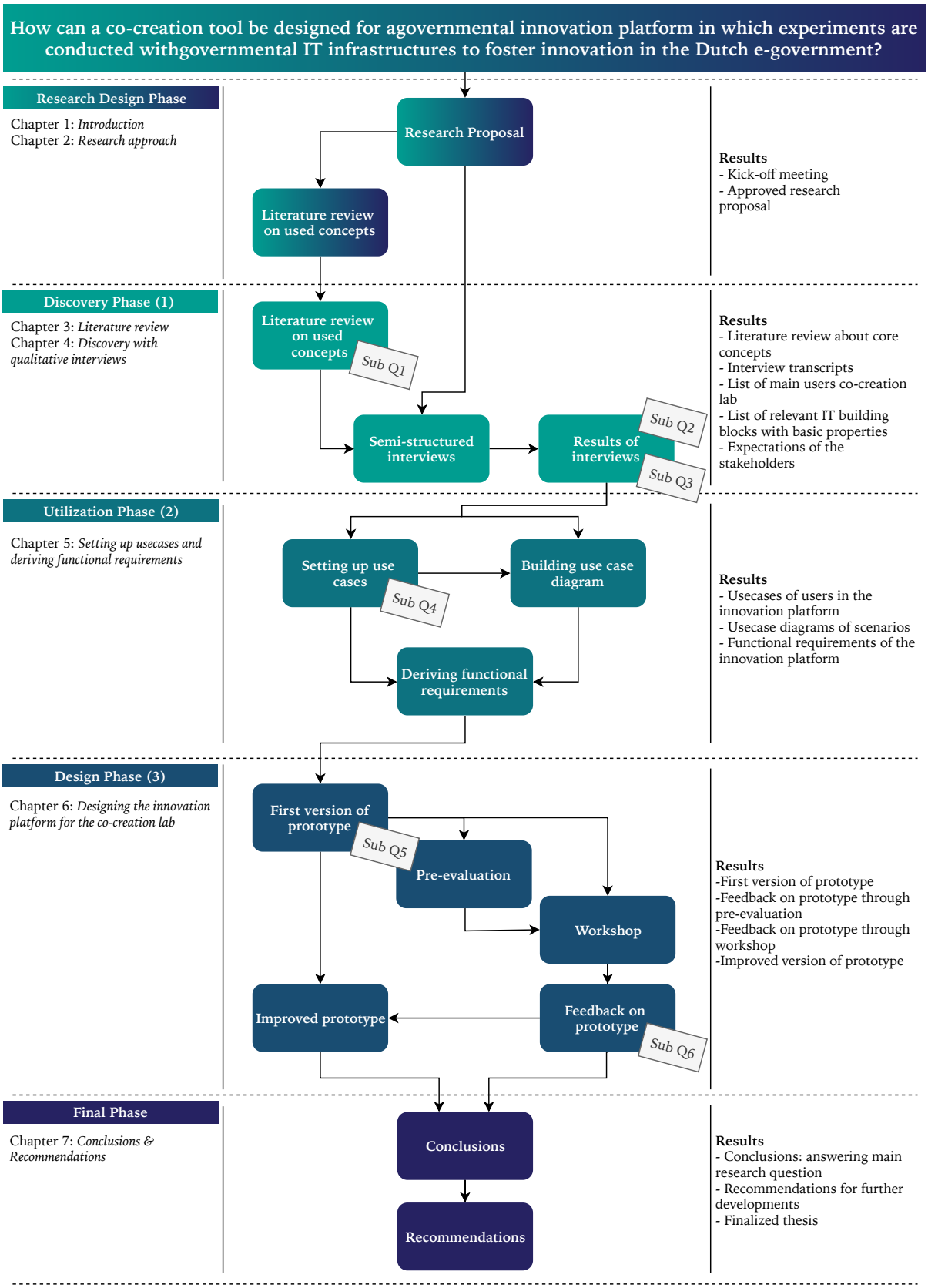


Figure 5: Research flow diagram

2.5 Research link with the MoT program

The Management of Technology (MoT) program of the Technology, Policy, and Management (TPM) Faculty of the TU Delft wants to bridge the gap between technological developments and its implications on society. Innovation is often considered an essential part of technology and its development. This thesis focuses on innovation in the public sector. Even though other factors apply in the public sector as compared to the private sector, technology is used in this case as a governmental resource and hence this research takes place into a technological context. This fits with a typical MoT thesis that is comprised of scientific research in a technological context. The scientific research can be focused on, for example, innovation processes. That is precisely the case in this thesis, researching how governments can benefit from fostering innovation.

The domain of research complies with courses of MoT I followed; Emerging and Breakthrough Technologies (MOT2421) and Technology Strategy and Entrepreneurship (MOT1435), which focus on innovation management. Also, the insights apply to the courses Economic Foundation (MOT1421) to understand the growth theory behind innovation, and Technology Dynamics (MOT1412) to understand the implications on society of innovation. Lastly, the course Research Methods (MOT2312) helps to create the scientific framework for the qualitative data collection.

The researcher's specialization within the MoT program was System Design and Management, which was studied at Keio University in Japan. The design frameworks and methods the researcher learned in Japan are applied in creating the use cases and the design research for creating the prototype. All in all, the researcher has specific knowledge to perform this research. The choice of topic, designing a co-creation tool for innovation in the public sector, including all the previously described applications, fits very well inside the MoT program the researcher followed.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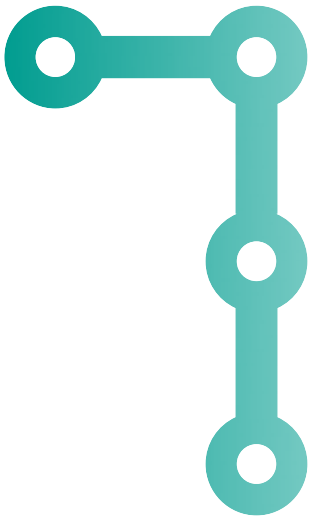


Chapter 3: Literature review

This chapter elaborates upon core concepts and insights from existent literature and answers research sub-question 1. For phase 1, the first result is obtained; literature review on core concepts. Core concepts in the literature review relate to the challenges as defined in the research problem. Concepts reviewed are; innovation in the public sector, the quadruple helix model, co-creation, innovation through use and reuse, experimentation for innovation, collaboration for innovation, innovation platform, experimental platform, and technologies applicable to the co-creation lab.

To structure the review, the literature is divided in three subsections. The first part deliberates on innovation in general as well different kinds of innovations and different contexts of application. The second part elaborates on the concepts behind the Digicampus's innovation model. The last and third part focusses on the technology that is involved in the operations of the Digicampus. The resulting base of knowledge is used to develop the rest of the research, find literary relations with the co-creation lab innovation approach, find inspiration for the interview questions, and answer the first research sub-question.

3.1 Innovation

This section reviews literature about innovation types and contexts of innovation applying to the Digicampus. *Appendix 2: Innovation: the literary definition* defines innovation in a general sense. That part may be read to understand the root definitions of innovation before reading this section.

3.1.1 Open Innovation

An innovation landscape is an environment of factors that surround innovation processes, either enabling or hampering (Gopalakrishnan & Bierly, 2001). To create an enabling innovation landscape, Chesbrough introduces a model of open innovation. In his book, he explains that open innovation is about innovating parties using external ideas and internal ideas as well as different internal and external paths from ideas to the market, see *Figure 6* (Chesbrough, 2003). The open innovation model should lead to lower costs of innovations, faster times to market, and more chances to share risks with others (Chesbrough, 2006). A primary requirement for the open innovation model is that knowledge should flow freely in and out of the innovating party (Chesbrough, 2003). The open innovation model promises a faster pace of disruption. An innovation landscape where knowledge flows freely in and out contribute in this way to technological progress. Vice versa, a knowledge monopoly can slow down technological progress (Van den Bergh, 2008). In his books and papers, Chesbrough focusses on the private sector, but the benefits are not secluded for application to the public sector. A better innovation landscape for the government is not only beneficial for the government itself and collaborating institutions but also civilians and societal interest.

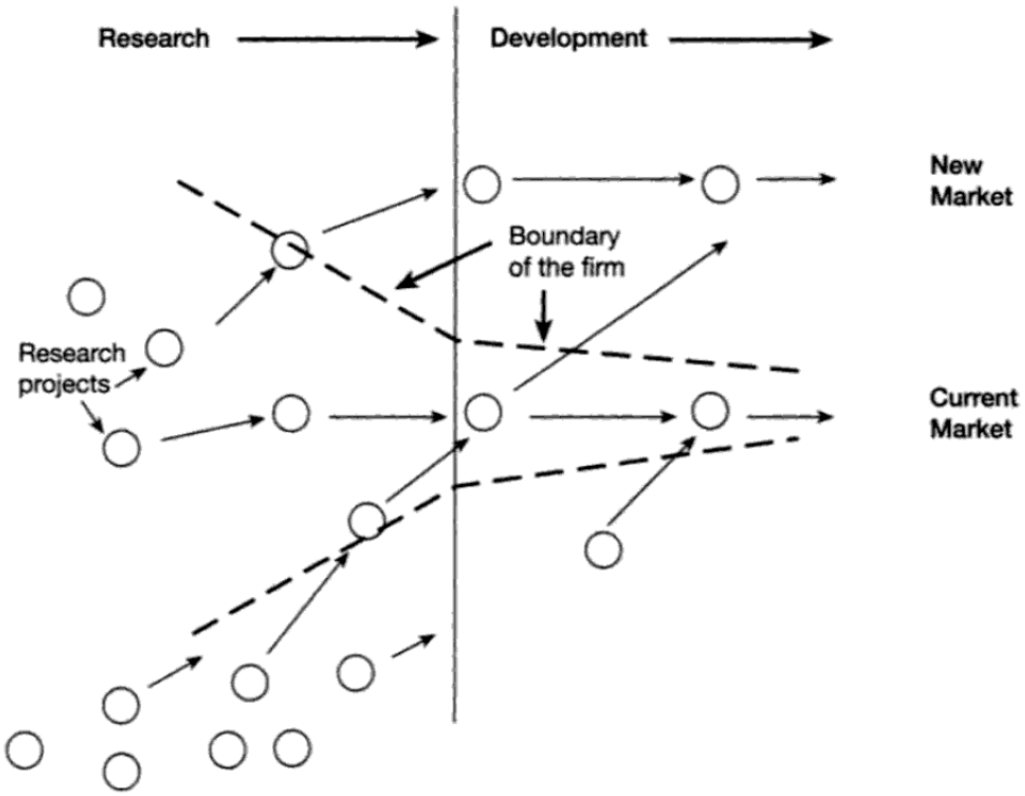


Figure 6: The open innovation paradigm of Chesbrough (Chesbrough, 2003, p. xxv, Figure I - 4)

3.1.2 Recombinant innovation

Recombinant innovation is recombining existing ideas into new innovations (Brynjolfsson & McAfee, 2014; Griffith, Lee, & Straathof, 2017; Weitzman, 1998). Combining ideas, old and recent, can create new utilities that provide a new added value. A way to explain this statement is the example of Waze [7], which is also described in the book of Brynjolfsson & McAfee (2014). Waze is a mobile phone app to support human car drivers. Waze notifies car drivers about traffic jams and consults them faster route alternatives. In order to so, Waze collects live driving information from other Waze users in combination with already existent traffic controllers. The combination gives Waze users an accurate live view about the current traffic situations. The utilization of this data also enables Waze to give drivers advice for good route alternatives. The Waze example can be considered a success with 110 monthly users worldwide and its acquisition by Google for 1.15 billion dollars (Spina, 2018; Bort, 2015). Waze created this service out of existing technology of GPS, social networks, and data transmission between mobile phones. The recombination of these technologies led to a new innovation. The advantages of recombinant innovations are its ability to create short-cuts in technological progress through combining technologies (Frenken, Izquierdo, & Zeppini, 2012). This not only speeds up the technological progress but also enables new solutions otherwise impossible, Waze being a prime example of that. The paper Frenken et al. (2012) oppose recombinant innovation against branching innovation, which is a new technology that 'branches' from older technology. The next figure displays the opposing forms of innovation.

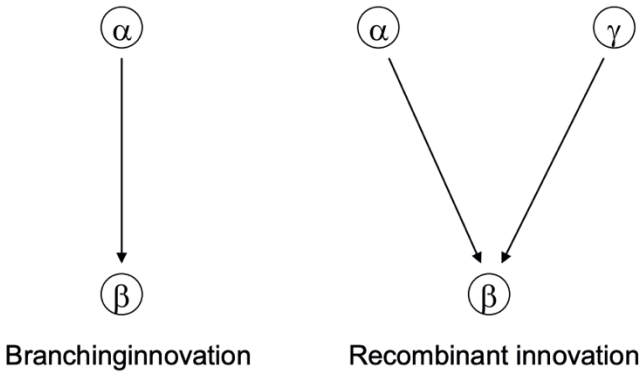


Figure 7: "Representation of possible innovation events in one period" (Frenken et al., 2012, p. 27).

Recombining existing ideas into a new application has similarities with meaning-driven innovation. Meaning-driven innovation uses existing technology put into a different context, creating a different meaning. The discussion here is whether existing technology falls into the scope of existing ideas. An overlap is present, but recombinant innovation does not seclude new technology creation of existing ideas. Norman & Verganti do not further elaborate on what the boundaries are for technology changes in meaning-driven innovation. The definition of meaning-driven innovation is confusing, where they argue no technology change is existent and their figure, which shows an incremental change in technology.

Weitzman (1998) harnesses the contribution of older knowledge reused for new ideas. His model suggests; *"the ultimate limits to growth may lie not so much in our ability to generate new ideas, so much as in our ability to process an abundance of potentially new ideas into usable form"* (Weitzman, 1998, p. 331). This emphasizes the ability to mold ideas into a usable form is essential for growth. Now, a quick recap made to the first part of this literature review, which argues that innovation contributes to societal advancement. Growth is also part of societal advancement. And, innovation contributes to growth

[7] https://www.waze.com/

(Verspagen, 2005; Wong, Ho, & Autio, 2005). Weitzman explains in his paper that a goal of growth theory was to unravel the *"black box"* of innovation. Recombinant innovation is in Weitzman's model, a highlighted part of this *'"black box"* innovation. Similarly to the Frenken et al. (2012) paper, Weitzman argues that recombinant innovation is essential to understand technological progress and that recombinant innovation improves technological progress.

3.1.3 Enabling recombinant innovation

The paper of Van den Bergh (2008) argues for an optimal diversity for businesses gaining a temporary monopoly on knowledge against recombinant innovation. A monopoly on knowledge is the opposite of an open innovation landscape where knowledge flows freely. Van den Bergh (2008) defines diversity according to the three factors of Stirling (2007), variety, balance, and disparity. Variety is a broad definition of the number of factors involved. Factors involved in this case are *"different technologies, processes, products, institutions, organizations or strategies"* (Van den Bergh, 2008, p. 567). Balance is the weight of each factor in the whole scope of factors, and disparity is the difference among each factor in the scope (Van den Bergh, 2008). Diversity is the opposite of when a firm has benefits through protection of its knowledge, creating a monopoly. A knowledge monopoly can slow down technological progress in the long run; hence, optimal diversity is required (Van den Bergh, 2008).

Van den Bergh (2008) acknowledges that a government can influence each of these factors with policies to improve the innovation landscape for recombinant innovation. From the paper of Griffith, Lee, & Straathof (2017), it is concludable that the current landscape is not optimal. A firm which is recombining ideas of other firms is less cost-efficient than developing ideas in-house, based on data from US and EU firms (Griffith et al., 2017). Griffith et al. (2017) argue that this is because of knowledge boundaries between firms. Interestingly as both, Frenken et al. (2012), Griffith et al. (2017), and Van den Bergh's (2008) papers argue policies should be put into place by governments to harness recombinant innovation for businesses to an optimal level. Interestingly, no governmental innovations are taken into account. Recombinant innovation done by the government has a severe lack of literature substantiation. However, recombinant innovation can be especially applicable for the government. In essence, the governmental organizations of one country do not hold boundaries towards each other, as the government is one government. The usefulness of recombinant innovation in the public sector has not yet been researched.

Next, it is considered to ask what enables recombinant innovation in the public sector. Recombinant innovation has a similarity with Chesbrough's open innovation model. Recombinant innovation uses existing ideas of other sources, and the prerequisite for open innovation is free knowledge transfer. Acquiring existing ideas requires logically free knowledge transfer. Also, the previously discussed diversity of Stirling (2007) and Van den Bergh (2008) play a role in the enablement of recombinant innovation. Diversity encompasses if the right factors are present and how these factors are distributed in order to enable recombinant innovation. The above-discussed concepts explain prerequisites for an environment to enable recombinant innovation. Bessant & Trifilova (2017) focus specifically on organization. They propose that an organization requires absorptive capacity. Absorptive capacity is the ability to recognize the value of new external knowledge, assimilate it, and apply it (Bessant & Trifilova, 2017; Cohen & Levinthal, 1990). Bessant & Trifilova (2017) propose three routines to enhance the absorptive capacity to enable recombinant innovation. The routines are abstract-driven search, brokerage, and cyclic adaptation. First, abstract-driven search is the search effort to search on a higher level of abstraction based upon the core principles of a question or solution (Bessant & Trifilova, 2017). This enables an organization to 'get out of the box' and levitate from the current perspective of a solution. An easy example of this is that if one travels by car to a destination and wants to travel faster is to ask how can someone travel the fastest, rather than how can someone travel the fastest by car. This enables the person to also look at other transportation means than a car. Second, brokerage is the ability to connect parties to enable fruitful interaction among the involved parties

(Burt, 2005). According to Bessant & Trifilova (2017, p. 12) there are three factors for effective brokerage; *"(1) the availability of rich and varied networks to generate potential partner signals, (2) the use of abstract-driven search to recognize analogous situations and (3) the ability to engage potential recipients in exploring outside of their 'normal' search space."* Third, cyclic adaptation is the usage of learning cycles during the development of a recombined idea (Bessant & Trifilova, 2017). This is the step where the recombined ideas are applied to the other context.

3.1.4 Agile

Bessant & Trifilova (2017) paper does not go into depth about the forms of cyclic adaptation. They mention the 'lean start-up' approach of Ries (2011), where a minimal viable product (MVP) has to go through iteration to improve. The Lean start-up is a methodology of agile process management (Ghezzi & Cavallo, 2018). Agile process management has recently become popular in business operations (Denning, 2015; Kukhnavets, 2018). Agile process management is a way of organizing business processes according to the Agile Manifesto, where it finds its roots. The Agile Manifesto is a set of 12 principles to approach software development differently (Fowler & Highsmith, 2001). Agile process management is ideal for processes with frequently changing requirements, high variability of people and technology used (Nerur, Mahapatra, & Mangalaraj, 2005). According to a study by Serrador & Pinto (2015), Agile process management is especially useful for improved stakeholder satisfaction, perception of project performance, and efficiency.

Key principles of the Agile Manifesto that apply to previous discussed topics are; *"our highest priority is to satisfy the customer through early and continuous delivery of valuable software"*, and *"deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale"* (Beck et al., 2001, p. 2). Continuous delivery of software in a short timescale is similar to the cyclic adaptation of Bessant & Trifilova. In this way, Bessant & Trifilova propose the usage of agile process management is required to realize recombinant innovation in practice. The focus of agile process management on IT makes it thus the more interesting for the Digicampus, where recombinant innovation with IT is conducted.

3.1.5 Digital and service innovation

The goal of the Digicampus is to innovate digital public services. If digital public services are taken apart, two innovation fields are discovered, service innovation and digital innovation. Digital innovation can be defined as an innovation (see the definition of innovation at 3.1 Innovation) that *"is embodied in or enabled by Information Technology"* (Fichman, Dos Santos, & Zheng, 2014, p. 330). Because of the involvement of IT, Digital innovation has slightly different characteristics. Three characteristics of digital innovation are re-programmability, homogenization of data, and the self-referential nature of digital technology (Yoo, Henfridsson, & Lyytinen, 2010). Yoo, Henfridsson, & Lyytinen (2010) explain that digital devices exist out of a physical device that has coded instructions, or also, more commonly known, the dichotomy of hardware and software. The software can be 'reprogrammed' to give different coded instructions to the device, hence re-programmability. Homogenization of data is the core principle that all digital data consists of binary digits (0s and 1s). In theory, every digital device can use digital data, which enables unlimited possibilities of data exchange (Yoo, Henfridsson, & Lyytinen, 2010). The self-referential nature refers to the embodied or enabled IT in digital innovation. More digital innovation will lead to more benefits of IT usage (e.g., costs reductions, better IT performance), which causes an increase in IT usage, which leads again to more digital innovation, creating an upward cycle of adoption (Yoo, Henfridsson, & Lyytinen, 2010).

When a party wants to perform digital innovation, it needs a specific approach because of its different characteristics (Nylén & Holmström, 2015). A difficulty, when performing digital innovation, is its rapid pace of development, also mentioned in the introduction. Nylén & Holmström (2015) specifically mention the *'malleability; the ease of reconfiguration'* is the causation of the pace, which complies with the

characteristic of re-programmability. Brynjolfsson & McAfee (2014) also name that because of this characteristic, IT is specifically well suited for recombinant innovation. To manage digital innovation properly, Nylén & Holmström (2015) propose a framework for firms. Firms are different from government institutions, but some areas of the framework comply with previously discussed topics. Areas of interest from the Nylén & Holmström (2015) are digital evolution scanning, improvisation, and user experience. Digital evolution scanning is gathering information about current trends in digital development. This complies with the need for diversity from van den Bergh (2008), which is needed for recombinant innovation. Looking for 'factors' or opportunities for innovation is actively searching for knowledge of others, similarly as is needed to enable recombinant innovation. A way of utilizing these opportunities is improvisation. Improvisation in innovation is similar to innovating on-the-fly. Nylén & Holmström (2015) argue that an environment for improvisation is beneficial for digital innovations. As a consequence of improvisation, ad hoc collaboration takes place. Ad hoc collaboration is one of the bottlenecks Bharosa, van Dokkum, Spoelstra, & Janssen (2019) define to solve. User experience is a need for digital innovation in the eyes of Nylén & Holmström (2015). User experience (UX) is a multi-faceted definition (Hassenzahl & Tractinsky, 2006; Law, Roto, Hassenzahl, Vermeeren, & Kort, 2009). In this thesis, a practical definition of UX is chosen to relate to feasible components which are realizable for a prototype. UX can be approached from a different point of view, where experience becomes a psychological phenomenon (Hassenzahl & Tractinsky, 2006). This is considered impractical as it touches in that way, another field of research. The Law, Roto, Hassenzahl, Vermeeren, & Kort (2009) is used, where UX focuses on a person interacting with a product, system, service, or object which has a user interface (UI).

The user experience definition brings us to the next innovation field; service innovation. Service innovation, or the innovation of a service, is one of the targets of innovation when innovators transform their ideas (Baregheh, Rowley, & Sambrook, 2009). The questions remaining are what a service is and what its innovation does entail. Service is the exchange of an organization using its skills and capabilities to the benefits of an actor, or service receiver, demanding it (Lusch & Nambisan, 2015). Characteristics of services are that they are fluid, intangible, delivered over time and space, and often enquire human involvement (Bitner, Ostrom, & Morgan, 2008). The human involvement in services causes interactions creating experiences. How a service receiver, or a user, experiences a service is a UX, which is also called service experience (Law, Roto, Hassenzahl, Vermeeren, & Kort, 2009). Creating a favorable experience is a way of creating extra value for a service (Bitner, Ostrom, & Morgan, 2008). Innovating services requires a look at the nature of services. Services are often designed as processes. A service process is a chain of actions performed by the organization that delivers the service for the service's realization (Bitner, Ostrom, & Morgan, 2008). Improving service processes has an impact on the way how service receivers experience it. Thus, the innovation of services entails adding extra value to the customer (Bitner, Ostrom, & Morgan, 2008). The addition of value can be multi-faceted through improving factors relating to service processes or customer experiences. Factors can be interpreted in a broad sense, for example, increasing the speed of service.

Now, with digital service innovation, the two fields of innovation of services and digital are combined again. Properties from both service innovation and digital innovation apply for this combined field. As digital innovation especially enables recombinant innovation, a new case of recombinant service innovation arises. Services can also be split up into components and be reconnected to fulfill other purposes (Cecere & Ozman, 2014). Beverungen, Lüttenberg, & Wolf (2018) apply the recombinant innovation principles to services. They continued to build on Frenken, Izquierdo, & Zeppini, (2012) figure, see *Figure 7: "Representation of possible innovation events in one period" (Frenken et al., 2012, p. 27).*, to create four recombinant innovation basic operations, see *Figure 8*. The four basic operations, as described in the Beverungen, Lüttenberg, & Wolf (2018), are; dissociation (1), association (2), addition (3), and internal and external resources (4).

1. Dissociation is using a specific component of an existing service to create a new one
2. Association is the creation of a new service by combining previously existing services into a new field of operation.
3. Addition is adding a service of components of a service to a newly created service.
4. Internal and external resources are the use of an external source to innovate the existing service through addition or association.

Beverungen, Lüttenberg, & Wolf (2018) propose that consideration of these basic operations improve the innovation process of new services.

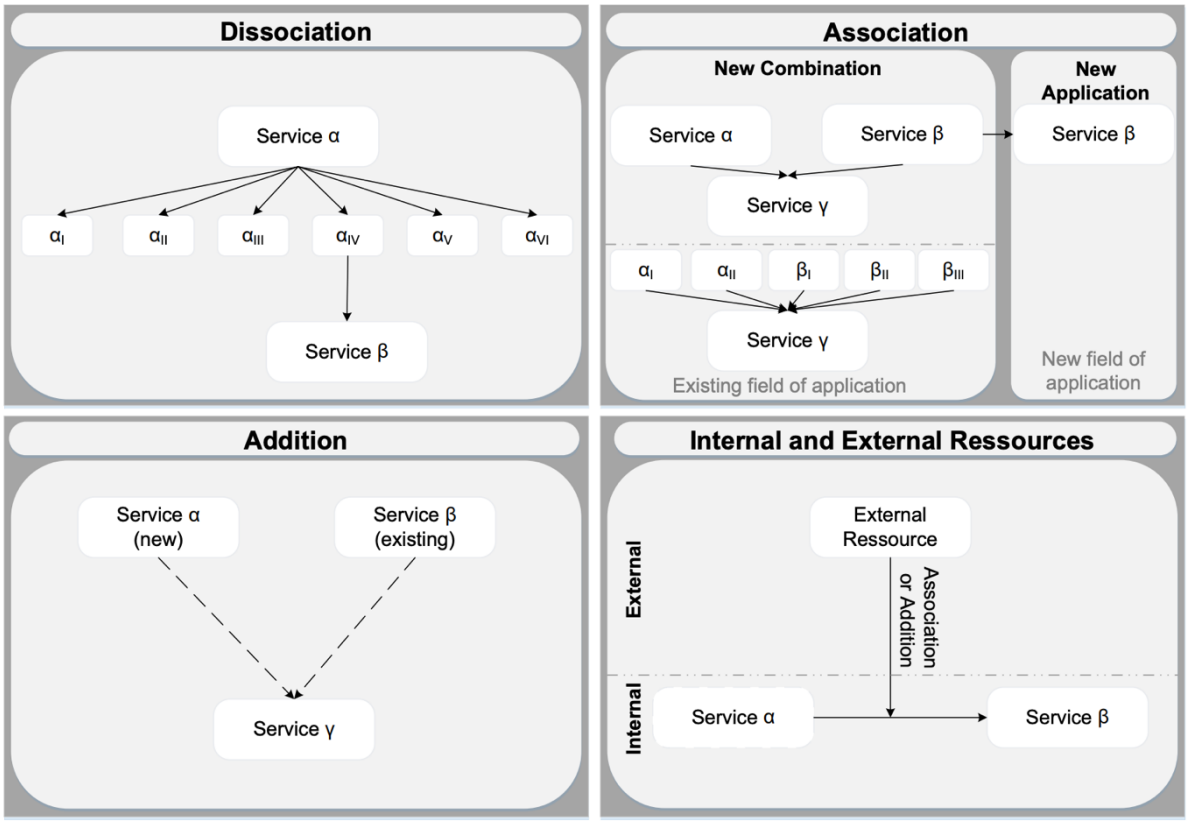


Figure 8: The four basic operations of recombinant (Beverungen, Lüttenberg, & Wolf, 2018, p. 139)

3.1.6 Innovation in the public sector

The last part of this section in the literature review is about innovation performed by the government. When performing innovation for public services, the government is inevitably involved as they are the service providers. Most scientific literature about innovation takes firms into consideration as innovation performers. Government institutions that inhabit products, services, and processes can innovate those as well. The non-focus on innovation within government context can be considered strange. Globally, large percentages of the nations' GDPs are formed through expenditure in their public service sectors [8]. Innovation is beneficial for governments as it can increase their effectiveness, satisfaction of service recipients, increased efficiency, and more citizen involvement (De Vries, Bekkers, & Tummers, 2016). Specifically, in the public service sector, innovation can lead to increased performance, increased public value, better response to user needs, and increased service efficiency (Mulgan & Albury, 2003).

[8] https://ourworldindata.org/government-spending

In the last two decades, a global turnaround is taking place that governments take an active standing in innovating its operations (Kamarck, 2004). Governments around the world are acknowledging the benefits of government innovations. The Digicampus is as well a prime example of that within the Dutch government. Nevertheless, innovation in the government is considered a complex endeavor (Kamal, 2006; Torugsa & Arundel, 2016). Kamal (2006) lists 42 critical factors for digital innovation adoption in the public sector. Ten years later, Torugsa & Arundel (2016, p. 412) argue for more future research *"to help build more robust models of innovation complexity in public sector organizations and the factors that lead to successful outcomes"*. Interestingly, Kamal (2006) is not cited in the Torugsa & Arundel (2016) paper.

While adopting new innovation approaches, specific barriers to innovation in the public sector can be recognized. From the systematic literature review of De Vries, Bekkers, & Tummers (2016), which analyzes innovation in the public sector, the following barriers can be recognized in four categories:

External barriers:

- Environmental pressures (media attention, political demands, public demands)
- No participation in networks and inter-organizational relationships
- Regulatory aspects hampering innovation
- Compatible agencies/organizations/states adopting the same innovation
- Competition with other organizations to do similar propositions

Organizational barriers:

- Lack of resources to perform innovations
- Leadership styles
- Risk aversion of involved actors
- No incentives/rewards for innovators
- Conflicts between organizations
- Organizational structures hampering innovation

Specific innovation characteristics:

- Ease of use of the involved innovation
- Relative advantage proposed by the innovation
- Compatibility to other contexts
- Trialability of an innovation in experiments

Barriers inflicting individuals:

- Little employer autonomy
- Bad organizational position of innovator
- Job-related knowledge and skills of innovator
- Lack of creativity of individuals
- Demographic aspects of individuals
- Commitment and satisfaction of employee in their current job
- Shared perspectives and norms of individuals
- Innovation acceptance by individuals

De Vries, Bekkers, & Tummers (2016) also argue that a barrier can be converted to an incentive for innovation.

Next, an important consideration is that the innovation landscape of government institutions performing innovations is different than in the private sector. From the literature, a couple of differences, which also have overlap with the defined barriers, can be listed that hamper innovation:

- Lacking reward system. A significant difference between the private and public sectors are the rewards granted when creating successful change. Government wages are often fixed with limited options for bonuses, thus the reward system is poor (Borins, 2001; Mulgan & Albury, 2003).
- Risk-averse behavior. Combined with lacking rewards, punishments for failure are often greater than in the private sector, due to the close watch of the media and opposition parties of government operations (Borins, 2001). This leads to the risk-averse behavior of employees (Mulgan & Albury, 2003).
- No venture capitalists. As government institutions fund projects themselves, no external parties use their resources to fund high-risk high-pay opportunities (Borins, 2001).
- Monopoly in service providing. Government institutions often have a monopoly in the services they provide to their citizens, making them the sole executioner having little incentive to renew or improve their services (Kamarck, 2004).
- Reluctancy towards shutting down existing bad-performing innovation programs. The public sector often has more employee protection policies making it harder to shut down bad-performing programs (Mulgan & Albury, 2003).

The literature also proposes solutions to the given barriers to innovation in the public sector. The following solutions were found:

- Experimentation with innovations allows testing of new ideas while containing the risk through allowing failure, enabling learning effects, and allows for discovery with fewer resources (Borins, 2001; Mulgan & Albury, 2003).
- Drawing information from a variety of sources for ideas for innovation and selecting them properly for continuation projects (Borins, 2001; Torugsa & Arundel, 2016).
- Create a workplace environment that stimulates individual and team creativity, with sufficient resources to perform innovation projects (Torugsa & Arundel, 2016).
- Allow innovative employees to gain recognition and award while protecting them from controlling agencies (Borins, 2001; Torugsa & Arundel, 2016).

To summarize, innovation in the public sector is dispersedly researched topic with lacking coherence. The two most recent papers that are widely cited agree. The research of De Vries, Bekkers, & Tummers (2016) argues that new empirical and theoretical knowledge is required to criticize and evaluate innovation performed in the public sector. This is similar to what the Torugsa & Arundel (2016) paper proposes, which is previously mentioned. The researcher notes that practical research or executional research for solutions is lacking. Therefore, the researcher would like to make a call for future research that involves the evaluation of applied solutions for innovation in the public sector.

3.2 Stakeholders and innovation

In this section, literature is reviewed that applies to stakeholders that are involved doing innovation. Collaboration of multiple stakeholders is inevitable while performing innovation in the Digicampus. Collaboration is also one of the key enablers to deal with the previously defined barriers proposed by the Digicampus.

3.2.1 Collaboration for innovation

An innovation landscape where knowledge flows freely between stakeholders creates links between the involved parties. When linkages become stronger between directly involved stakeholders, a new sort of community arises, called an 'Innovation Community' (Lynn, Reddy, & Aram, 1996). An innovation community can be highly productive to create ideas that are prone to adoption (Dahl, Lawrence, & Pierce, 2011). The innovation community fits into Chesbrough's model of open innovation. Previous known or unknown knowledge barriers are easily lifted through innovation communities. Sharing knowledge is within itself, a form of collaboration. Forming alliances for collaboration is proven to be successful in increasing the innovativeness (Ahuja, 2000). To keep the innovation community alive and thriving is the right usage of promoters and transformational leaders, collaboration within the community is crucial for successful open innovation (Fichter, 2009).

Sharing knowledge is not the only form of collaboration which boosts the successes of innovation. Experimentation can lead to the adoption of new ideas with excellent results if done correctly (Davenport, 2009). Collaborating for experimentation adds a new implication to the previous concepts of innovation communities and the quadruple helix model. As experimentation is not as simple knowledge sharing alone. An experiment is the test of a technical application in an enclosed environment. Performing experiments requires at least a simple testing plan and an idea on how to evaluate observations. Experimentation is beneficial for innovations as it enables learning opportunities over failures (Thomke, 2003). The effects of learning about an innovation contribute to how well the technology behind the innovation is, contributing in the end back to the innovation's potential success (Schilling, 2010, p. 71).

Searching and using new modes of experimentation can be an essential factor as well to increase the effectiveness of an innovation process (Thomke, Von Hippel, & Franke, 1998). The open collaboration through experimentation for innovation approach has the potential for success, but also comes with challenges. Open collaboration can be difficult when cooperators are a minority, free riders are present, diversity is lacking, or goods are rival (Levine & Prietula, 2013). The research of Levine & Prietula (2013) concludes from computational experiments that even within these conditions, open collaboration for innovation forms well and is likely to expand to other domains, then they researched.

3.2.2 Triple Helix and Quadruple Helix

The Dutch government seeks to implement a new approach for collaborating in innovation where there is a safe environment for experimentation (Bharosa, van Dokkum, Spoelstra, & Janssen, 2019). The government seeks to collaborate within multiple stakeholders in a quadruple helix model. The quadruple helix model is an adjustment to the triple helix model. The triple helix model is a model for innovation where knowledge flows between three defined parties, industry, government, universities (Leydesdorff & Etzkowitz, 1998). The main idea is that the collaboration between the stakeholders helps innovation in an upward cycle, hence the term helix (Etzkowitz, 2007). Figure 6 illustrates the triple helix with an added helix to form a quadruple helix model. The triple helix is used to prevent technology lock-ins (Leydesdorff, 2000). A locked-in technology is a technology stuck to a trajectory because of other influences (Spulber, 2002). Technology lock-ins can be perceived as harmful as it hampers innovation. In the case of lock-in, the current technology will not be disrupted by innovation.

This will increase the 'life-cycle' of a technology plenty fold. The three main parties that Leydesdorff defines that are responsible for innovation are the three defined parties. Putting them into a dialogue, creating a network between them should prevent technology lock-ins (Leydesdorff, 2000). Leydesdorff argues that active policymaking is needed in the triple helix model to prevent lock-ins. A downside of the triple helix model is that results from efforts of active policymaking are unpredictable, because of the complexity of the model (Leydesdorff, 2000).

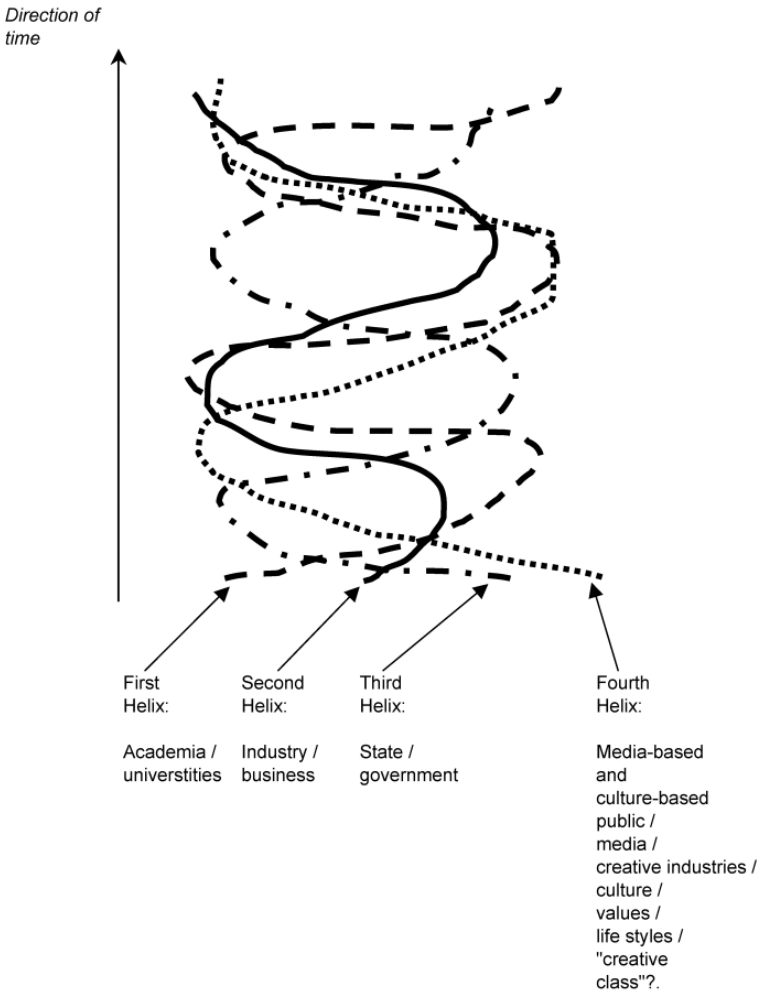


Figure 9: The conceptualization of the 'Quadruple Helix' (Carayannis & Campbell, 2009).

The theory of the triple helix has been applied to measure the knowledge base of the economies in the Netherlands and Germany in the papers of Leydesdorff & Fritsch (2006) and Leydesdorff, Dolfsma, & Van der Panne (2006). Leydesdorff & Fritsch (2006) uses Germany as a case that finds the medium-tech and high-tech manufacturing industry are the crucial denominators for the regional innovation system. The medium-tech manufacturing industry is the most important for the local knowledge-based economy. Leydesdorff defines that innovation processes differ per region. The geographical properties impact the innovation processes. It can, therefore, be argued that policy decentralization and focus on medium-tech manufacturing companies is beneficial for the knowledge-based economy. With the case of the Netherlands Leydesdorff et al. (2006) draws a similar conclusion. Although it is a difference between the two countries based upon the finer geographic distribution of regions, the Netherlands can be perceived as a national system of innovation. In contrast, the German can be perceived as a federal innovation system based upon the 'Bundeslanden' (Leydesdorff, 2012).

In the same paper, Leydesdorff argues that more dimensions can be added to the helix depending on the context where it is applied, creating an N-tuple of helices (Leydesdorff, 2012). In the case of Japan, solely stimulating the triple helix has not led to improvements in the innovation environment. Adding extra helices might strengthen the explanatory power of the helix models. In the case of Japan, this was internationalization (Leydesdorff, 2012). In the new Dutch approach, the public is the fourth dimension. The Digicampus paper uses the definitions for the quadruple helix model of Carayannis & Campbell. Carayannis & Campbell define the quadruple helix model as follows: the collaboration for innovations between government, businesses, the scientific community and adding users/civilians is the quadruple helix innovation ecosystem (Carayannis & Campbell, 2009). In this model, the fourth helix is defined as the 'media-based and culture-based public'. The fourth helix of Carayannis & Campbell can be primarily seen as the context in which innovation takes place with the public. The 'public reality' is shaped by media and culture and influences the national innovation systems back, creating an 'innovation culture' (Carayannis & Campbell, 2009). Implementing innovation policies and strategies influence the media system and, therefore, also the 'public reality' (Carayannis & Campbell, 2009). Carayannis & Campbell (2009) justify the use of their fourth helix based upon an unreferenced quote of Leydesdorff & Etzkowitz "That the triple helix model should help to display patterns of social structure". Therefore Carayannis & Campbell (2009) argue that adding the fourth helix can be helpful as an analytical tool for additional insights, hence increasing the explanatory power.

Leydesdorff & Etzkowitz (2003) argue that adding the public as the fourth dimension can be beneficial, but is risky as it denies the public as a foundation for the innovation. This statement is exciting as this contradicts Carayannis & Campbell's (2009) paper and Leydesdorff (2012) later paper. Adding a helix should help to increase the explanatory power when applied to analyze an innovation system. The precise definition of who and what is included in this fourth helix is still open for debate (Arnkil, Järvensivu, Koski, & Piirainen, 2010). Carayannis & Campbell also describe another perspective of the user in the quadruple helix model in their paper cited from von Hippel (2005). Citing from Carayannis & Campbell (2009): *"Interesting is also the concept of 'democratising innovation'. With this concept, Eric von Hippel (2005) proposes a 'user-centric innovation' model, in which 'lead users' represent 'innovating users', who again contribute crucially to the performance of innovation systems. 'Lead users' can be individuals or firms. Users often innovate, because they cannot find on the market, what they want or need."* This is similar to what Arnkil, Järvensivu, Koski, & Piirainen (2010) argue; the public is interpreted in the broad sense, where user-centric innovation approaches are an essential element in the Quadruple Helix model. The quadruple helix model is an innovation cooperation model in which the four parties collaborate to create innovations (Arnkil, Järvensivu, Koski, & Piirainen, 2010).

Arnkil, Järvensivu, Koski, & Piirainen's (2010) report constructs four models in applying the Quadruple Helix model, as they argue that the Quadruple Helix can best be perceived as a continuum with multiple dimensions. One of the recognized models, the public-sector-centered living lab model, has similarities with the Digicampus approach. Citing: *"The Public-sector-centred living lab model focuses on the development of public organizations and services. In this case, the owner of the innovation process is a public organization or a group of public organizations. The goal of innovation activity is above all to develop public organizations so that they can function better and offer new and better products and services to their clients, to the citizens."* (Arnkil, Järvensivu, Koski, & Piirainen, 2010). The participation of citizens is vital to create improved services in the model. The role divisions in the public-sector-centered living lab model are similar to the Digicampus as the public organization is in both the owner of the innovation system. Also, the goal of the public-sector-centered living lab model is similar to that of Digicampus to create better public services. The goal of the Digicampus is only broader as it aims to foster digital innovation in general within the Dutch e-government, and not only focusses on citizens. In the next paragraph, more is explained as there is zoomed in on the interaction between the helices.

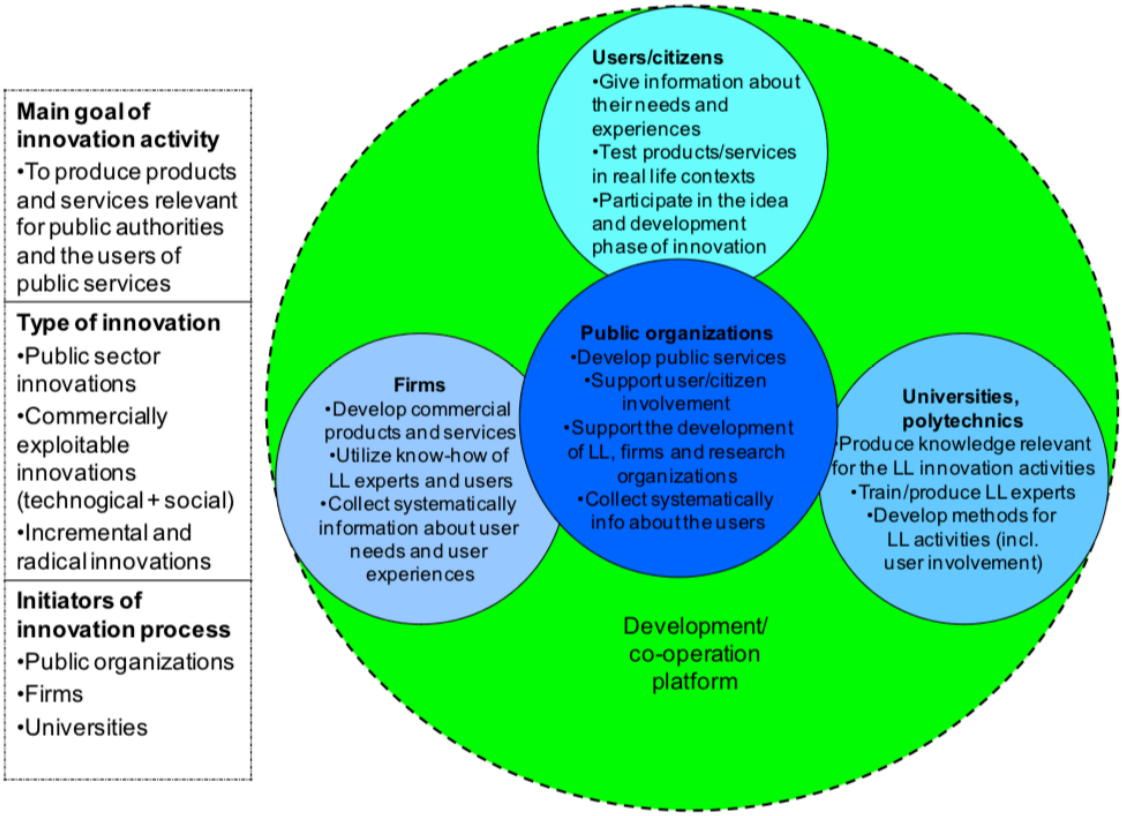


Figure 10: The public-sector-centred living lab model (Arnkil et al., 2010).

3.2.3 Co-creation

If helices in the quadruple helix model work together for innovation, co-creation takes place. In the literature, co-creation is defined as the active involvement of end-users to create extra value in the innovation process (Voorberg, Bekkers, & Tummers, 2015). The end-user in the government context can be considered citizens. So, the involvement of the 'fourth' helix is the definition of co-creation. In this thesis, a broader definition of co-creation is used. The chosen name for the experimental service of the Digicampus, the co-creation lab, contains the definition co-creation. For the co-creation lab, all the possible interactions between the helices should be included in the innovation process. Only involving the 'fourth' helix in the co-creation lab is considered uncomplete. Therefore, co-creation is defined as the following; the collaboration of different involved parties on equal terms to create added value to new/improved products, services, processes. The new definition ties co-creation to the quadruple helix model. The paper of Lee, Olson, & Trimi (2012) also proposes a broader definition of co-creation, with multiple involved stakeholders. Unfortunately, they argue that the customer or citizen is the most important one. Despite the citizen scope of most articles on co-creation, a benefit can be identified, which is also applicable in the new definition. Due to the involvement and active participation of other parties in the innovation process leads to the legitimization of the innovation (Voorberg, Bekkers, & Tummers, 2015). This helps in overcoming political barriers, which are especially relevant in a governmental innovation process, see *3.1.6 Innovation in the public* sector in this chapter. Even though the results of co-creation require further research, according to Voorberg, Bekkers, & Tummers (2015).

To enable co-creation, four elements are suggested; experience mindset, the context of interactions, network relations, and an engagement platform (Ramaswamy & Gouillart, 2010). Experience mindset and the context of interactions are focused on the citizen's scope of co-creation. The last two elements

allow for a broader interpretation. Ramaswamy & Gouillart (2010) propose with engagement platforms as sandboxes where a select group people collaborate for innovation through experimentation and sequentially learning from experiment results. Network relations are considered important as in who become involved in the engagement platform (Ramaswamy & Gouillart, 2010). The scope of the network in the Digicampus is already determined through the quadruple helix model, but enabling these helices to engage with each other in a platform is discussed in the next paragraph.

3.2.4 Innovation platforms

To enable interactions between stakeholders, a place that allows interaction is required. Such a place can be called a platform. A platform is defined in this thesis as a derivation of the digital platform definition of de Reuver, Sørensen, & Basole (2018) and Parker, Van Alstyne, & Choudary (2016). A platform is an enabler of the value-creation interplay among various stakeholders, and such an enabler can be either physical, virtual, or a combination of the two. A platform can have different adjectives to be focused on a specific target. The digital platform is a virtual platform enabled through hardware and software elements. This focusing on digital is similar to digital innovation, which *"is embodied in or enabled by Information Technology"* (Fichman, Dos Santos, & Zheng, 2014 , p. 330). The title of this thesis contains the focus of a platform towards innovation, an innovation platform. Even though defined for the agrarian sector, the definition in the paper of Adekunle, Fatunbi, & Jones (2010) describe the focus suited with the platform definition of this thesis; an innovation platform is a physical or a virtual forum which allows interplay and learning among stakeholders to enable joint problem diagnosis, joint exploration for opportunities, and research for solutions to fuel innovation in a selected expertise.

Establishing an innovation platform proposes a couple of benefits. First, Janssen & Estevez (2013) propose a concept of 'lean government'. Within the lean government concept, platforms can be used as communication means for creating a network that brings the right stakeholders to stimulate innovation. Proposed benefits in the lean government are 'doing more with less' through streamlining organizational processes through better stakeholder involvement and at the same time, stimulating innovation (Janssen & Estevez, 2013). To benefit from the created network government has to have an orchestrating role in forming the platform. This orchestrating role corresponds with the enabling factor for recombinant innovation of brokerage from Bessant & Trifilova (2017). Brokerage depicts stimulating fruitful interactions between stakeholders, which has direct links with involving stakeholders and using a platform as communication means. Thus, establishing an innovation platform holds the potential to make use of the advantages of recombinant innovation. Using recombinant innovation leads to new faster routes for innovation through combination, see *3.1.2 Recombinant* innovation.

In the lean government concept, the government is rebuilt as a platform where stakeholders can interact. The paper of O'Reilly (2011) depicts that a government as a platform should function like a bazaar. A bazaar is described as *"a place where the community itself exchanges goods and services"* (O'Reilly, 2011, p. 15). A successful bazaar offers a wide variety of goods and services where stakeholders can choose with whom to do business. Low entry barriers for stakeholders are essential, according to O'Reilly (2011), to foster innovations. Creating a set of stakeholders that are continuously interacting with each other for innovation can also be called; an innovation ecosystem. The term innovation ecosystem has recently become popular for governments (Oh, Phillips, Park, & Lee, 2016). Innovation ecosystems are described as: *"the complex relationships that are formed between actors or entities whose functional goal is to enable technology development and innovation"* (Jackson, 2011, p. 2). Literature discourages researchers from using the term innovation ecosystem as the prefix, eco-, adds nothing to its meaning and refers to a faulty analogy of natural ecosystems (Oh, Phillips, Park, & Lee, 2016). Therefore, this thesis moves away from the term innovation ecosystems and uses the term innovation platform.

The let the government function as a platform for innovation, O'Reilly (2011) proposes several steps for individual government agencies. The steps of O'Reilly (2011) are considered too focused on an individual government agency. The steps to function as a platform are put more in a general context:

- Share open APIs with the public.
- Build an architecture that allows disclosure of underlying data.
- Share work with other stakeholders.
- *"Don't reinvent the wheel: support existing open standards and use open-source software whenever possible"* (O'Reilly, 2011. p. 39). Use and reuse of others.
- Create an overview of available software applications from stakeholders as well as applicable external applications.
- Sponsor meet-ups and other activity sessions for stakeholder involvement.

The steps of O'Reilly (2011) are not yet tested but provide a concrete example of creating a platform for the e-government. These steps can proposedly to be taken into consideration to create the 'bazaar' for innovation, as depicted by O'Reilly (2011).

Lastly, an essential consideration for creating an innovation platform is that it has to be a long-lasting effort (Chan, 2013). Otherwise, an innovation created through the platform is a once-in-a-time utilized opportunity, with little impact on broader technology development and society (Chan, 2013).

3.2.5 Experimentation platforms and existent initiatives

An essential part of the definition of an innovation platform is; joint exploration for opportunities and research of solutions. Experimentation can be a vehicle to enable exploration for opportunities and solutions. As described previously in this section, experimentation is good for learning opportunities (Thomke, 2003), increases the effectiveness of innovation processes (Thomke, Von Hippel, & Franke, 1998) and is a proposed solution to overcome governmental innovation barriers (Borins, 2001; Mulgan & Albury, 2003). Experimentation is also considered crucially for success while adopting the lean government concept and utilizing the benefits of the concept (Janssen & Estevez, 2013).

Focusing the platform definition to experimentation results in the following definition; an experimentation platform. An experimentation platform is an environment where collaboration for innovation takes place focused on testing and prototyping in usage settings (Ballon, Pierson, & Delaere, 2005). This is also where a distinction can be made between the co-creation lab and the Digicampus. The co-creation lab is an experimentation platform, and the Digicampus is an innovation platform. An experimentation platform can thus be part of an innovation platform.

Experimentation platforms are not an uncommon sight, also often called innovation labs. Famous examples in the private sector are Microsoft Research, Google X labs, and Ikea's Space10 [9] [10] [11]. These experimentation platforms are mostly closed, as it is in corporate interest to not always share knowledge. A governmental experimental platform works differently than corporate innovation labs, as the public sector deals with different principles then the private sector (Hautamäki & Oksanen, 2018), and see *3.1.6 Innovation in the public* sector. Also, governments tend to skip experimentations of their created solutions, going straight from idea to implementation (Nambisan, 2009). Skipping the experimentation phase causes improper judgment of created solutions, making them less effective. So to say, creating an experimentation platform for experiments incorporating government innovation is beneficial.

[9] https://www.microsoft.com/en-us/research/

[10] https://x.company/

[11] https://space10.io/

In other countries than the Netherlands, the first initiatives for governmental experimentation platforms are already present. In Finland, the government set up the Kokeilun Paikka (Place to experiment)[12] to test out new policy ideas, often involving IT. The experimental platform is part of the Prime Minister's strategic 10-year vision to have an exploratory tool for new policies (Hokkanen & Kotipelto, 2018). Instead of a dictated top-down development process, the aim is to facilitate co-creation redefining the relation between citizens and government [13]. In Sweden, living labs are initiatives to create better, more user-centric digital services through user participation [14]. The definition of the living lab is as follows: *"a Living Lab is an open innovation environment in real-life settings in which user-driven innovation is the co-creation process for new services, products, and societal infrastructures. Living Labs encompass societal and technological dimensions simultaneously in a business-citizens-government-academia partnership"* (Bergvall-Kåreborn & Ståhlbröst, 2009, p. 2). User-centered design through user participation in a quadruple helix model is the focal point. The Finnish and Swedish platform models focus on co-creation in the one-dimensional view of only involving the citizens. The Digicampus, as described previously, while comparing it to the public sector-centered living lab model of Arnkil, Järvensivu, Koski, & Piirainen (2010), has a broader scope.

[12] https://www.kokeilunpaikka.fi/en/

[13] https://www.oecd.org/gov/innovative-government/embracing-innovation-in-government-finland.pdf

[14] https://www.sics.se/our-offer/sics/stockholm-living-lab

3.3 Involved technology

3.3.1 IT Infrastructures

Already mentioned before multiple times, a primary ingredient of the experiments to be conducted are IT infrastructures. IT infrastructures is the network of components of hardware and software modules needed to provide a digital service (Laan, 2017). The scope of what can belong to an IT infrastructure is extensive. A part of IT infrastructure can be as big as a datacenter or as small as a piece of code making the exit button work from, for example, a Windows program. The experiments from the co-creation lab are required as a try-out for ideas for the implementation of IT infrastructures on a small scale. That is to prevent going straight away to large scale components such as data centers.

An IT infrastructure that will be used for experiments is an Application Programming Interface (API). An API is a small piece of an application's interface used in another application (Chen, Annadata, & Chan, 2009). An API enables the usage of IT infrastructures created by others for one's application. An example of a widely-used API in the Dutch government is the API of DigiD [15]. DigiD is a verification tool for a person's online identity and is used widely for different governmental departments, such as the tax authorities, healthcare registrations, etc. The API of DigiD is used in multiple applications of different governmental departments. The usage of APIs enables recombinant innovation. Looking at the Waze example, in particular, multiple services from, for example, different governmental departments can be recombined in a new service.

3.3.2 Open Architecture and Model-Driven Architecture

Supposedly, IT infrastructures enabling connection with other IT infrastructures, create new possibilities for innovations. An overarching architecture for IT infrastructures is needed to enable this connection. An open architecture provides this. Open architecture allows users to reuse, upgrade, swap, and modify parts freely (Ericson, 2011). This freedom for developers and architects is needed to start up different experiments. It also enables recombinant innovation. Therefore, making the use of open architecture for governments is very beneficial: *"Open Architecture reintegrates IT within the more relevant context of tackling the demands of the public for better services at lower cost and the new working practices required to achieve the necessary change—rather, than as in the past, IT being seen as a means largely of automating existing processes. Open Architecture is about achieving meaningful improvements to the way government designs, delivers, and operates public services and the integral role of IT in helping with that transition"* (Fishenden & Thompson, 2012, p. 998). The openness of the government in this field is essential, as it directly contributes to recombinant innovation possibilities and, thus, to societal improvement.

For the ability to modify individual parts in an architecture, the architecture needs to be a component-based system. A component-based system is a system that exists out of pre-developed and combinable components (Janssen, Wagenaar, & Sharpe, 2006). A component in a component-based IT system can also be called an IT 'Building Block'. Focusing on specific components in the architecture for modifying leads to reduce costs, allows to reuse them for other purposes, and increases development speeds (Janssen, Wagenaar, & Sharpe, 2006). A primary problem that arises when adopting a component-based system is appropriate notation of the underlying architecture (Garlan, Monroe, & Wile, 2000). Proper notation enables developers to edit and improve components of the system (Garlan, Monroe, & Wile, 2000). An example of a notation is UML. Janssen, Wagenaar, & Sharpe (2006) propose a method to evaluate existing organizations' IT systems to evolve towards a component-based system. The method was considered in their case study about Dutch municipalities, but further research is required for implementation (Janssen, Wagenaar, & Sharpe, 2006).

[15] https://www.digid.nl/

The Dutch government can also use Model-Driven Architectures (MDA) and Model-Driven Development (MDD). Model-Driven Architecture is an IT architecture that makes use of prewritten source codes, called models (Mohagheghi, Dehlen, & Neple, 2009). An MDA can be considered an approach for making a component-based system (Jézéquel, Defour, & Plouzeau, 2003). However, components in component-based systems have a broader scope then models; for example, a component can also be a combined set of models (Schmidt, 2006).

To create a Model-Driven Architecture, the models should be compatible to enable connection with each other to form the IT architecture. The models are the 'IT building blocks' of the architecture. Building a Model-Driven Architecture is Model-Driven Engineering (MDE), MDE is convenient as it hides the complexities of straightforward machine coding (Schmidt, 2006). This allows developers to reach a higher level of abstraction and to be able to deal with more complex systems (Kleppe, Warmer, Warmer, & Bast, 2003). The Model-Driven approach is also opting for chances for non-IT organization, enabling them to create IT architectures. Developing such systems based upon models is called Model-Driven Development. Current platforms to use MDD are Object Management Group's (OMG) Model-Driven Architecture and Unified Modeling Language's (UML) xUML (Mellor, Balcer, & Foreword By-Jacoboson, 2002; Soley, 2000). Another well-known platform that offers models to create a Model-Driven Architecture is Mendix [16]. Mendix is a platform that allows small businesses to make use of prefabricated models to create information systems. The tool is highly efficient for developing web-based information systems of medium complexity for smaller companies (Henkel & Stirna, 2010).

The quality of the models used in an MDA is essential as they make up the architecture. A wrong sequence of models will result in a bad MDA. Based on the literature review of Mohagheghi, Dehlen, & Neple (2009) paper, there is a 6C quality framework to assess the quality of each model. The 6C quality framework incorporates Correctness, Completeness, Consistency, Comprehensibility, Confinement, and Changeability. Following the quality framework will improve the usability of the models in an MDA. User-Experience (UX) for MDA should be taken into consideration as a wide variety of users will be recognized in the quadruple helix model. Nowadays, with other already existing MDA (e.g. UML, SysML) the complexity and lack of linkage with domain experts are challenges in the UX design (Abrahão et al., 2017). Overcoming the challenge beforehand and moving to a more user-driven approach seems a future solution for the problem, but is also still a challenge (Abrahão et al., 2017).

[16] https://www.mendix.com/

3.4 Chapter conclusion

3.4.1 Answering research sub-question 1

- How do the literary subjects elaborate on the challenges that are attached to the research problem?

The answer to this research sub-question contains six parts. The recognized challenges written in the problem definition, see
2.1.1 Problem definition, structure the answer.

The first challenge is that the research on innovation in the public sector is still meager (De Vries, Bekkers, & Tummers, 2016). The literature review shows that there are multiple scientific articles available on the topic. However, in the articles the defined innovation barriers are not unambiguous. This is observable in the literature review, where defined barriers have multiple sources. Another finding from the review of the literature is that innovation is a widely researched topic that differs per context. Therefore, differences arise which are observed in the explanations of meaning-driven innovation, digital innovation, service innovation, and recombinant innovation. The new combination of these different contexts in the co-creation lab, therefore, also form the contribution to the literature. The approach of the co-creation lab is novel in itself and is a new piece in the literature about innovation in the public sector. Also, the literature review brings innovation definitions newly towards the public sector, such as digital innovation, service innovation, and recombinant innovation

Second, the adoption of the quadruple helix is a challenge. The quadruple helix is a further deliberation of the triple helix model in which a 'fourth' helix, which is the citizens and end-users, is added to the triple helix. Carayannis & Campbell (2009) argue that adding the fourth helix can be helpful as an analytical tool for additional insights. However, multiple papers describe the fourth helix differently. The user and its role in the quadruple helix should be defined well. Otherwise, it can hamper innovation, causing it to be of little added value to deviate from the 'simpler' triple helix model. The current Digicampus is similar to that of Arnkil, Järvensivu, Koski, & Piirainen's (2010) public-sector-centered living lab. In the public-sector-centered living lab, citizens are vital for the improvement of digital services. However, within the Digicampus, the role of the 'fourth' helix is still ill-defined as it focuses more on supporting innovators. The definition of the 'fourth' helix is essential in adopting the quadruple helix successfully and should be a point of attention. Lastly, a challenge to overcome in adopting the quadruple helix is the unpredictability, which is caused by the different properties of the helices (Leydesdorff, 2000).

Third, to enable co-creation, a collaboration between the involved parties is required. Equal involvement of all parties results in extra value for created innovations and helps to contribute to the legitimization of the innovation process. The last implication helps to overcome innovation barriers in the public sector. Enabling co-creation means fostering collaboration between involved parties. To do that, the researcher suggests using two elements from Ramaswamy & Gouillart (2010): network relations and an engagement platform. The elements are realizable through an innovation platform, which physically or virtually connects parties to enable co-creation.

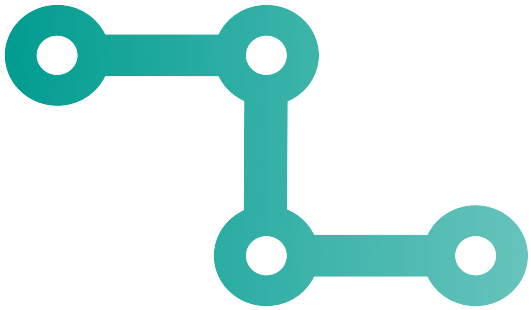
Fourth, the requirements to perform experiments is a challenge. As described before in
2.1.1 Problem definition, collaboration is required to perform experiments. When multiple parties are involved in performing experiments, co-creation takes place. Performing experiments thus has an implication on the parties involved. An enabler for performing experiments is setting up an experimentation platform. An experimentation platform is an environment where collaboration for innovation takes place, focused on testing and prototyping in usage settings (Ballon, Pierson, & Delaere, 2005). Testing and prototyping are also similar to the cyclic adaptation of Bessant & Trifilova

(2017), where the lean-start up method depicts the same. Therefore, recombinant innovation is linkable to the experiments conducted within the co-creation lab. Literature substantiation is missing on the topic of performing recombinant innovation in the public. Nevertheless, the three routines of Bessant & Trifilova (2017) can be considered to enable recombinant innovation.

The fifth and sixth challenges address the technology involved. The involved technology is Information Technology. Recombinant innovation is especially relevant to IT due to the re-programmable, homogenous, and self-referential nature (Yoo, Henfridsson, & Lyytinen, 2010). Component-based IT systems form a solution to enable the use and reuse of IT innovations because they allow focusing on components within the system for adjustment. A requirement to enable recombinant innovation in a component-based IT system is that there is an open architecture, which allows parts to be reused, upgraded, swapped, and modified. However, the notation of component-based IT system is essential in order to make it editable.





Chapter 4: Discovery with qualitative interviews

In this chapter, the initial interviews will be elaborated upon. The first phase, discovery, will be completed in this chapter. There will be discussed what content will be gathered, who is interviewed, and what results are after the interviews are conducted. Sub-question 2 and 3 will be answered in this chapter.

Chapter content:

4.1 Interview setup

4.1.1 Goal and content

As explained in chapter 2, there are three goals for the interviews. There are three definable goals for the interviews. First, the interviews discover the expectations of the co-creation lab and its experiments from the people close and involved with the Digicampus. Second, different IT infrastructures suitable for experimentation and of importance to potential use cases are discovered. Third, the interviews should identify use cases and provide a knowledge basis to formulate use cases. In this process, it should become clear what the primary users of the co-creation lab are going to be. The following results are obtained according to phase 1 (minus the literature review):

- Interview transcripts
- Expectations of the people close to the Digicampus
- List of IT infrastructures relevant to potential use cases with basic properties
- Identified use cases
- List of primary users in the use case

Interview transcripts are created from the conducted interviews. The interview transcripts are the primary source of data in this phase. The data is the basis to derive the other four results. Further deliberation on the results that the researcher wishes to obtain is within the following list:

1. Interview participants have expectations of what the co-creation lab should achieve. Within their expectations, the interview participants will have ideas on how an ideal innovation journey would look. The ideas on ideal innovation journeys will provide insights into what the 'experimenters' need to conduct experiments.
2. A list of IT infrastructures is needed to perform the experiments. This list will be the objects/actions which the actors interact/perform with in the use case. These will be the 'blocks within the box' according to the UML guidelines (Fowler & Kobryn, 2004).
3. Identification of two experiments that will be used to create use cases. Through interviews, two exemplary experiments will be searched for that can be used for the use cases.
4. The list of the users that are involved in the use cases. The primary users are the actors in the use case.

These four results will be the main drivers for the questions' topics that will be used in the interview. In the following paragraphs, there will be a further elaboration on the interview setup.

4.1.2 Interview method

The chosen manner of gathering data is semi-structured interviews. The combination of structured and unstructured is needed as there is a clear goal on what topics should be discovered while the direction is still unclear. Conducting a solely structured interview might miss essential insights that are essential for the use case (Sekaran & Bougie, 2016, p. 114). A fully unstructured interview might miss the structure and/or basic knowledge needed to build to use cases (Sekaran & Bougie, 2016, p. 114). Semi-structured interviews are the balance. Data collected from the interviews will be qualitative. To support the value of the qualitative data, the interviews will be conducted face-to-face. With semi-structured interviews, preformulated questions need to be able to be adapted on the spot to the context in which the interview is conducted. Face-to-face interviews not only allows the research to adapt better to the context of one particular interview, but it also enables the researcher to pick-up non-verbal cues (Sekaran & Bougie, 2016, p. 120). The choice of face-to-face interviews should, therefore, increase the value of the data. In order to obtain qualitative data, the interviews are recorded if the participants give their consent. From the recordings (or directly if the participant refuses the recording), an interview

transcript will be created. The transcripts made after the interviews are sent to the participants for validation. Participants will be asked to check the transcripts for irregularities. Irregularities will be corrected. The transcripts will be added as a supplement to the master thesis document and will not be included in the appendix.

In order to conduct viable scientific interviews, appropriate literature is consulted. To create a structured method for interviewing the interview guidelines of Baumbusch (2010), Whiting (2008), and Rowley (2012) are used. Whiting and Baumbush divide the interview into stages; Whiting describes six stages and Baumbusch five. Baumbusch's five stages primarily focus on the build-up on the interview. The five stages of Baumbush show a build-up of first creating rapport, followed by slowly building-up the difficulty of questions and then slowly decreasing the weight of the conversation (Baumbusch, 2010). Whiting's stages also show the same structure where there is an emphasis on slowly building more trust and so gaining more interaction from the participant. From the book of Kvale & Brinkmann (2009), an interview can be perceived as a conversation, and the interview should also be treated as such. Rowley (2012) argues that to start a conversation properly, the introduction of the researcher and its research is vital. The build-up approach in stages will be incorporated in the interview set-up, and the importance of conversation an as interview will be considered. Therefore, the following items will be put in the interview.

- Starting with 'Coffee chit-chat.'
- Asking what the participant does and how he/she is affiliated with the Digicampus to build up trust.
- Introduction of researcher and his research.
- Slowly increase the difficulty of questions.
- After the most difficult question, the difficulty will decrease with easier questions.
- Final 'chit-chat' after the interview.

For the interview also, a set of ethical guidelines should be taken into consideration. Whiting (2008) proposes a checklist in which the most important points are elaborated upon. As the interviews are planned to be recorded, the participant must give their consent. In order to not forget essential points, the checklist is used. Also, according to TU Delft guidelines, a form of consent will be given to the participant. In *Appendix 5: Consent Form for Master thesis of Koen,* the consent form is shown. The participant can choose in this form if he/she gives consent to the interview and how the collected data is used in this thesis considering privacy. Thereby the participant will have informed consent before the interview. If the name of the participant is disclosed in the thesis, the participant agreed upon that.

BOX 3

Checklist of points for explanation before an interview

- Purpose of the interview.
- Clarification of topic under discussion.
- Format of the interview.
- Approximate length of interview.
- Assurance of confidentiality.
- Purpose of digital recorder – ask permission to use it. Explain who will listen to the recording.
- Assure participant that he or she may seek clarification of questions.
- Assure participant that he or she can decline to answer a question.
- Assure participant that there will be opportunity during the interview to ask questions.

(Adapted from Rose 1994)

Figure 11: Box 3: Checklist of points for explanation before an interview (Whiting, 2008)

Rowley (2012) argues that a semi-structured interview can have multiple forms and adaptations, with usually 6 to 12 questions. The interviews should be between 30 and 60 minutes (Rowley, 2012; Whiting, 2008). In this research, these guidelines will be used in order to make the interview design. In the interview design, topics based upon the wanted results will be used as the common thread. From these topics, questions will be derived. 6 to 12 questions based on the topics will be created beforehand. As the topics are leading in the interview design, this generates freedom for the questions. The questions can be altered based upon the context, or additional questions can be added if needed. It is chosen to deviate from the grounded theory methodology from Corbin & Strauss (1990). Grounded theory depicts that the interview protocol should be altered based upon the results of each interview (Corbin & Strauss, 1990). As the topics of the results of the research sub-questions are already known beforehand, these topics will be the leading in the interview, see *4.1.4 Topics interview*. This will cause the interviews to become more rigid, but ensure better that the wanted results are obtained. To ensure the researcher's adaptability to the context of each interview, examples from previous interviews will be used to support the discussion topics. Questions might slightly change in this process to ensure a a proper answer will follow.

To ensure the engagement of the participant, other techniques of interviewing can be deployed in which the researcher can be creative (Rowley, 2012). In this research, a tool will be deployed in which the participant is asked to perform a task. In line with the results discussed before, the participant will be asked to create and continuously draw an innovation journey of an innovation in their organization. How this will be conducted and why this is relevant will be discussed in *4.1.4 Topics interview* within this chapter. The goal is to engage the participant with an example he/she experienced. While reconstructing the journey, the participant will be asked to 'talk-aloud'. This creates an extra dimension in the interview besides discussion, and it should boost the engagement of the participant.

A final step to ensure the conducted interviews are documented accordingly is that the created transcript will be sent to the participants. Each transcript will be sent to the matching participant. The participant will be asked to read the transcript to validate the transcription. The participant can alter their spoken words in the transcription if they disagree with or to improve their explanation. This will be an extra step to ensure the participant's consent to the processing of the information from his/her interview.

Lastly, if information is missing during the analysis or requires a further declaration, the researcher will try to gain contact with the participants via email to obtain extra information.

4.1.3 Interviewee identification and justification

There is chosen for judgment sampling; this strategy allows freedom to choose subjects according to their qualification to the research problem (Sekaran & Bougie, 2016, p. 255). The researcher chose to interview 4-5 people. Participants are chosen upon their experience and suitable knowledge to the co-creation lab. The choice for a small number of people is mainly because of time limitations. Some stakeholders are already known from the beginning of this research, as they are directly involved in the Digicampus. Experience and suitable knowledge should be based upon the interviewee's involvement in other Dutch governmental digital innovations. The target group should include technical developers and business developers who are directly involved with the Dutch e-government. This creates two different perspectives in the results obtained. Not only will this be a basis for two different use cases, but it will also generate extra insights through data triangulation. Data triangulation is the usage of multiple perspectives to approach a research problem (Sekaran & Bougie, 2016, p. 106). The choice for these interview participants is generalizable to other governments as well, because different e-government also has a group of people supporting and developing it. This is just a scoop of the Dutch e-government. In *Table 2,* the choice for whom and why is described. Names in this thesis are disclosed with the consent of the interviewees.

#	Name/ Appointed function	Organization	Position	Justification
1.	P1	Logius	System architect	P1 is a system architect for Logius. His long experience in system architecture for IT systems will be essential to understand what experiments with IT infrastructures include.
2.	J2	Logius	Business Consultant	J2 is a business consultant for Logius. He seeks new business opportunities for Logius. As Logius is involved with the creation of the Digicampus, J2 is as well. J2 will be able to proclaim the business perspective on experimentation and the innovation platform.
3.	T3	Digicampus	Innovation engineer	T3 is the 'quartermaster' of the Digicampus within the Dutch Ministry of Internal Affairs. T3's responsibility is to set up the first operations of the Digicampus. T3's know-how will prove vital for the research as she not only created the first operations of the Digicampus, she knows the initial ideas on how the Digicampus should operate. She will be able to proclaim the perspective of the Digicampus in this research.
4.	M4	Novum (SVB)	Technical developer	M4 works for Novum, the innovation lab of the Dutch Social Security Bank (SVB). M4 is not yet involved with the Digicampus, but knows its existence and what it does. In the future, Novum and Digicampus will collaborate with experiments. His experience and knowledge as a technical developer for public services is essential to understand what the experiments will include. M4 has more distance to the Digicampus. Therefore, he can show an outsider's perspective on the topic.
5.	A5	Rijksdienst voor	System Architect	A5 works for the government office of identity data (RiVG). This office is part of the Dutch ministry of internal affairs and

		Informatie Gegevens (RiVG)		is responsible for the identity data of Dutch citizens. A5 is responsible for the implementation of a big innovation process conducted by the office. In the nearby future, A5 will start a collaboration with the Digicampus to conduct experiments. A5's insights as he will be an important client in the near future and is an outsider to the Digicampus. His perspective will contribute to understanding what the Digicampus and the co-creation lab should offer to future collaborators.

Table 2: Overview of interviewees

As the native language of all participants is Dutch, including the researcher, the interviews will be conducted in Dutch. The transcripts will, therefore, be in Dutch as well.

4.1.4 Topics interview

The topics that will be discussed are based upon the research sub-questions that need answering and the results that should be obtained. From the research sub-questions, a brief explanation will be given what approach of questions will be used in order to answer them.

- What are the expectations of the people close to the Digicampus using the co-creation lab as a platform for performing experiments?

A wide variety of users will use the experimental platform of the co-creation lab. Users that want to perform experiments have needs and wishes. To facilitate the right utilities to these users for experimentation, the current innovation journey within the Dutch government has to be discovered. The people that are close to the Digicampus are also potential users. Therefore, the identified participants have to be asked what they need to perform a successful innovation journey and what they require to perform experiments.

- What are the different governmental IT infrastructures that are eligible for the experimentation in the co-creation lab?

There is no complete overview of what is needed to conduct experiments with the governmental IT infrastructures. The different IT infrastructures developed in each department might not share the same computer-coding language. This means that the integral usage of IT infrastructures is difficult. For example, the IT infrastructures of the Dutch tax authorities might not be able to communicate with an IT infrastructure of the Ministry of Justice. To discover what IT infrastructures are eligible for experimentation, technologies that are going to be used in Digicampus context will be searched for and assessment on what kind of innovation takes place in the Digicampus. The full technology assessment of the IT infrastructures is not in the scope of this research. However, answering this research sub-question shows which technology is involved in the experiments and can help a future assessment for changes in the underlying technology.

Together with the insights of the sub-questions, there is also a set of results that needs to be obtained to move to the next phase. The deliberation on the results are already described in *4.1.1 Goal and content*. The insights and the results that are wished to be obtained are merged to create the following four topics. The topics are the guidelines to create the questions.

1. Innovation Journey
2. Requirements
3. Use case identification
4. Users

Innovation journey (1) will be the primary topic of discussion to answer the sub-question 2 and to obtain the results 'Expectations of the people close to the Digicampus'. The innovation journey can help to assess problems and needs from participants while innovating what can reveal their wishes. The degree of implementation of an innovation is bound to certain levels. In this research, the level 5 'Integration' of Hall, Loucks, Rutherford, & Newlove (1975) is used. Which describes integration as a 'state in which the user is combining own efforts to use the innovation with related activities of colleagues to achieve a collective impact on clients within their common sphere of influence' (Hall et al., 1975). The user, in this case, is the final end-user of the innovation.

In this topic, participants are asked to draw a current journey of an innovation within their organization. The journey will show the participants' perspective on how an innovation is created and implemented. The drawing of the journey will be the start of the interview after the introduction to gain more engagement of the participant. The journey will be the basis for the next questions of other topics as well. For example, how their drawn innovation journey could be improved according to them. In order to help the participant, a template of 'steps' in the innovation journey is given. The participant has the freedom to fill the boxes in, draw arrows between the steps, and create new steps. Level 5 of Hall et al. (1975) is used as a guideline to mark the end of the innovation journey. The template is given in *Figure 12: Template of innovation journey*.

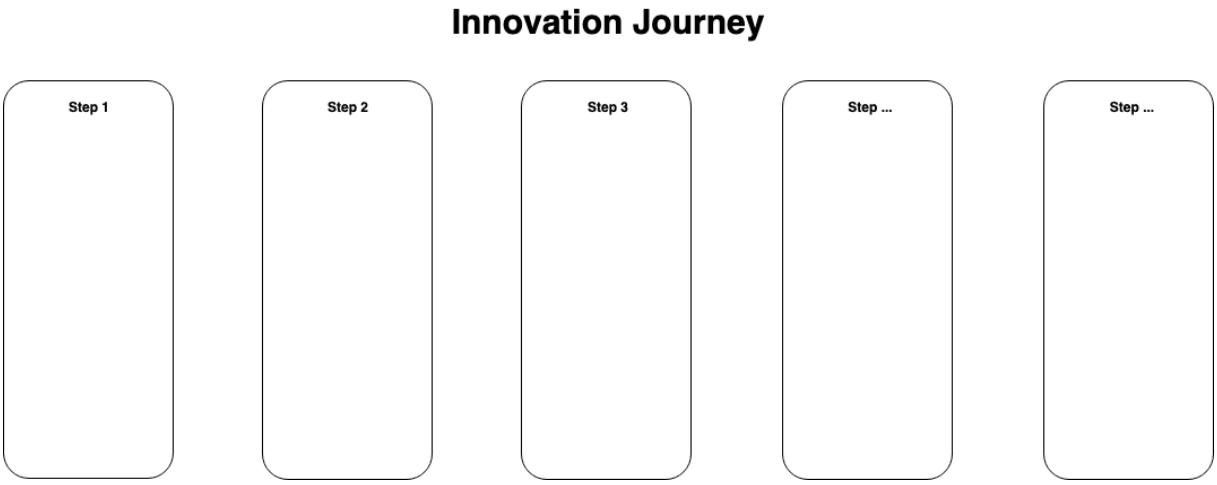


Figure 12: Template of innovation journey

Drawing an innovation journey is a complex task as there are multiple levels of impact an innovation can have. As previously deliberated upon during the literature review, there are four types of innovation, technology-push innovation, market-pull innovation, technology epiphanies, and meaning-driven innovation (Norman & Verganti, 2014). The matrix of Norman & Verganti will be used in order to assess the innovation chosen for the innovation journey. This works both ways the interview participant is urged to choose an innovation that fits within the matrix. The matrix is thereby a guide for the participant.

Unfortunately, the innovation matrix of Norman & Verganti does not assess how complex an innovation is. High levels of innovation complexity influence the innovation journey in that it becomes more elaborate, requiring more processes are involved for adoption (Torugsa & Arundel, 2016). The participants will be asked to give a value judgment on the chosen innovation's complexity. There are five defined levels.

Easy innovation	*Slightly complex innovation*	*Neutral complex innovation*	*Complex innovation*	*Highly complex innovation*

Table 3: Different levels of innovation's complexity

The value judgment can be made through the emotion of the participant to the chosen innovation or (if the participant asks) based upon the exemplary criteria found in the literature:

1. The perspective of uncertainty and fear of failure (Gopalakrishnan & Bierly, 2001)
2. The existence of multiple dimensions (number of components involved) (Goffin & Mitchell, 2005)
3. Interdependencies (Borins, 2001; Fritsch & Meschede, 2001)

The requirements topic (2) will be the topic to answer sub-question 2 & 3, and to obtain the following results; list of IT infrastructures relevant to potential use cases with basic properties, and the wishes of stakeholders. In this topic, it is essential to capture the participants' view on what is required for the implementation of the innovation. The already drawn innovation journey can be used as a case to answer this question if the participant struggles with the question. To think beyond the drawn case is highly encouraged in the interview. The primary issues to be discovered are what is required organizationally and technically for a successful innovation journey.

Use case identification (3) topic will be used to obtain the result; identified use cases. In the final topic, the participant will be asked in what way an experiment for innovation can contribute to the given innovation journey. A small brainstorm of a representative experiment will be held in order to find a use case.

Users (4) topic will be the topic to obtain the last result; a list of primary users in the use case. In this topic, the participant will be asked who is involved in the innovation journey. The drawn innovation journey can be used as an exemplary case, but another fictional case of the Digicampus can be used as well.

4.1.5 Formulation of questions

The full interview design with a complete overview of the question can be found in *Appendix 3: Interview design*. Questions are derived from the topics. Exemplary follow-up questions on pre-defined questions are written down as well. The guidelines of Rowley (2012) and Whiting (2008) are used, resulting in 9 questions, and an interview approximated to take 45-60 minutes.

For the flow of the interview, the build-up from Baumbusch (2010) is used. The build-up is used to create good rapport with the participants and involve them better in the interview through the intensity build-up. Good involvement and a good rapport should result in high-quality qualitative data. The first question *'What are recent innovations that the organization that you work for created?'* is an easier question for the participant to familiarize with the questions' topics through his/her own experiences. Next, the participant will be asked to draw the innovation journey. Based on the innovation journey, more difficult questions will be asked to explore the context of the chosen innovation. The Norman & Verganti (2014) matrix is used to determine what kind of innovation is chosen by the participant. The matrix will not be shown directly to the participant, as the matrix might be too complex for the participant to understand directly. Instead, questions will be asked to determine where the chosen innovation of the participant is within the matrix. If the context allows so, the matrix is shown to the participant. If the participants know or understand the matrix directly, it will be used to answer the

question. The answers going in-depth about the innovation journey are considered the most difficult questions, as they are the most abstract. To lower the intensity of the interview, the topic will move on to the next topic; use case identification. The question *'How would an exemplary experiment in the Digicampus look like according to you?'* is asked. As all participants are familiar with the Digicampus the question should be easier, as the question is less conceptually and more realistic. The last question 'Who is involved in the process?' is an easy tangible question as the participants are busy with the Digicampus on a daily basis they know who is involved. The build-up is shown in *Figure 13: Interview intensity overview*. Intensity is defined as a combination of the weight of the conversation and the difficulty of questions.

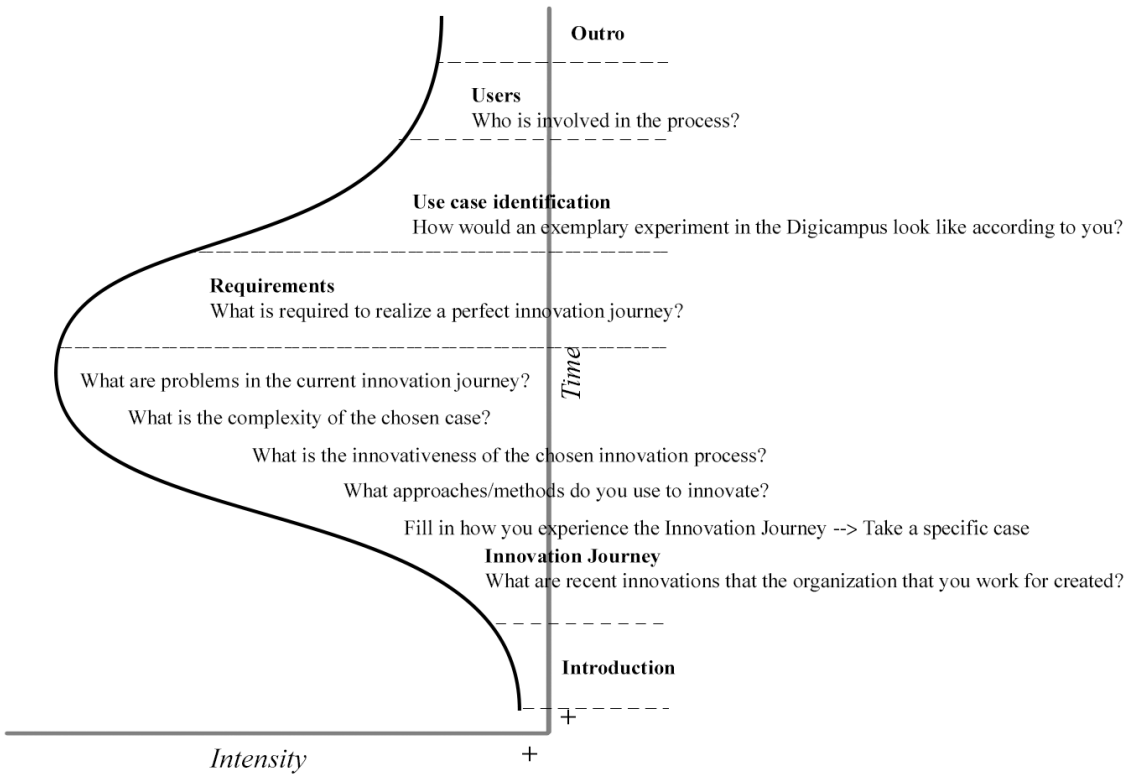


Figure 13: Interview intensity overview

4.1.6 Analysis method

The final step after the interviews are conducted to process all the data. The audio from the recordings will be converted to text. The text is used for further analysis. Rowley (2012) prescribes four stages in which qualitative data is processed, organizing the data set (1); getting acquainted with the data (2); classifying, coding, interpreting the data (3); presenting and writing up the data (4). The process of codification normally has three stages, open, axial, and selective coding (Corbin & Strauss, 1990). A code is a conceptual label to a phrase from the text which represents a specific meaning (Boeije, 2009). The methods of Corbin & Strauss (1990) and Rowley (2012) have a slight overlap. Both methods will be merged to get a structured method to conduct the analysis. The method of Rowley is leading in which the codification process of Corbin and Strauss is intertwined. ATLAS.ti software will be used to support the codification and analyze the interview transcripts. As the text in the interview transcripts is Dutch, and this thesis is English, the codification process will use the English language for codes.

Organizing the dataset (1) will be done while converting from audio to text. The text files and the drawings made during the interviews will be uploaded to an ATLAS.ti file to create an overview of all

the data. Getting acquainted with the data (2) is the first read-through to get initial ideas of the results. In this phase, open coding will take place. Open coding is the recognition of the first key themes in the transcripts. A part of the key themes is already defined through the interview topics. Other key themes are added if recognized in the open coding process. These key themes will be categorized into code categories. The organization of categories and subcategories will be the first step in the search for patterns and relations (Sekaran & Bougie, 2016, p. 337). Classifying, coding, interpreting the data (3) is the codification process of the gathered data. Here, axial coding and selective coding will take place. Axial coding is the second step in which the level of abstraction increases and the codes are merged, categorized, and sub-divided. The key themes from the interview question are further specified, and applied to analyze the gathered data. Categories and subcategories will be further broken down. Next to the final step, selective coding will take place in which the theory is built from the recognized codes and code categories to answer the research questions. Presenting and writing up the data (4) is the last step in the analysis. First, the codification process will be displayed in a table. Next, summarizing tables will be made from the interview transcripts, which is a representation of the bulk of data. In the last part of this chapter, research questions will be answered.

4.2 Interview results

4.2.1 Interview process reflection

The overall process of the interviews went according to the plan of the researcher. The ethical committee of the TU Delft permitted the interviews. In *Table 4: Interview process data*, a brief overview is given of the simple quantitative data obtained during the interviews. *Appendix 8: Interview reflection*, further deliberates about the process of conducting the interviews.

Interview #	Date and time	Location	Name	Duration (hh:mm:ss)	# of transcribed words
1.	13:00 5-7-2019	The Hague	M4	01:14:18	9862
2.	13:00 9-7-2019	The Hague	J2	00:46:45	6672
3.	15:00 9-7-2019	The Hague	T3	00:39:56	6413
4.	13:15 12-7-2019	The Hague	P1	00:56:44	7667
5.	11:45 23-7-2019	The Hague	A5	00:35:06	5265
Total	-	-	-	04:12:49	35879

Table 4: Interview process data

4.2.2 Codification process

To subtract the data to answer the research question and create the use cases, the analysis method is used as described before. The codification process as part of the analysis method is displayed in *Table 5: Codification process: open coding*, *Table 6: Codification process: axial coding*, and *Table 7: Codification process: selective coding*.

Phase	Number of quotes	Number of categories/ sub-categories
Open coding	498	9 / 11
Approach and examples		
The first code categories are based upon the interview topics and the interview questions. Some of the code categories are broken down into subcategories. This is done according to exemplary follow-up questions and question's subdivisions. Each question is considered to form code categories. For example, the participant is asked to draw an innovation journey and which approaches/methods are used. One code group is created for *Innovation Journey*. Each step the participant describes is categorized under the code category *Innovation journey: steps*. Methods used in the innovation journey are categorized in *Innovation journey: Methodology*. While coding, the researcher recognized that there are, besides different methodologies, also different organization forms to perform innovations. A different subcategory is added to the innovation journey category: *Innovation Journey: Organization*. Besides the question-based code categories, other categories are added. For example, *Technology Form*, which is a code category that describes the kind of technologies mentioned in the interview and relevant for the Digicampus. A picture from ATLAS.ti for a quick view of the open coding process can be found in *Appendix 6: Open coding screenshot*.		

Table 5: Codification process: open coding

Phase	Number of Quotes	Number of categories/ sub-categories
Axial coding	465	7 / 41

Approach and examples

In the axial coding phase, the transition is made from code categories based upon interview questions to code categories based upon answering the research sub-questions and obtaining the required results. The sub-questions are broken down according to data obtained and previous interview questions. Unnecessary and unclear quotes for future answers are removed. An overview of this new division can be seen in *Appendix : 7: Axial coding category subdivisions*.

Each code category from the open coding phase is broken down into sub-categories and sub-sub-categories until the sub-category contains 5 to 20 quotes. An exception is made with one specific sub-category containing only two quotes, as the insight given in those two quotes was insightful, and both are said by different participants. Another exception is made with two sub-categories, which are enumerations, such as *Technology: form* and *Users: Direct Organizations*. An example is given with the *Problems Innovation* Category. Problems Innovation is broken down into 6 sub-categories. Then de sub-category *Problems Innovations: Organization* exceeded the 20-codemark and is broken down again in two sub-categories, process, and stakeholders. Then the same was done again with *Problems Innovations: Organization: Process* for the same reason as previously described. Later, as the *Innovation Journey: Organization* sub-category described many problems about the current organizational problems within the government's organization in the innovation journey, a new sub-category was created in *Problems Innovations: Organization* called *Problems Innovations: Organization: Own organization*.

Table 6: Codification process: axial coding

Phase	Number of Quotes	Number of categories/ sub-categories	Number of codes
Selective coding	369	7 / 42	99

Approach and examples

The last step is selective coding. All quotes directly needed for answering the sub-questions made in the axial coding step are checked. The initial network links from the axial coding phase are validated, and only the best quotes answering the sub-questions are kept. Different quotes that have overlap in their meaning are evaluated, and the best fitting quote to substantiate the meaning is chosen according to the judgment of the researcher. A maximum of two quotes per participant per code category is used to gain a focused substantiation per code category, not including the drawings. The rest is deleted.

An example of this process is the selection in the code sub-category *Future insight: Digicampus Organization*. Participant A5 explains in three different quotes that the citizen's involvement in his project is later in the process then normally, the quadruple helix model depicts. The quote is chosen where he addresses the quadruple helix model directly and the substantiation of his project's complexity that requires him to do so. The other quotes only had substantiation about his project's complexity that required a delay in the citizen's involvement. These quotes were therefore considered less complete and were deleted. Exceptions are made if a participant has more than two insightful quotes upon a code category that addresses different topics or if the code category is an enumeration. Exceptions that were made with more insightful quotes are *Users: Insights, Problems Innovations: Organization: Own Organization, Problems Innovations: Organizations: Process: Politics, Requirements: Innovation: Short cycle evaluation, Technology: insights: requirements Digicampus experiments, Technology: insights: requirements technology assessment, and Problems Innovations: Organizations: Process:*

Rigidities. Exceptions that are enumerations are *Technology form: holistic*, *Technology form: applied specified*, *Users: Roles*, *Users: Job functions*, *Users: Direct Organizations*. The visual overview of this step is portrayed in *Appendix 7: Visual overview of the selective codes*.

From all the remaining quotes, summary codes per category subdivisions are made. In this step, there is searched for similarities between individual quotes per participant. For example, in the code subcategory *Problems Innovation: Uncertainty*; P1, T3, and A5 define uncertainty in innovation processes as a problem in the innovation journey. A summarizing code is made based upon their quotations. The summarizing code is; *"There is a lot of uncertainty in innovation within government context. Traditionally the government seeks for certainties. The government is not used to work with uncertain processes."* This led to a total of 99 codes. Codes from enumeration code categories, as mentioned above, are not counted, because the labels put onto the quotes are observations and do not have a specific conceptual meaning. Overview of all the result tables can be found in the following parts; *4.2.3 Results for answering research sub-question 2*, *4.2.4 Results for answering research sub-question 3*, and *4.2.5 Preliminary answer to research sub-question 4* and in the appendices 8 to 15.

Table 7: Codification process: selective coding

4.2.3 Results for answering research sub-question 2

In order to answer research sub-question 2, a subdivision of this question is made through additional questions based upon the interview questions. To understand the expectations, the process, problems in the current process, solutions the participants think are needed, expectations, and ideals from participants about successful innovation should be understood. As expectations of the participants are contextual, which are based upon their perspective about the current innovation journey. These questions allow us to understand that. The following questions resulted from that (which can also be found in *Appendix 7: Axial coding category subdivisions*):

1.1 What is the current innovation journey?
1.2 What are the problems in the current innovation journeys of the Dutch government?
1.3 What do participants think is needed for successful innovation?
1.4 What do the participants expect from the Digicampus?
1.5 How do participants see the future of innovation in the Dutch government?

The ATLAS.ti analysis led to results that can answer these questions. The answers to these questions will be used to answer the research sub-question directly.

Question 1.1 is answered by the interview questions and the drawings of the innovation journey by the participants. The innovation journeys are contextual and can differ per organization, per underlying technology, and per project. All participants are employed directly or indirectly by the Dutch government and work in the IT sector. The innovation journey that is discovered is based upon their experiences, which is bound to time and place. The current innovation journey portrays the journey of an IT innovation in government context. In this journey, four phases are defined, which are in sequence to each other:

1. A cause.
2. Initial set-up phase.
3. The struggle zone.
4. The final phase.

The phases are displayed in *Figure 14: The current innovation journey*. In this result table, unlike the others, no column is added to display how often codes are mentioned. This is deemed unnecessary, as the table's focus is on displaying the innovation journey.

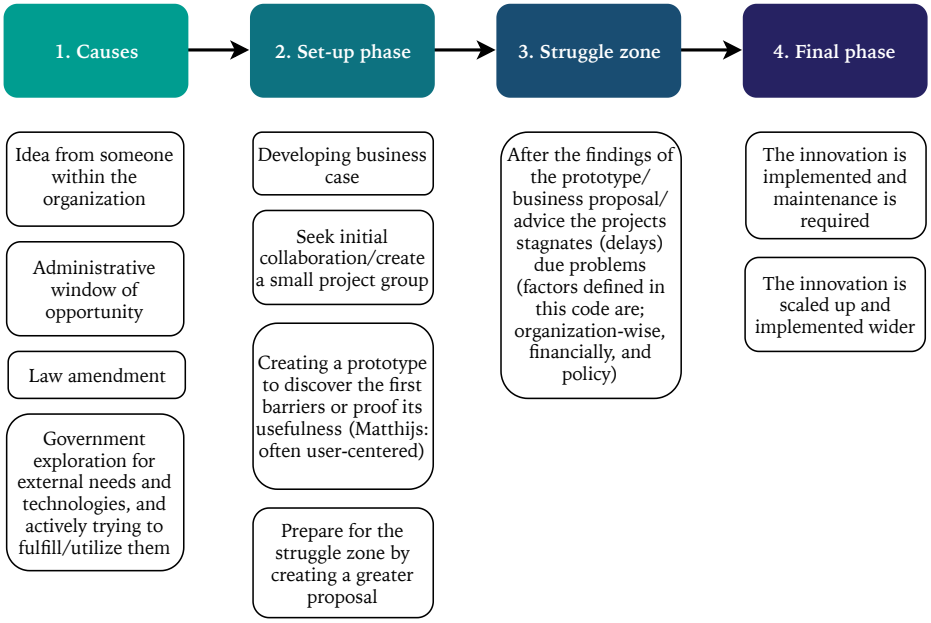


Figure 14: The current innovation journey

In the current innovation journey, many 'causes' do not proceed to the following phase due to problems encountered. The struggle zone derives its name from it because most innovations end here or are significantly delayed, hence the struggle. On the contrary, the advancement from cause to set-up phase usually is fluid. The set-up phase is the direct extension of the cause. Here, the project supporting the innovation is still small, and not many barriers are met. When the project becomes more serious, the problems it encounters grow significantly. When all the problems are dealt with, the innovation reaches its final phase. The innovation is either implemented or scaled up. Scaling is an interesting path for the innovation. As the size of the innovation during the set-up phase is open to interpretation. During the interview, J2 drew multiple steps that required new actions for scaling up. The actions that he drew that were required again are very similar to actions done during the set-up phase, as displayed in *Figure 14: The current innovation journey*. It is suggestible that when an innovation is scaled up, it passes again through the set-up phase and struggle zone. It is recognizable as a loop until the innovation is implemented in a size where it is not scaled up to any further and requires maintenance. Due to the large size of governments and the impact an innovation can have, the loop displays a snowball-effect through government administrations (scaling up from; project group (team); department (within Logius); organization-wide (Logius); nationwide (The Netherlands); internationally (EU)). However, further research will be needed to support the suggestion to create a claim.

Question 1.2 addresses which problems are encountered. The struggle zone is the main focus of this question. This is the phase where most problems are encountered. The problems define the struggle phase, and the struggle zone is where the innovation journey becomes more complex. During interviews, while drawing, participants often let out a big sigh when addressing a step that fits into this phase. In *Figure 14: The current innovation journey*, the struggle zone code defines three factors that contribute to delays in the governmental innovation projects; organizational problems, financial problems, and policy problems. When further asked upon, the interview participants gave extra factors that contribute to the struggle zone. The complete overview of all problems in the innovation is given in the appendix *Appendix 10: Interview results: Problems in innovation.* These problems contribute directly to the struggle in the struggle zone.

To answer question 1.2, a couple of codes from the code category *problems in innovations* are highlighted. The highlighted codes are mentioned multiple times during the interviews and are, according to the

researcher, essential to answer the question. The first code is: *"The more parties there are involved, the more complex innovation projects become. Even though in government context, a collaboration between multiple stakeholders is required to create impact. It creates more risks and lobby is required to create focus."* The code substantiated by quotes from P1, J2, and T3 deliberates on the difficulties of a wide range of involved parties. The wide range of involved parties in government processes can also be seen in *Appendix 18: Interview results: users mentioned during interviews*. The involvement of multiple parties creates more risks and a required lobby, and these are the causes of other codes. Especially the *Problems Innovation: Organization: Process* code sub-category where it is argued that political processes caused by the required lobby slow the innovation process down. Another contributor to the slowness is the following code: *"The Dutch law prescribes actions how business processes within the Dutch government are to be conducted. This is complex because of the large number of laws that need to be taken into consideration. It causes rigidities."* Policies create laws, and policies result from political processes. Prescriptions of actions to perform business processes are tools to support the political process - these tools slow innovation down, according to P1, T3, and M4. Thus, causing rigidities in the process.

The next code describes something different *"The government is traditionally not an innovator. Government offices are large organizations with old fixed processes, which require effort to gain room for innovation."* This code substantiated with quotes from M4 and A5 shows that room for innovation lacks partly due to the old fixed processes. The old fixed processes are also the laws prescribing actions for business processes. These fixed processes are, according to the researcher, besides political processes, a result of uncertainty, which is described in this code: *"There is a lot of uncertainty in innovation in government context. Traditionally the government seeks certainties. The government is not used to work with uncertain processes."* The government struggles to cope with the uncertainty of innovation. A complicating factor is a large number of parties involved in the process of innovation. To cope with the risks and complexity, the government uses laws and prescriptions. This declines the room for innovation slowing the innovation process even more down.

Problems in innovation:

- The more parties involved, the more complex the innovation projects become, creating risks and lobby processes.
- Dutch law prescribing processes create rigidities.
- Uncertainty.
- No room for innovation, due to traditions.

Question 1.3 is a search to discover what the interview participants think is needed for successful innovation. In *Appendix 13: Interview results: Requirements for Innovation* an overview is given of codes that represent these requirements. One key feature that multiple interview participants portray as needed for innovation is collaboration. In the code sub-category; *Requirements for innovation: supporting collaboration,* participants argue that collaboration is needed and which requirements there are for collaboration. A primary concern of P1, T3, M4, and A5 is the organization culture displayed in the following code: *"The organization culture is key for innovation. There needs to be trust, openness, transparency, collaboration, and room for innovation within an organization."* They list four requirements based upon their quotes trust, openness, transparency, and room for innovation. The requirements, openness and transparency, are highlighted in another code by P1, J2, T3, and M4: *"In order to collaborate, openness and transparency are required to have good communication. Required information should be accessible."* Open access to information seems one of the key requirements in order to have successful collaboration for innovation.

Next, a link is discovered with a towards the code sub-category *Innovation Journey Methods: Currently used: New*, displayed in *Appendix 11: Interview results: Innovation Journey Methods* in *Table 24: Innovation Journey methods currently used*. The code; *"It is important to work with innovations in short cycles in order to recognize mistakes and failures quickly to learn from and make changes. It requires evaluation loops, work culture changes, and*

systems that support such a work method.", describes a need for faster cycle times, mentioned by P1 and J2. This complies with newly applied methodologies for innovations participants mentioned. M4 mentions the innovation method at the innovation lab as *"Continuous interaction: pivot or persevere"*. A5 named the building process of the first prototype of his organization as a *"permanent interaction in sprints from 2 to 4 weeks."* M4 and J2 also specifically mention *"Agile methodologies."* As mentioned before, Agile methodology is a way of working in small continuous sprints with short evaluation cycles, see *3.1.4 Agile.*

Requirements for innovation:
- Organization culture should resemble openness, transparency, collaboration, and room for innovation.
- For collaboration, openness and transparency is needed.
- Fast cycle evaluations for learning.

Question 1.4 emphasizes the expectations of the interview participants of the Digicampus. *In Appendix 14: Interview results: Digicampus's Needs* an overview of the codes on expectations of the Digicampus is displayed. As all interview participants are familiar with the Digicampus, expectations come to rise for collaboration. One expectation resembles an important link with the previously described need for innovation for openness and transparency. The code, substantiated by J2, T3, and A5; *"Openness and insight into different information architectures between different government offices is needed to advance in the digital society of the Netherlands. This accessibility is needed for innovation and enables reuse of other findings of different parties.",* portrays the direct expectation that the Digicampus will provide the openness and access to needed information for innovation. As openness and transparency is also a requirement for innovation at the previous question, the expectation is considered as an important requirement of the Digicampus.

In the next code; *"Because of Digicampus special position in the Dutch government they should be able to connect private and public parties to collaborate in a quadruple helix.",* describes that the Digicampus should have the ability to connect parties, substantiated by quotes from J2, M4, and A5.

Another code addressing a requirement deemed relevant by the researcher is addressed. The code; *"The Digicampus should be developer-friendly and speed up the creation of experiments. The process toward experimenters should be smooth and useful for the developers.",* substantiated by T3, M4, and A5. For developing the prototype in *Chapter 6* the potential user of the tool should be taken into consideration. This code directly portrays the expectation for a developer-friendly tool to be supportive of the co-creation lab.

While answering the interview question what is required for successful experiments, interview participants often mentioned IT "Building blocks". IT "Building blocks" are services of existing IT infrastructures within the government that are eligible for experimentation. These IT "Building blocks" are needed for experimentation. Further explanation of the so-called IT "Building blocks will be given in the next paragraph, *4.3.2 Answering research sub-question 3*. Codes to organize the IT "Building blocks" were made due to the need for experimentation according to the interview participants. A code formed from codes of P1 and A5 shows the importance; *"A catalog to find different "building blocks" is required to support the experimentation. A "building block" should be editable in order to be useful for experimentation."* T3 even mentions *"Experimentation with the 'building blocks' is a need within the government because of its closedness."*

Expectations for the Digicampus
- Openness and access to required information
- Ability to connect parties from the quadruple helix for innovation
- Developer-friendly

- A catalog of IT “Building blocks”

Question 1.5 is to discover new chances for the Digicampus. The answer to this question can be considered direct advice and reflection for the Digicampus. A5 remarks about the usage of the quadruple helix: *“The civilian cannot be incorporated in the innovation process straight away. First, an organization should function technically and organizationally before the civilian can be actively involved in that the process. It is only up till this point the perspective of the civilian is useful.”* J2 and T3 emphasize together in codes that: *“Policy and technology have to work together. If both lobby trajectories and technology projects are performed parallel, this will speed up innovation processes.”* Speeding up the innovation process is a reoccurring theme in the interview transcripts. The need for faster cycle times of innovation projects is also highlighted with four other codes besides the one of J2 and T3. Enabling a faster cycle for innovation projects can be considered a goal for the Digicampus. The last future insight is from M4 the code based upon his quotations: *“Funding for the first phase of innovation is important and often difficult to acquire. This should change.”* Finding the appropriate funding is an innovation problem and defined in *Appendix 10: Interview results: Problems in innovation*. P1 highlights this in quotations, which is formed into the code *“Funding is influenced by power and political influence. Disability to innovate because of lack of funding is a repeating discussion.”* M4 proposes a solution in the interview to ease the funding for the first phases of an innovation project. However, if funding is within the scope of the Digicampus is a question. In the future, the financing of the first phase can be taken into consideration, hence the position of this code in the code sub-category, *Future Insights: Finances.*

Advice for the Digicampus
- The civilian helix in the quadruple helix model should be reconsidered
- Enable faster cycle times in order for policy and technology to collaborate
- Create initial finances for innovation projects.

4.2.4 Results for answering research sub-question 3

The same method to answer the previous research sub-question is used to answer research sub-question 2. A subdivision of this question is made through extra questions based upon the interview questions. The extra questions are created to understand the scope of the technologies that will be used during experiments. The scope of technology is determined by what technologies are nowadays used for digital public services. An extra dimension is to understand what kind of innovation takes place with the used technologies. The following questions resulted from that (which can also be found in *Appendix 7: Axial coding category subdivisions*):

1.1 What are the technologies used in the Digicampus?
1.2 What innovation methods are used?
1.3 What kind of innovation takes place within the Dutch government?
1.4 What does technology implicate for the innovation process of the Digicampus?

The ATLAS.ti analysis led to results that can answer these questions. The answers to these questions will be used to answer the research sub-question directly.

Question 2.1 is the first assessment of what kind of technology is used. Logically for digital public services, it is expected that Information Technology (IT) is used. IT is in itself such a broad scope that in the interview, there is asked what kind of IT participants work on. All the mentioned technologies can be found in *Appendix 16: Interview results: Technologies mentioned during interviews*. A distinction is made between IT that is applied and a reference to a technology concept itself, called holistic. The holistic view is used for the researcher what technology concepts are used or thought about within the government. The applied/specific column to understand what kind of technologies is worked on. The column shows three primary technologies that are found. The first is XBRL. XBRL is the taxonomy for

business data exchange between government organizations. Logius currently administers the network for the exchange of the data, called Digipoort [17]. Digipoort is the communication platform for businesses and government departments to communicate their business data using the XBRL standard. The standardized method is called Standard Business Reporting (SBR). Due to the close collaboration from Logius and Digicampus, it is most likely the co-creation lab will come in touch with XBRL and SBR. The second is facial recognition. Facial recognition is mentioned multiple times throughout the interviews. It is suitable for the governmental context as in a lot of citizen-government interactions, identification of the citizen is required (e.g. border customs). The third is Artificial Intelligence (AI). AI is seen as an opportunity to automize specific government processes. M4 mentions AI multiple times and possible solutions to use it.

Primary technologies
- XBRL
- Facial Recognition for identification
- Artificial Intelligence for process automatization

Question 2.2 is to discover, after question 2.1, where is determined which technology is used, what methodologies are used to work with these technologies. *Appendix 11: Interview results: Innovation Journey Methods* in *Table 24: Innovation Journey methods currently used*, and *Table 25: Innovation tools and methods* codes that answer this question are displayed. Previously mentioned upon answering in question 1.3, *Table 24: Innovation Journey methods currently used* show methodologies currently being used. *Table 25: Innovation tools and methods* display insights upon methodologies. The usage of appropriate methodologies is important, based upon quotes from M4, this code emphasizes on it: *"It is important to apply the right methodologies into the right innovation context. (e.g. when do I use design thinking, human-centered design, and prototyping)"*. To assess when which method should be used requires research on each methodology. As this is not the scope of this research, this is not assessed. The interview answers recognize two relevant methodologies for developing IT. P1 and M4 mention both *"beta-testing"*. In the following code, substantiated from their quotes, it is emphasized upon: *"Beta testing is to put a pre-version (beta) of the real product online in order to test it. This removes the hardship of the final requirements of a real version, as mistakes can still be made."* Beta-testing complies with the previously described requirement faster cycle times. Beta-testing enables more iterations on the current product, which is in line with the requirement. The methodology should be taken into consideration as it helps to create a faster cycle. The second methodology is mentioned only by P1: *"Performing an open-source development program where all progress and developed objects are shared."* This code is showed as this draws a comparison with the previously described Digicampus's needs for openness and transparency. Open-source development also complies with the open innovation model of Chesbrough (2006), where knowledge flows freely for innovation. More innovation methods are mentioned during the interviews as well, but the ones described align well with previously described needs and requirements. The methodologies should be taken into consideration by the Digicampus.

Innovation methods
- Beta-testing
- Open-source development

Question 2.3's answer should give an understanding of what kind of innovation takes place in a government context. The codes resulting from the interview analysis are displayed in *Appendix 12: Interview results: Innovation impact level* in *Table 26: Innovation's impact level*. As previously elaborated upon, Norman & Verganti (2014) describe four levels of innovation determined by a meaning axis and a technology axis. While asking the interview participants what kind of innovation takes place, the

[17] https://www.logius.nl/diensten/digipoort

dominant answer is portrayed in this code, substantiated with quotes from P1, J2, and M4: *"Primarily within the government, existent and proven-technology is used for innovation. These technologies are searched for and then put into a different governmental environment, scale, and use."* This points directly to Norman & Verganti's meaning-driven innovation, where existing technology is put into a different applied context. A5 contradicts this by elaborating in his interview about his project where new technology is developed. Even though he mentions in the following code that not the technology but its application in a new context will be revolutionary: *"The technology that is used in my project is not technologically advanced, but its implementation and its impact will be enormous. It will cause a revolution."* Because his project has an implication on both axes, it is determined that the innovation is radical. According to P1, radical innovations in government context are rare, but there are exceptions. Not being put into codes, because it does not contribute directly to the innovation impact level, A5 has explained more in the interview about his project. He explains that before he contacted the Digicampus, he developed the required technology for his project in another trajectory. After he completed the research and development behind the required technology, he needed the Digicampus for testing. The code from Digicampus's needs, the reason he needs the Digicampus is: *"Because of Digicampus special position in the Dutch government, they should be able to connect private and public parties to collaborate in a quadruple helix."* Together with the argument from the previous code explaining that most government innovation is done with proven-technologies, it seems that the Digicampus scope best suites meaning-driven innovation. Technological development happens most likely before it reaches the Digicampus.

Innovation impact level

- Meaning-driven innovation is dominant in the government context
- Radical innovation takes place in the government, but the technical development does not happen in Digicampus context

Question 2.4 is to discover what technology is used for innovation implicates for the experiments conducted in the co-creation lab. The answer gives insight into what should be taken into account technology-wise while performing experiments. The overview of codes can be found in *Appendix 17: Interview results: Technology insights*. The first insight is displayed in the following code, which is substantiated by P1, M4, and A5: *"Technology that is used is not complex and is often already proven technology."* The answer to question 2.3 contributes to this claim that the technology used is already existent and proven-technology. Proven-technology, in this context, means that the added value of the implementation from the underlying technology is already existent and known. This implicates that the technology is already understood and is ready to be utilized. M4 substantiates with quotes the following code: *"At the beginning, experiments should be simple, and there should not be too much emphasis on technical constraints. Just try it out. A possibility is too use services that provide tools to use technologies (such as facial recognition)."* The technical constraints should already be limited because mostly proven-technologies are used. The code mentions services that provide tools to use technologies; such services can be called "Building blocks". Throughout the interviews, participants mention "building blocks". From quotes of P1, J2, and A5, the following code is made to define "building blocks": *"A "building block" can be a service to perform an experiment. A "Building Block" can be, for example, a source code or a test API to use a certain service of the chamber of commerce."* As the underlying technology for the "building blocks" is information technology, the term IT "building blocks" will be used throughout this thesis. The usage of IT "building blocks" has its problems. The following code, based upon quotes of T3 explains: *"The IT infrastructure "building blocks" from the government are closed off and inaccessible for developing parties."* Why this is because: *"The IT back-end of the government is not accessible. There should be a test environment which is accessible if a party has the right permission by law."* P1 explains in quotes, which led to this code. This shows a problem for the need for Openness & Insight in the Digicampus. As access is required to IT "Building blocks" to support experiments to try things out and have a simplistic approach, as explained in the previously mentioned code in this sector.

Technology insights
- The technology used in the government context is often not complex in its application
- IT "Building blocks" are a useful service to use technology in experiments
- Currently, accessing IT "Building blocks" are often inaccessible

4.2.5 Preliminary answer to research sub-question 4

The preliminary data to answer research sub-question 3 is gathered. In *Chapter 5,* this research sub-question will be answered. The sub-sub questions formulated in the axial coding phase are the following (which can also be found in *Appendix 7: Axial coding category subdivisions*):

3.1 Who are the users in the Digicampus?
3.2 What are the use cases?
3.3 What are user insights?

Question 3.1 is answered by documenting all the users and their roles mentioned during the interviews. The complete overview can be seen in *Appendix 18: Interview results: users mentioned during interviews*. Interesting is the large number of mentioned parties that might be involved in the Digicampus. All these parties might become future users of the Digicampus.

Question 3.2 is answered by first asking in the participants in the interview about exemplary experiments that can be conducted in the co-creation lab. J2 gives examples of two future experiments. T3 describes the same experiments as J2, but on a higher abstract level. J2 goes more in-depth and describes two experiments. One experiment is purely data-based, focused on processing bulk data. The other experiment is based on the accessibility. Both experiments involve the same standardization, more about the underlying standardization will be explained in *Chapter 5: 5.1 Identified Use* cases. A5 describes a different experiment. In the experiment, an already created technology has to be tested by different parties to discover barriers before larger implementation. As described in *Chapter 2: 2.3.2 Phase 2:* Utilization, there is chosen to create two use cases that differ from each other. The two experiments described by J2 are deemed too similar. The experiments are both based upon the same standardization and have, therefore, a similar context with similar actors. Even though both experiments can be considered technical due to the technical nature of the standardization, it is chosen to proceed with the experiment based on accessibility. The accessibility experiment is less abstract and more fitting within the researcher's background and capabilities. The choice was evaluated through informal talks and new talks with the involved participants. Therefore, the data-based experiment described by J2 will be deleted. The data-based experiment is hence removed in the *Users: Use case identification* code while shifting from the axial coding phase to the selective coding phase. The experiment of A5 and the remaining experiment J2 will be the use cases. The users in the use cases which were mentioned in the interviews were put in the code category *Users: Use* case. This code category is the basis for the user tables in Chapter 5; *Table 8: Users in the digital identity use case* and *Table 12: Organizations in the SBR with JSON Use Case*. Further elaboration on the use cases can be found in *5.1 Identified Use cases.*

Chosen use cases:
- J2's technology-based experiment on accessibility
- A5's implementation experiment

Question 3.3 will be directly used to answer the research sub-question 3. The answer to question 3.3 will create a more in-depth understanding of the answer, as qualitative substantiation is added. The user insights derived from code category *Users: Insights* are displayed in *Table 33: User insights* in *Appendix 19: Interview results: user insights.*

4.3 Chapter conclusion

4.3.1 Answering research sub-question 2

- What are the expectations of the people close to the Digicampus using the co-creation lab as a platform for performing experiments?

Next to the people close to the Digicampus, the first part of answering this question is understanding what stakeholders are going to use the co-creation lab as a platform for experiments. The stakeholders involved in experiments are those of the quadruple helix: the business world, the scientific community, the government, and the civilians. However, within each experiment, involved stakeholders might differ. For example, a technical experiment might only involve scientific research and government Information Systems. Therefore, it is different per experiment which 'helices' apply. The government can be considered the most important helix, as the goal of each experiment is innovation in the public sector.

Secondly, from the literature, it can be concluded that there is significant value in collaborating for co-creation. Collaboration for innovation increases innovativeness (Ahuja, 2000), and creates ideas that are prone to adoption (Dahl, Lawrence, & Pierce, 2011). Co-creation helps to create added value to new/improved products, services, processes. It also legitimizes created solutions to the involved stakeholders (Voorberg, Bekkers, & Tummers, 2015). In order to do so, the co-creation lab is set up by creating an experimental platform. Performing experiments enhances learning opportunities (Thomke, 2003), increases the effectiveness of innovation processes (Thomke, Von Hippel, & Franke, 1998), and helps to overcome governmental innovation barriers (Borins, 2001; Mulgan & Albury, 2003). The general wish of the co-creation lab is to utilize the proposed benefits from the literature to foster innovation in the Dutch public sector.

The interview results give an insight on how the current process of innovation is performed and what the people directly involved with the co-creation lab expect from it. The current process of innovation can be defined in four steps: a cause, an initial set-up phase, the struggle zone, and the final phase. In general, interview participants described that there are no issues with the first steps of creating an idea and then performing the first steps of further elaboration. After the initial set-up phase, the struggle zone is considered the phase were most barriers for innovation occur. Next to the innovation barriers in the literature, the interviews results show the following barriers causing the problems:

- The involvement of more parties increases the complexity leading to increased risks and lobby processes
- Dutch law prescribing processes creates rigidities
- The uncertainties of innovation
- Traditions leaving no room for innovation

To overcome these problems, participants believe that there should be an organizational culture with room for innovation, and an openness and transparency to enable collaborations. Also, they propose that there should be faster cycles of evaluations to enable learning. Direct expectations from participants to realize this are: insight and overview of required information for innovation and the ability to connect parties from the quadruple helix for innovation. If a quick recap is made to the literature of O'Reilly (2011), the required information for innovation can be identified as sharing work done on current innovation, and sharing IT infrastructures with the involved stakeholders. Interview results also show open IT 'building blocks' for innovation are expected to be offered in the co-creation lab. For the ability to connect parties in quadruple helix, Bessant & Trifilova (2017) describe that a

brokerage can help processes of recombinant innovation, which allows new possibilities for innovation and faster innovation processes.

To conclude, the expectations of the people close to the Digicampus are overcoming the acknowledged problems in the governmental innovation process and realizing the proposed benefits of innovation. The people close to the Digicampus want to use the co-creation lab's method of performing experiments to achieve this. In doing so, they want to realize a change of mindset within organizations, speed up innovation processes, and make use of promised benefits of innovations. To do this, they want overview and insight from multiple involved stakeholders in order to collaborate and be connected with applicable parties for collaboration and co-creation.

4.3.2 Answering research sub-question 3

- What are the different governmental IT infrastructures that are eligible for the experimentation in the co-creation lab?

One of the requirements for innovation defined by the interview participants is access to the required information. A part of the required innovations for experimentation is IT infrastructures of the involved stakeholders. In order to answer this research sub-question, it is first assessed what happens with the IT infrastructures. The IT infrastructures are used in experiments for innovation. The type of innovation that takes place is mostly recombinant innovation, using and reusing ideas for new innovations (Brynjolfsson & McAfee, 2014; Griffith, Lee, & Straathof, 2017; Weitzman, 1998). Interview results show that most governmental innovations are focused on creating new meaning and thus are meaning-driven innovations (Norman & Verganti, 2014). Radical innovations where completely new technology is developed is considered rare in government innovations by interview participants. What can be concluded from the different recognized innovation types is that existing governmental IT infrastructures are being used and reused to be put into different contexts for innovation. An eligible IT infrastructure should thus be able to be recombined with other IT infrastructures for new solutions.

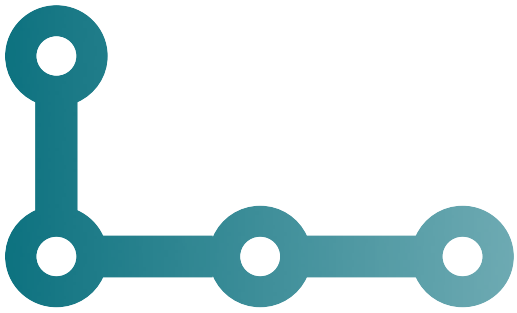
In the literature technology section, see *3.3 Involved technology,* IT infrastructures such as APIs in enabling overarching architectures are deemed to be eligible for experimentation. APIs give access to IT infrastructures from others, and a component-based architecture allows the combination of different IT infrastructures. The scope of the experiments can be focused on APIs as well as the overarching architecture. An experiment could test the functionality of an API or a set of combinations of APIs. The eligibility in this way requires IT infrastructure to be open for use and reuse. Interview participants consider that organizations often keep their resources to IT infrastructures closed for other parties, which is considered a problem. Another problem is that organizations can use different notations for their architectures, hampering the ability for adjusting. Open-source development, which depicts that any stakeholder can access the developed solutions during experiments of the co-creation lab, is considered by the interview participants as the key for open access to use and reuse the IT infrastructures.

The current topics of IT infrastructures that are recognized by interview participants and will likely be experimented with in the recent future are IT infrastructures about or related to; XBRL, facial recognition for identification, and artificial intelligence for process automatization. These topics are mentioned by interview participants as ones that are applied in current innovation processes.

The primary method of experiments will uphold putting the IT infrastructures into a beta-testing mode. Beta-tests are tests conducted with prototypes of proposed solutions. A beta is not the final product. Beta-testing is considered important by interview participants to enable more evaluation cycles in

innovation processes. Enabling more evaluation cycles is considered important to foster innovation, see *4.3.1 Answering research sub-question 2*. Therefore, the IT infrastructures should be eligible to be used for beta-tests.

To conclude, eligible governmental IT infrastructures for experimentation are open and accessible (open-source) for the involved stakeholders in the experiment, are able to be recombined into new solutions, and can be used for beta-tests.



Chapter 5: Setting up use cases and deriving functional requirements

In this chapter, use cases are created. From the use cases, functional requirements will be derived. This chapter represents phase 2, utilization, in this research. The content of this chapter is based upon the previous chapter qualitative analysis. This chapter answers sub-question 4.

Chapter content:

5.1 Identified Use cases

5.1.1 Introduction

The qualitative analysis identifies two use cases. The use cases are based upon the gathered qualitative data and continuously improved through e-mail contact with the interviewed participants and informal meetings with the interviewed participants.

The experiments that are wished to be conducted in the co-creation lab are the use cases in this chapter. Different types of experiments can be conducted in the co-creation lab to obtain different results. The two use cases that will be chosen should represent two different perspectives, as described in the research approach of *2.3.2 Phase 2: Utilization*. With these two different perspectives, different experiments are conducted to obtain differing results. It is chosen to create one use case that represents a technical experiment and one that represents an institutional experiment. A technical experiment is an experiment within the co-creation lab where a different technology application is tested. An institutional experiment is an experiment where the technology behind the experiment is already created and applied in a different context. An institutional experiment is to discover constraints in a potential future implementation of the newly created technology behind it. The two different perspectives are needed to understand what kind of experiments can be conducted in the co-creation lab context. The synthetization of both perspectives will help to answer research sub-question 3 and create a well-substantiated functional requirements list for the prototype. In the future, other types of experiments can be conducted in the co-creation lab.

The first use case is described by A5. A5 works on the usage of a digitized identity for identification. The digital identity will be an addition to current passport identification methods. A5 wants to collaborate with the Digicampus to try experiments with using a fully digital identity in a semi-governmental context. The specific semi-governmental context is when private organizations need proof if a person has certain dedicated rights. An exemplary case is when business owners go to a specialized wholesaler for businesses. In the Netherlands, business owners need to prove that they are registered with the Dutch Chamber of Commerce in order to buy from the specialized wholesaler. A5 seeks to gain insights into how such a system will operate in real life and which barriers are met.

T3 and J2 described the second case. T3 works in a dual role for the Digicampus and SBR (Standard Business Reporting) innovation for Logius. J2 is a business consultant for Logius responsible for setting up Digicampus experiments. SBR is an agreement on standardization of how the government communicates with public and private organizations. This agreement is 15 years old and requires renewal to be applicable to new IT infrastructures. To create innovation in the rigid standardization, experiments are conducted. The standardization should be opened up in order that new parties can start using SBR. As more parties start using SBR, it should create more efficiency in business reporting from government to businesses and vice versa. The opening up will require new coding languages to be compatible with SBR. SBR currently works on XML-syntax while other parties often work with different syntaxes.

5.1.2 Use case structure

Fowler & Kobryn (2004) guidelines are used to create the use cases. The guidelines do not prescribe a specific structure for the use cases, besides being a set of scenarios. Also, guidelines on how the use cases should be visualized are not present. The researcher created structure and visualization. The idea of the researcher is to create sequential steps in the use case diagram as the use case scenario will have steps that follow after one another. In this way, the use case diagram will show how the scenario flows, and it will also show when which actor is involved. The last part is vital to answer research sub-question

3, where interaction between actors should be discovered. Using the idea, the use case diagram not only shows where actors interact but also when in the scenario.

As can be concluded from the interview results, users identified per use case are case-specific. Even if different experiments are similar, the chosen parties to experiment with form the basis of the user identification. The term, user, in this thesis, is multi-layered. A user is a party who is involved with the Digicampus. Actors are the users who are involved in the use cases, hence have a role in the use case (Fowler & Kobryn, 2004). An actor is not necessarily an organization. It can also be a group of representatives of an organization, such as an individual or a team. Users who are involved with the Digicampus are organizations, such as the Chamber of Commerce or Logius. Organizations can be users in a use case, but the individuals or the teams these individuals will form are often the actors in the use case. For example, the board of directors of Logius is not directly responsible for a specific experiment, but a detached project leader or a team working on the experiment is. Exceptions are made when an organization has a minor role in the use case. In these situations, it is not deemed necessary to break down the organization, as this makes the use case too complicated.

5.1.3 Phases and the system boundary

In the use cases there are three phases recognized. In each phase, different interactions will take place between actors and subsystems. Different primary actors may be identified in each separate phase of the use case. Therefore, for each phase, a different use case is required. Each phase will have a specific scenario and a corresponding use case diagram. The following three phases are defined.

1. Starting up the experiment
2. Performing the experiment
3. End game of the experiment

The 'Starting up the experiment' phase is the first step of the experiment. Localizing the right actors and gathering the resources required to experiment is essential in this first phase. The 'Starting up the experiment' phase will resemble a business use case on a kite-level view. Business use cases describe business processes, and kite-level view uses a broader perspective to portray interaction (e.g. business interactions) (Fowler & Kobryn, 2004). This is considered more suitable in the context of the first phase as only business interactions take place to start up and create the experiment. The system boundary will be called Digicampus. Business interactions will be mostly external from an actor to the Digicampus and vice versa. Therefore, a higher abstract point of view is needed to see all the interactions.
The 'performing the experiment' phase is the phase where the experiment is executed. This phase is simpler as actors are already known, and interactions are focused around the experiment. A sea-level view will be used to show how the experimenters will interact with each other but also with the experiment. A sea-level view commonly shows the interactions between the actors and the system used (Fowler & Kobryn, 2004). The system boundary of this phase will be called the co-creation lab. In this phase, all the required resources and the involved actors are in place. A lower abstract point of view is used to see how the experiment is performed within the Digicampus context.

The 'end game of the experiment' is the phase that represents what happens after the experiment. This phase portrays how experimental findings are stored, and how the findings are wished to be utilized in later processes. A kite-level view will be used again. There needs be zoomed out again as a broader scope of actors from outside needs to be taken into consideration. Communication with other actors about the experimental findings is one of the primary events in this phase. Because of the broader scope, the system boundary will be called the Digicampus again.
Lastly, if the findings were to be recycled for a new experiment, a new 'Starting up the experiment' phase is entered.

5.2 Use case 1: Digitized identification

5.2.1 Context

The Dutch government office of identity data (Dutch: RvIG; Rijksdienst voor Identiteitsgegevens) is responsible for maintaining the identity data of Dutch citizens and is part of the Ministry of Internal Affairs. Now the RvIG doing a project to create a verifiable digital identity for citizens. The project, already running for two years, now seeks collaboration with the Digicampus to perform the first experiments. The Digicampus is chosen by the RvIG, because the Digicampus promises connection with multiple parties through its network. Incorporating the right parties is needed to create a test environment. The test environment should simulate the real-life context in which the new digital identity can be tested. Multiple experiments are initiated, but the first experiment is the creation of the entrepreneurial passport. The entrepreneurial passport will link the data of the Dutch Chamber of Commerce (Dutch: KvK; Kamer van Koophandel) with the data of the Dutch Basic Registry of Persons (Dutch: BRP; Basis Registratie Personen).

The data of the Dutch Chamber of Commerce, called the KvK commerce register (Dutch: HR; Handelsregister), and the data of Basic Registry of Persons, using Dutch citizens' service-numbers (Dutch: BSN; Burger Service Nummer), will be combined in an SSI wallet. The wallet will be a digital place where the data will be stored. SSI stands for Self-Sovereign Identity (SSI). Self-Sovereign Identity is defined according to the 10 properties of Allen (2016), which are quoted from his article:

1. *"**Existence:** Users must have an independent existence"*
2. *"**Control:** Users must control their identities"*
3. *"**Access:** User must have access to their data"*
4. *"**Transparency:** System algorithms must be transparent"*
5. *"**Persistence:** Identities must be long-lived"*
6. *"**Portability:** Information and services about identity must be transportable"*
7. *"**Interoperability:** Identities must be as widely usable as possible"*
8. *"**Consent:** Users must agree to the use of their identity"*
9. *"**Minimalization:** Disclosure of claims must be minimized"*
10. *"**Protection:** The rights of users must be protected"*

To enable the SSI for a digital identity, the Stokkink & Pouwelse (2018) paper proposes a blockchain structure to fulfill properties for the SSI. The SSI wallet is a model of the blockchain structure proposed by Stokkink & Pouwelse (2018). Using a blockchain structure promises the abolishment of a trusted third party required in the identification process. For further explanation about the underlying digital structure, reading of the Stokkink & Pouwelse (2018) is encouraged. A5 mentions in the interview that he collaborates with the author of the paper, Pouwelse. Also, the Stokkink & Pouwelse (2018) paper mentions the collaboration with the RvIG.

The SSI wallet will be the technical basis for the entrepreneurial passport. The goal of the entrepreneurial passport is to speed up transactions that require KvK commerce register identification. The experiment is needed to test for irregularities while using the SSI wallet and to discover how two databases of the Dutch government can be connected. Outcomes of the experiment will not only help to improve the usage of the SSI wallet but also carriers a broader political agenda. A proper working SSI wallet should stimulate organizations, for example, banks, to adopt the SSI wallet for identification processes. Also, if the experiment is successful, it might become a showcase for other Dutch Basic Registries to work with an SSI wallet and blockchain. Dutch Basic Registries, such as BAG, BGT, BRI, BRK, BRO, BRT, BRV, and WOZ, are official data registries of the Dutch government used to carry out

its public duties [18]. There are in total 10 Dutch Basic Registries. The broader goal of the governing organization of the RvIG, the Dutch Ministry of Internal Affairs, is to connect more Dutch Basic Registries with each other using this technology, according to A5. The third and last contribution of a successful experiment is towards the EBSI. The European Blockchain Service Infrastructure (EBSI) is a European initiative to use blockchain technology to provide EU-wide public services [19]. A successful experiment can help other countries in the European Union to learn from the experiences using an entrepreneurial passport based on the SSI concept and blockchain technology.

5.2.2 The Experiment

The goal of the experiment is to connect the KvK commerce register with the SSI wallet and perform a transaction that requires identification via the SSI wallet retrieving data of the KvK commerce register.

The objectives of the experiment to reach this goal are:

- Create a test environment of the SSI wallet in which the KvK commerce register data is used.
- Create a description of how to use the KvK commerce register data for the SSI wallet.
- Simulate a transaction using the identification.

If all the objectives are reached, it will profound a basis to start experimenting using data of other Dutch Basic Registries for the SSI wallet. For the experiment, funding is already existent within the RvIG and the Digicampus.

5.2.3 Users and actors

In *Table 8: Users in the digital identity use case*, the organizations that will be involved in the use cases are displayed, as recognized in the qualitative interviews. In this use case, the recognized users are plenty. From the interview data, many organizations of interest in the experiment are defined.

User	**Role**
Government office of identity data (Dutch: RvIG Rijksdienst voor Identiteitsgegevens)	The main initiator of the innovation with digital identity.
The Dutch Ministry of Internal Affairs	Owner of the government office of identity data, politically and jurisdictional responsible for the identity data of Dutch citizens.
Logius	Owner of the general digital infrastructure of the Dutch government. Logius will be responsible in the future to maintain the IT system required to implement the innovation.
The Dutch Chamber of commerce (Dutch: KvK; Kamer van Koophandel)	Potential client.
The Dutch Ministry of Justice and Security	High-level client.
The Dutch Ministry of Economic Affairs	High-level client.
The Dutch Ministry of Finance	Most important client in political perspective.
TU Delft	A supporter of the implementation of the innovation by scientific research.
Idemia	Passport manufacturer and supplier of passports to the Dutch government.

[18] https://www.digitaleoverheid.nl/dossiers/basisregistraties/

[19] https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/EBSI

Dutch Blockchain Coalition	A coalition of multiple parties of the government, scientific community, and businesses to support the creation blockchain solutions for the government.
A European collaboration of 14 countries (EBSI: European Blockchain Service Infrastructure)	An international community interested to implement the innovation in the European context.

Table 8: Users in the digital identity use case

As explained in the introduction of this chapter from the 'users', actors in the use case are created. In *Table 9: Actor table of the digital identity use case*, the actors are displayed. In this table, the specific actors are determined. To scope down the many organizations found during qualitative interviews. There is looked at who is directly involved in the experiment. There are a couple of parties that are politically involved in the development process of the RvIG. These are clients of the RvIG interested in the research of the RvIG with the SSI wallet. While utilizing the Dutch Basic Registry of Persons, the Ministry of Justice and Security and the Ministry of Finance will become involved. Basic Registry of Persons is the most critical registry for The Ministry of Justice and Security and the Ministry of Finance in their daily operations. Hence, these two ministries become automatically political stakeholders in the development process. As it is chosen to utilize the KvK commerce register, the Ministry of Economic Affairs will become automatically involved. The Ministry of Economic Affairs governs the Dutch Chamber of Commerce. As these 'political' clients only contribute to the experiment indirectly, they are neglected further in the use case. A couple of political clients will be displayed in the use case. This is because the results of this experiment will be used in a further political agenda. The 'political' actors are chosen who are directly involved in the development process, according to the interview with A5.

In the use case, blue is the color of a political actor who only is a recipient of the actions of other users and does not play an active role in the 'performing the experiment' phase.

A couple of new actors are created, which are inevitably required to reach the experiment's objectives. Those are the actors in red. The actors in red are the parties required to simulate the transaction that should be conducted in the experiment.

Actors	**Organization from the actors**	**Roles in the experiment**
'Experiment group'	Digicampus	The team performing the experiment
'Incoming innovator'	Government office of identity data (Dutch: RvIG short for Rijksdienst voor Identiteitsgegevens)	Initiator of the use case, and owner of the development process of the SSI wallet.
'Contact person'	Digicampus	Responsible person within the Digicampus organization to enable the experiment and maintain contact with the incoming innovator.
'Participant'	Entrepreneur of a small start-up	Transaction enabler
Digicampus organization	Digicampus	Support organization for the experiment.

KvK	Dutch Chamber of Commerce (KvK: short for Kamer van Koophandel)	Stakeholder/participant in the experiment, who needs to open up their resources for the experiment
RvIG	Government office of identity data (Dutch: RvIG short for Rijksdienst voor Identiteitsgegevens)	Stakeholder/participant in the experiment, who needs to open up their resources for the experiment
Third party	Dutch Bank (e.g. ING)	Transaction enabler
A European collaboration of 14 countries	EBSI (European Blockchain Service Infrastructure)	Political actor
Dutch Blockchain coalition	Dutch Blockchain coalition	Political actor
Other Dutch basic registration parties	BAG, BGT, BRI, BRK, BRO, BRT, BRV, and WOZ [20]	Political actor

Table 9: Actor table of the digital identity use case

5.2.4 Use case scenario

See *Appendix 20: Use case 1: Digitized identification use case diagrams* for the use case diagrams.

Starting up the experiment:

1. 'Incoming innovator' contacts the Digicampus organization
2. The Digicampus organization appoint 'contact person' to 'incoming innovator'
3. 'Contact person' establishes contact with the 'incoming innovator'.
   a. Ask 'incoming innovator' for his/her needs in the experiment.
   b. Judge the 'incoming innovator' if applicable for the Digicampus based upon Digicampus's resources
   c. Examine the 'incoming innovator's resources
   d. Check if the experiment is possible based upon both resources
4. 'Contact person' and 'incoming innovator' refine experiment.
   a. Define stakeholders.
   b. Create goals.
   c. Create deliverables.
   d. Create a planned approach.
5. Digicampus organization creates a specific 'experiment group' for the experiment.
6. 'Contact person' and 'incoming innovator' find participants, KvK, RvIG, 'participant', and third party, for the experiment.
7. The KvK, RvIG, 'participant', and third party open up their resources for the experiment.
8. 'Experiment group' validate if resources are present to conduct experiment.
   a. Check for appropriate technical resources.
   b. Generate the appropriate resources from the collaborating parties, KvK, RvIG, 'participant', and third party
   c. Check for the right amount of funding with 'incoming innovator'
   d. Check if all the current 'experiment group' has the expertise to conduct the experiment.

[20] https://www.digitaleoverheid.nl/dossiers/basisregistraties/

Performing the experiment:

1. The 'experiment group' generates an experimental environment.
   a. The KvK commerce register is combined with the SSI wallet.
   b. The SSI wallet is made accessible for the third party and 'participant'.
2. The 'experiment group' creates a description of what is required to create an SSI wallet combined with KvK commerce register.
3. The 'experiment group' simulates the parties required to perform the experiment in collaboration with the 'participant' and the third party.
   a. The 'experiment group' simulates 'participant'.
   b. The 'experiment group' simulates the third party.
4. The 'experiment group' performs the experiment.
   a. 'Simulated participant' requests a transaction with third party (e.g. opening bank account).
   b. Simulated third party receives a transaction request from participant.
   c. 'Simulated participant' identifies himself with SSI wallet through the KvK register.
   d. Simulated third party receives verified identification claim.
   e. Simulated third party accepts transaction request.
   f. The transaction is conducted.
   g. Test if identification is processed accordingly (safety).
5. The 'experiment group' generates a summary and conclusion (findings) from the experiment.

End game of the experiment:

1. The 'experiment group' saves the findings of the experiment for future consulting of other parties in the Digicampus database and Github.
2. If the identification process is not good enough, the 'experiment group' improves the process based on experimental findings.
3. 'Contact person' and 'incoming innovator' communicate to the KvK, RvIG, 'participant', and the third party.
4. 'Incoming innovator' communicates to a European collaboration of 14 countries, Dutch Blockchain Coalition, and other Dutch basic registration parties about the experiment's findings.

(5.) A policy cycle starts to scale up the project for further implementation in the government*

* The policy cycle is not part of the system boundary, but is the next event after the actions in the 'end game of the experiment' phase'.

5.3 Use case 2: SBR with JSON

5.3.1 Context

The experimentation involves the opening up of the standardization of SBR. SBR works with the XBLR standard and is based upon the XML coding language. XBRL, short for eXtensible Business Reporting, is an international standard for digital business data exchange [21]. XML, short for eXtensible Markup Language, is a coding language to structure text formats to ease processing [22]. An exemplary XML code is shown in *Table 10: XML example*.

XML example of a song

`<?xml version="1.0" encoding="utf-8"?>`
`<playlist name="myfavorites"xml:lang="en">`
`<song>`
`<title>Bohemian Rhapsody</title>`
`<artist>Queen</artist>`
`</song>`

Table 10: XML example

In order to be opened up and be useful to a new set of users, XBLR needs to be compatible with other coding languages, such as JSON. JSON stands for JavaScript Object Notification and is used regularly for web-based purposes [23]. JSON is more commonly known by programmers than XML and works together with any other coding language. The XML standard is lesser well-known and not considered easy to use by new entrants. The SBR standard compatible with JSON should create more ease for new entrants to start using SBR.

JSON example of a song

`{"playlistname":[`
`{"myfavorites":[`
`{"song":[`
`{ "title":"Bohemian Rhapsoly",`
`"artist":"Queen"`
`}`
`]}]}]}`

Table 11: JSON example

XBRL international, a non-profit organization that maintains and improves the XBRL standard, is familiar with the XML problems [24]. XBRL international created a new initiative, the Open Information Model (OIM). OIM aims to create a syntax-independent model for business reports using the XBRL standard in which lossless transformation can take place between a variety of different syntaxes (Warren, Fischer, Goodhand, & Dracott, 2019). The business reports gain the possibility to be viewed without using an XML-syntax. XBRL-JSON is currently the easiest and clear view option for XBRL reports. XBRL-JSON also makes it easier to use XBRL for APIs in other applications.

The OIM can be applied to different contexts accordingly. In the case of this use case, the usage of XBRL-JSON is researched for SBR between the different Dutch governmental offices. Due to the functionalities of JSON, XBRL-JSON has a high probability of becoming the preferred syntax for XBRL.

[21] https://www.sbr-nl.nl/software-geschikt-maken/xbrl

[22] http://www.xml.org/

[23] https://www.json.org/

[24] https://www.xbrl.org/

5.3.2 The Experiment

The goal is to process an XBRL-JSON business report within SBR according to the OIM. This will test if XBRL-JSON is suitable and easier to use for web-based solutions of SBR.

In order to simulate the real-life context, a potential near-future situation is created. The Dutch Central Statistics Office, currently working with SBR based upon XBRL-XML, wants to receive SBR reports from different Dutch municipalities. Multiple Dutch municipalities claim that the XML-syntax of XBRL is inconvenient as multiple programmers do not have to experience with the XML-syntax. JSON is the preferred language used by the programmers of the municipalities. Logius, the administrator of SBR, understands this need from the municipalities and sets up a project to apply the newly developed OIM that enables XBRL-JSON SBR reports. Logius asks the Digicampus to collaborate to perform an experiment so that Dutch municipalities can start using the XBRL-JSON for SBR reports instead of XBRL-XML. The Dutch Ministry of Internal Affairs, responsible for Logius and SBRR, is keen to expand the usage of SBR between government offices and approves funding.

5.3.3 Users and actors

In the following *Table 12: Organizations in the SBR with JSON Use Case* the different organizations that will be involved in the use cases are displayed, as recognized in the qualitative interviews.

Organizations	**Roles in the project**
Logius	The administrator of SBR
The policy commissioner (exemplary:) - Dutch Ministry of Internal Affairs	Funder
Digicampus	Connector of the different parties
Parties currently using SBR (exemplary:) - Tax authorities (Dutch: Belastingsdienst) - Chamber of commerce (Dutch: Kamer van Koophandel) - The Dutch Education Office (Dutch: DUO Dienst Uitvoering Onderwijs) - The Dutch Central Statistics Office (Dutch: Centraal Bureau voor Statistiek) Note: all parties are Dutch governmental organizations	Users of the SBR standardization
New parties eligible using SBR - Different Dutch municipalities Future parties using SBR (Not in the scope of this experiment) - Start-ups - Established private corporations	Potential new users of SBR

Table 12: Organizations in the SBR with JSON Use Case

As explained in the introduction of this chapter from the 'users', actors in the use case are created. In *Table 13: Actor table of SBR with JSON Use Case*, the actors are displayed. In this table, the specific actors are determined. For certain roles in the experiment, other organizations could have been used too. It

is chosen to scope the use case down to predetermined organizations based upon the qualitative interviews. Especially in the first phase 'starting up the experiment', where collaborating parties are seeking to perform the experiment, other parties could have been chosen as well. The choice for specific organizations is based upon additional contact that the researcher had with the interview participants. A focus group in this context is a group of experts within an organization who use their expertise to elaborate on topics concerning the organization's operations. Quotation marks and color is added to different actors to highlight them in the use case scenario.

Actors	Organization from the actors	Roles in the experiment
'Project leader'	Digicampus/Logius *	Directly responsible individual of the experiment
'Project group'	Digicampus/Logius *	The team performing the experiment
'Focus group'	Digicampus/Logius *	Initiators of the use case
Central Statistics Office (Dutch: CBS)	Central Statistics Office (Dutch: CBS)	Stakeholder/participant in the experiment, who needs to open up their resources for the experiment
A Dutch municipality	e.g. the municipality of The Hague	Stakeholder/participant in the experiment, who needs to open up their resources for the experiment
Policy commissioner	Dutch Ministry of Internal Affairs	Funder
Logius	Logius	Provider of technical resources for the experiment

Table 13: Actor table of SBR with JSON Use Case

* As some employees of Logius working on SBR are also involved with the Digicampus, there is an organizational overlap between Logius and Digicampus. This applies to the actors, project leader, project group, and the focus group.

Blue is the color of an external party in the use cases who only is the recipient of the actions of other users and does not play an active role in the 'performing the experiment' phase.

5.3.4 Use case scenario

See *Appendix 21: Use case 2: SBR with JSON use case diagrams* for the use case diagrams.

Starting up the experiment:

1. A 'focus group' from Logius and Digicampus generates an experiment.
   a. Brainstorm about new experiments.
   b. Judge made-up experiments based upon effort to conduct the experiment and the potential impact.
2. The 'focus group' refines the experiment.
   a. Define stakeholders. (In this use case: CBS, Dutch municipalities, Digicampus, Logius, policy commissioner)
   b. Create goals.
   c. Create deliverables.

   d. Create a planned approach.
3. The 'focus group' appoints a 'project leader' of the experiment.
4. The 'project leader' creates a 'project group' for the experiment.
5. The 'project group' finds participants, Central Statistics Office and a Dutch municipality, for the experiment.
6. The Central Statistics Office and the Dutch municipality open up their resources for the experiment.
7. The 'project group' finds a policy commissioner for funding.
8. The 'project group' validates if resources are present to conduct experiment.
   a. Check for appropriate technical resources with Logius
   b. Generate the appropriate resources from the collaborating parties, Central Statistics Office and the Dutch municipality.
   c. Check for the right amount of funding with the policy commissioner.
   d. Check if all the current 'project group' has the expertise to conduct the experiment.

Performing the experiment:

1. The 'project group' translates the OIM to SBR context for JSON.
2. The 'project group' creates a description of what is required to convert the XBRL-JSON to XBRL-XML for SBR.
3. The 'project group' generates an experimental environment in which JSON SBR reports can be sent to an XML-syntax bases system and consequentially be received and validated.
   a. Create an environment that simulates the real-life context based upon the resources from the Central Statistics Office and the Dutch municipality.
   b. Create an XML-based SBR system that can process JSON SBR Reports.
4. The 'project group' performs experiment to test first-hand processing.
   a. Generate an SBR report based on JSON.
   b. Send the JSON SBR report from a *simulated Dutch municipality* to a *simulated Central Statistics Office* system using XML-syntax.
   c. Test if the JSON SBR report is processed accordingly in the XML-syntax system.
5. The 'project group' generates multiple SBR reports based on JSON to test processing.
   a. Generate correct SBR reports based on JSON.
   b. Generate false SBR reports on JSON.
   c. Send multiple false and correct JSON SBR reports from a *simulated Dutch municipality* to a *simulated Central Statistics Office* system using XML-syntax.
   d. Test if all JSON SBR reports are processed accordingly in the XML-syntax system.
6. The 'project group' generates a summary and conclusion (findings) from the experiment.

End game of the experiment:

1. The 'project group' saves the findings of the experiment for future consulting of other parties in the Digicampus database.
2. The 'project leader' communicates to the Central Statistics Office, the Dutch municipality, Logius, and the policy commissioner about the experiment's findings.
3. The 'focus group' elaborates on a follow-up experiment with other parties (e.g. a market party, such as start-ups or established private corporations).

5.4 Functional requirements

Based on the use cases and the results of the interviews, the functional requirements are created for the prototype. The functional requirements exist out of two sub-categories. First, the direct functional requirements of the tool, which should be verifiable and validatable. Second, the non-functional requirements are requirements that are not verifiable, but validatable. The functional requirements will be the design objectives for the prototype. The functional requirements list will mark the end of phase 2: utilization of this thesis and Peffers et al. (2007) second activity; define objectives for a solution.

In the functional requirement list, three domains will be neglected as they are considered out of scope for the tool. The first domain is the operation of an involved party internally. This is neglected as the tool cannot make decisions within the party's organization. An example from the use cases is the appointment of the contact person in the Digicampus organization to establish contact with an external party. In this case, the decision is based on human judgment, and the created tool cannot intervene with that. The second domain is communication means. Communication means enabling people to communicate with each other, which is already in place. The assumption is made that the systems to call and email peers are already existent in the involved organizations. The third domain is funding. Funding is taken into consideration into the use cases as it has to be present in order for an experiment to be able to be performed. However, acquiring funding and using it is considered out of scope as it involves the party's organization internally and again, human judgment. Organizations wanting to conduct experiments are expected to bring their funding as a prerequisite to start experiments in collaboration with the Digicampus.

5.4.1 Functional requirements list

1. The tool enables parties to establish contact with each other.
2. The tool gives insight into the IT Building blocks of different Dutch governmental institutions.
3. The tool gives insight into the technical resources of different Dutch governmental institutions.
4. The tool gives insight into current experiments being conducted in the co-creation lab.
5. The tool gives insight into the findings of previously conducted experiments in the co-creation lab.
6. The tool gives insight into different parties wishing to perform experiments.
7. The tool gives insight into different parties that performed experiments.
8. The tool gives insight into government organizations that can perform experiments with the Digicampus in the co-creation lab.
9. The tool enables the creation of an experimental test environment.
    A. The test environment enables simulation of involved parties.
    B. The test environment enables simulation of a designed operation process in the experiment.
10. The tool lets external parties save their content/resources to give a contribution to the insight requirements.
11. The tool lets parties edit their saved content.

5.4.2 Non-functional requirements list

1. People from different backgrounds should easily understand the tool.
2. The IT Building blocks should be able to be viewed in a developer-friendly way.
3. Experiments should be started without broader political implications.
4. The tool should take into consideration that content from other organizations, that is saved on it, is not of ownership of the tool.

5.5 Chapter conclusion

The digital identity use case and the SBR-JSON use case are different experiments but have similar end goals. The use cases both a technical test to gain insights for further implementation of the tested technology. The similarity is interesting as the focus of the SBR-JSON experiment is technologically focused rather than the politically focused digital identity use case. The findings are communicated to the external/involved parties through action in both use cases. The business focus of the last phase in both use cases accentuates this. Both experiments have an institutional goal, which is vital to take into consideration for the co-creation tool as it aims to support collaborations and experiments.

5.5.1 Answering research sub-question 4

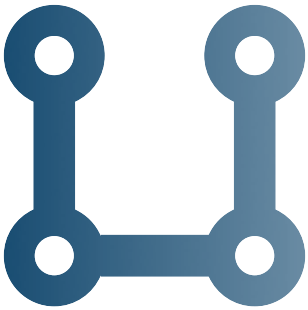
- How are potential users of the co-creation lab interacting with one another and accessory IT infrastructures to perform experiments?

Answering this research sub-question involves looking at the interview results and the created use cases. The first aspect that stand out from the interview results is the large number of parties/users involved (see *Table 32: Overview of mentioned users during interviews*). From the interview, multiple participants confirm that each involved party has their own interests. This can be read in the interview results: *"The more parties involved, the more complex the innovation projects become, creating risks and lobby processes",* see *4.2.3 Results for answering research sub-question 2*. These interests often conflict, thereby contributing to the struggle zone. The conflicting interests are also present while performing experiments. In *Table 33: User insights*, interview participants admit that *"Different parties with different roles and corresponding concerns are involved into an issue per experiment."* Similarly, each experiment has a different target audience; *"Different target audience per experiment (e.g. employee, citizen, developers)."* Different target audiences have different needs that contribute to differing interests and concerns of involved parties. Thus, in the innovation platform interactions are based on a multi-actor environment in which actors hold different interests. The situation where multiple parties are involved to conduct experiments is inevitable. The involvement of different parties enables knowledge sharing which is a corner stone of Chesbrough open innovation paradigm (Chesbrough, 2003). Parties involved should therefore learn to deal with diversity. In order to work efficiently, the interview participants suggest that *an assessment for a new party is needed when it joins an experiment trajectory (factors A5 mentions as decisive: content, process, culture, and relations)*. An assessment helps to develop trust, and requires openness and transparency which are mentioned by the interview participants to be requirements for innovation (see *Appendix 13: Interview results: Requirements for Innovation)*. In the end, forming alliances for collaboration is proven to be successful in increasing the innovativeness (Ahuja, 2000).

Also, the execution of the Digicampus's quadruple helix approach can be nuanced. In the interviews, the role of the citizen while performing experiments is questioned. A5 mentions; *"The citizen can only be involved in the development process if certain technology and policy processes are already finished."* The question can be raised; is the citizen an equal helix in the quadruple helix model adopted by the Digicampus? The citizens are a final target audience for the experiments, but its role in the experimentation is questionable. Now, as A5 mentions, the citizens in the Digicampus application are like Guinee-pigs for the experimentation. Arnkil et al. (2010) reasons that the public can be interpreted in a broad sense. In this way it easy to implement the citizens as an equal helix. However, the notion can still be raised that the Digicampus approach is a triple helix with a strong user focus. Specifically looking at the Leydesdorff & Etzkowitz (2003) paper, it is argued that adding the public as fourth dimension can be beneficial but is risky as it denies the public as foundation for the innovation. Although, in a later paper of Leydesdorff (2012) the constraints of adding a helix seem more loose. This thesis does not aim to put a straight conclusion on what the Digicampus's helix approach is; triple with user focus or indeed quadruple. Instead, it wants to incentivize the Digicampus organization to think about the role of

citizens in experiments and how actively it wants to involve them. After the execution of a couple of experiments this role should become clear.

Lastly, the use cases are analyzed to answer the research sub-question. The mere creation of the use cases gives an overview of how different parties in different experiments interact with one another. The switch of viewpoints in the different phases of the use cases is considered most important to see how participants interact to perform experiments. Different perspectives are utilized to symbolically approach each phase: first, the switch, second, a kite-level viewpoint, third, a sea-level viewpoint, and last, kite-level again. It is important to realize that the kite-level represents a business point of view and sea-level a technical operation point of view. This implies different interactions among actors and different involved knowledge. The different points of view should be taken into consideration while performing each phase. The knowledge that is involved in both technical and business points of view should be consulted together to create better experiments results. A requirement to do this is accessibility to each involved party's resources. Multiple interview participants mention that, *in order to collaborate, openness and transparency is required to have good communication. Required information should be accessible* (see *Appendix 13: Interview results: Requirements for Innovation)*. Openness and insight a requirement for the interaction of co-creation lab users. Interview participants also mention this as a need for the Digicampus; *Openness and insight into different information architectures between different government offices is needed to advance in the digital society of the Netherlands. This accessibility is needed for innovation and enables reuse of other findings of different parties* (see *Appendix 14: Interview results: Digicampus's Needs)*. Well-organized experiments will not only judge innovations better, but experiment findings can also become more worthwhile for further implementation or upscaling.



Chapter 6: Designing the co-creation tool

This chapter performs the last phase of the research, phase 3: creation. With that, the chapter resembles the last four activities of Peffers et al. (2007), design and development, demonstration, evaluation, and communication. As an addition to the description of *2.3.3 Phase 3: Creation* , the activity, design and development, is described in three steps. The first step, execution design and development, is a brief review of the process of creation. The second step, the user definition prototype, is a further elaboration on the proposed users of the prototype. As the use cases are case-specific, the prototype should exceed the level of case-specific users of both experiments. In the future, new and different experiments might come into play. A definition of users on a higher abstract-level is needed for the design and development process. The third step, prototype structure, is the elaboration on the created prototype. This step is straightforward in what it wants to describe, what the prototype is, and its functionalities.

The last subsection, evaluation round, is the execution of the last three activities of Peffers, demonstration, evaluation, and communication. The choice of why it is conducted this way is described in *2.3.3 Phase 3: Creation* and how it is conducted is addressed in this chapter. Finally, the chapter answers the last sub-questions 5 and 6. The design of the prototype will be submitted in PDF format in a second supplement to this thesis.

Chapter content:

6.1 Execution design and development

6.1.1 Goal of the design

The goal of the design research in this thesis is to create a co-creation tool. A co-creation tool is a tool that supports the co-creation lab in its operations to enable collaborations and to perform experiments. The co-creation lab has to be supported in its operation of starting up experiments, performing experiments, and communicating experiment results.

The research challenges complicate the operation of the co-creation lab. Previous described literary concepts and insights of the interviews are used to solve the research challenges. First, to enable co-creation, the researcher aims to use two elements of Ramaswamy & Gouillart (2010); network relations and an engagement platform. The elements are assumed to be realizable through an innovation platform, which physically or virtually connects parties to enable co-creation. Second, recombinant innovation is part of the goals of the experiments. To enable use and reuse, Bessant & Trifilova (2017) propose three routines; abstract driven-search, brokerage, and cyclic adaptation. These routines are taken into consideration in the design. Third and last, in the interviews, the need for insight and overview is considered one of the primary enablers for innovations in the Digicampus. The function to give insight into different domains is, therefore, the scope of multiple functional requirements.

6.1.2 Ideation

The activity, design and development, has no apparent description of what approaches can be used; differing approaches can be used (Peffers et al., 2007). The researcher chose to use an iterative approach for developing the prototype. The prototype will be iterated through informal talks and an interactive workshop, see *6.4 Prototype* evaluation. However, to start with an iterative approach, first, an idea has to be created. This process is called ideation. Here, an idea has to be created that fulfills the design objectives, which are written down through functional requirements. An idea is also required for the iterative approach. In this phase, informal discussions and meetings were conducted with Bas Kaptijn. Bas Kaptijn is an IT architect at ICTU. As previously mentioned, ICTU is one of the involved parties setting up the Digicampus. Bas Kaptijn is made responsible for the creation of the co-creation lab. In the meetings with Bas Kaptijn, the idea for the prototype was created. The idea is the following:

The idea is to create a website that functions as a catalog where defined users can find information that they require.

This idea is the basis for the prototype. A catalog that supports the innovation platform in its operation is considered a tool that fits into this thesis research objective and its design research. The chapter explains the prototype further in *6.3 Prototype structure.*

6.1.3 Creation process

The prototype will be created in collaboration with Bas Kaptijn. Due to the researcher's background, the researcher will focus on creating the User Experience (UX) and User Interface (UI) of the catalog. Bas Kaptijn will focus on the back-end development of the website. Bas Kaptijn's ideas for structuring the website will be explained in this thesis, but the underlying computer science will not be part of it. This specific knowledge is considered to be owned by Bas Kaptijn and is not compatible with the background knowledge of the researcher. It is chosen to work with the macOS program Sketch to create the UX/UI [17]. Based on informal talks, the UX designers of Logius work with the same program. Therefore, it is chosen to work with this particular program. The design of the prototype will be submitted in PDF format in a second supplement to this thesis.

[17] https://www.sketch.com/

6.2 User definition of the prototype

6.2.1 User roles

To generate an overview of all the parties potentially collaborating with the Digicampus, all the parties mentioned in the qualitative are displayed in *Table 21* in *Appendix 18: Interview results: users mentioned during interviews*. All these parties might become potential users of the prototype. As this is a broad scope, the researcher chose to converge users based upon their knowledge background. The users of the prototype will have a wide variance in knowledge background. The wide variance is because of the involvement of the quadruple helix model. User roles are created to structure users. The user roles are based upon the interview results and the use cases. User roles are specific perspectives on how users interact with the prototype. Four roles are recognized, which are displayed in *Table 3: User roles and involvement in organizations*. The user roles are organized through the quadruple helix model.

User roles	Government	Businesses	Scientific community	Public
Business developers	x	x		
Technical developers	x	x	x	
Policy commissioners	x			
Researchers			x	x

Table 3: User roles and involvement in organizations

The four roles that are recognized are defined as the following:

- Business developers are considered active users responsible for the innovation projects of an organization. Business developers are present in the helices; government and businesses. Both governments and businesses are considered organizations with a need for innovation. A business developer acts out on this need and creates the projects needed for innovation.

- Technical developers are users that have technical knowledge and are responsible for the creation of innovations. Technical developers can have different knowledge backgrounds. For example, data scientists, programmers, UX designers, and IT architects are all considered technical developers. These developers use their skills to realize the innovations. Technical developers can come from three helices; government, businesses, and the scientific community. This is similar to the user role business developers, but with an additional helix of the scientific community. The scientific community is added, as this helix includes people with technological knowledge working in a research environment. These scientific, technical developers can contribute to the Digicampus using and reusing previously acquired knowledge or technical objects. Therefore, this helix includes technical developers, as well.

- Policy commissioners are government officials who are general supervisors of innovation projects. They check not only if public spending is accounted for, but also if created solutions comply with the law. The policy commissioner is primarily chosen as a user role for its legal viewpoint on innovation and takes accountability into account. The only helix that applies to the policy commissioner is the government. Policy commissioners work with laws, and public spending and this is part of the government operations.

- Researchers are users that want to gain knowledge to start or learn about innovation projects for their research. A researcher is a broad user term, as researchers can have multiple knowledge backgrounds. Research can be conducted in multiple domains, for example, legal research, technology research, public administration research. The helices that apply for this user role are the scientific community and the public. The scientific community conducts

fundamental research with multiple domains. Domains that apply to Digicampus can be the basis for research. Currently, only the TU Delft is directly involved, which focusses primarily on technology and public administration. In the future, other universities with other knowledge backgrounds might join the mix. The other helix that applies is the public. As the Dutch government is considered a democracy, the public influences policymaking. Therefore, citizen's initiatives research specific interests. Citizen's initiative is a group of people who seek to elaborate on specific cases of interest. Citizen's initiatives can be the basis for new societal developments and policymaking. Innovation projects can be of interests of these groups as it influences the services of the government towards the public. Also, the citizen's initiatives can be a target group of experiments. Therefore, the public is considered a helix of the researchers' user role.

6.2.2 User stories

Each role that is recognized has its specific user story how it interacts with the prototype. In order to create user stories, the methodology of agile software development is used (Cohn, 2004). The agile software development user story allows a simple description of a user story. The user story can be used as a perspective to analyze the prototype and discover the needs of proposed users (Cohn, 2004). The use cases where the functional requirements are derived from already display needs for users. However, the functional requirements do not represent a specific perspective or 'glasses' to analyze the prototype. Therefore, it is chosen to use a simple description to create perspectives. The perspectives can be considered user categories. The description of a user story has the following structure: as a <user role>, I want <goal>, so that <benefit>. From the four recognized user roles, the following user stories are created.

- As a *business developer*, I want to gain insight into parties who are available for experiments, and parties willing to perform experiments, so that I can start experiments for innovation.

- As a *technical developer*, I want to gain insight into the technical components that are required to perform experiments, so that I can build the technology for innovation.

- As a *policy commissioner*, I want to gain insight in experiments that are already conducted, being conducted, and the experiment where I will be involved in, so that I can justify my spending or my operation.

- As a *researcher*, I want to be able to collect knowledge about innovation projects of the Dutch government so that I can use this knowledge for my research.

6.3 Prototype structure

6.3.1 Three axes

The prototype will thus be a website that functions as a catalog. To create an overview of how the catalog will be organized, a site map is created. The site map can be observed in *Figure 13: Sitemap prototype*.

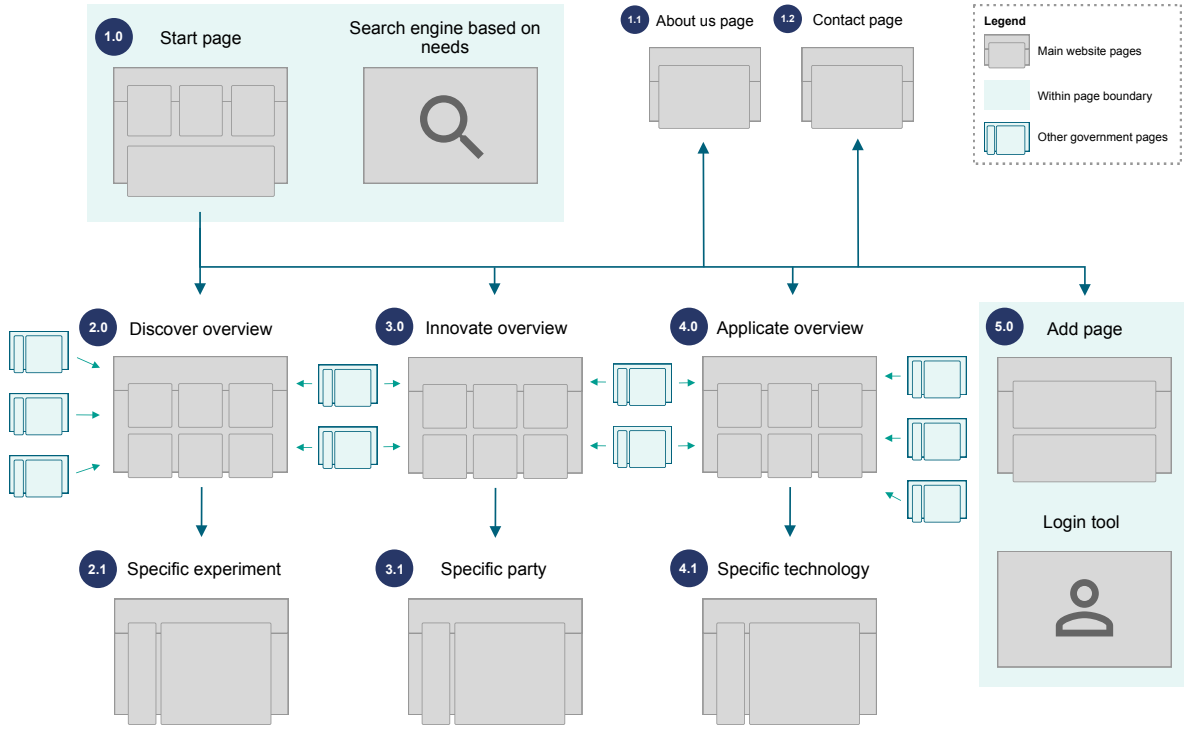


Figure 13: Sitemap prototype

To structure the catalog, an attempt is made to define motivations for catalog usage. Based on the use cases and user stories, three motivations are recognized, discovery, innovation, and application. The motivations are defined as follows:

- Discovery (or discover) is the need of users to find initial knowledge that is required to perform innovation. Users need to perform discovery when they are still in a fuzzy place about their innovation idea. Information about current trending topics in government IT usage, recent political decisions involving IT, innovation targets of involved companies, and previous experiment results are deemed suitable for this motivation.
- Innovation (or innovate) is the need of users to start an innovation project actively. Here, users need to gain access to information that enables them to start innovation projects. Information about parties willing to perform innovation experiments (e.g. innovation labs), innovation services, test environments for specific innovations, and current innovation programs is helpful.
- Application (or apply) is the need of users to have access to tools and technology to perform experiments. Once an innovation project is started (or is already started), the need might arise to perform experiments. Specific methodologies and supporting technologies can or have to be used to perform an experiment. Information about specific software, hardware, APIs, technical test environments, datasets, and design tools (e.g. business canvasses) is required to perform experiments.

A fit between the user motivations and the recognized user roles is displayed in *Table 4: User motivations with user roles*. The fit is created to give an understanding of how the user stories are synthesized in the motivation for the catalog use.

	Discovery	Innovation	Application
Business developers	x	x	
Technical developers	x		x
Policy commissioners	x	x	
Researchers	x		x

Table 4: User motivations with user roles

The three motivations will be used to structure the prototype through axes, as can been seen in *Figure 13: Sitemap prototype*. Information that corresponds with specific axes is organized through them. In the prototype, three examples of information samples will be worked out. Each fitting in one axis. The worked-out examples can be seen in the second supplement about the prototype.

6.3.2 Storage: Decentralization & Metadata

There is already written about the information that is present in the catalog. Important for the general structure is also the way how information pieces are stored. The idea is to do this in a decentralized way. As there is a great diversity of proposed parties that will be involved in the Digicampus, and all these parties have different interests, a suitable structure has to be adopted. The primary idea is that the catalog should support innovation activities. A pillar for supporting innovation activity is to connect all these parties. The goal is not to take the propositions or information of these parties away from them and use it in Digicampus context. Therefore, the catalog should provide linkages to other parties' information. In this way, a network will be established where innovating parties can gain access to each other's content. The idea is that for the involved parties, it adds value to be in the catalog. Being part of the network of parties who display their information in the catalog will be valuable.

Also, the decentralized storage takes the burden away from the catalog to govern all collected information. Linkages to the content of other parties are the only information that is stored. To decentralize further, parties wanting to be in the catalog can upload their information and govern it. The catalog should then grow slowly by itself with parties joining the network.

Stored information is assigned specific metadata to support the catalog. Metadata are characteristics of specific pieces of information (Duval, Hodgins, Sutton, & Weibel, 2002). The metadata makes pieces of information searchable. When parties are adding their content, it is crucial to assign the right metadata in order for other parties to find the content. Parties adding their content can do that themselves. Nevertheless, putting the responsibility to those parties for the creation of metadata can lead to mistakes in the metadata. To overcome this, the catalog also assigns metadata to added information pieces. Bas Kaptijn will create the precise IT infrastructure of meta-dating. Further elaboration on that topic is considered out of scope for this thesis.

6.3.3 Key features

To enable the prototype's structure functionalities, underlying key features are required. The key features are displayed in the sitemap with the color green, see *Figure 13: Sitemap prototype*. Three key features are recognized: a login tool for monitoring (1), a search engine based on needs (2), continuous screen-scraping to update content (3). All these key features are tools for the prototype's structure in order to function correctly. In the next paragraphs, the key features will be addressed.

A login tool for monitoring (1). Creating accounts and 'logging-in' is what millions of people do every day on the internet on platforms such as, Facebook, their e-mail browser, YouTube. A login tool is the IT

infrastructure that enables users to get access to specific content that is meant for them. 'Logging-in' is an identification method for the website. The website knows through the identification that it can provide access to a specific user. The prototype has a decentralized structure where users can add specific content and also edit them. A login tool is required to see what belongs to which party and that a party can edit their added content. Also, from the prototype's perspective, it is demandable that not everybody has the freedom to upload content. Using a login tool is the safeguard against non-usable content uploaded to the site. Therefore, from the Digicampus perspective, moderation is required to see who uploads content. Users can to create accounts and fill in requests to add content. Also, there is an option given for the user to fill in requests without a creating account. This is done for user who might not want to create an account immediately. The requests will be sent to the e-mail address of the moderator and be placed on a specific page for the moderator of the website for approval. The moderator is the responsible person from the Digicampus to maintain the catalog.

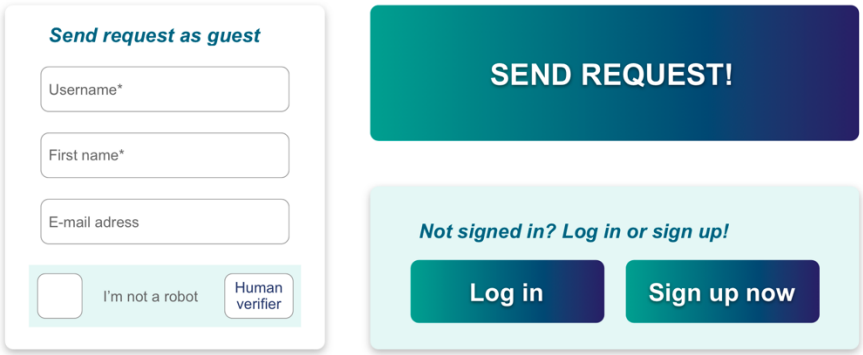


Figure 14: Screenshot of prototype: request to add content

Lastly, it is a goal for users to create accounts on the website for community building. Users with accounts are known by the prototype and, therefore, easier reachable for the Digicampus. This creates opportunities to create links. Creating links between stakeholders for innovation creates an innovation community (Lynn, Reddy, & Aram, 1996). Innovation communities are beneficial for innovation, see *3.2.1 Collaboration for innovation* (Dahl, Lawrence, & Pierce, 2011).

Search engine based on needs (2). The creation of the three axes is based on the needs of users, discover, innovate, and apply. In the future, more needs might be added as well as further evolvement of the needs from the three axes. For example, a developer might have the individual need to use specific APIs to build a test environment for an experiment, see *Figure 15: Screenshots of the prototype: search engine*. This is a further evolvement of the need; apply. A search engine is a convenient tool to find specific content in the catalog. The search engine will be added with the functionality to fill in a user role and a specific need. The search result will be delicate and specified to the specific need for the user. The search engine based on needs is an idea from Bas Kaptijn. The information pieces will need extra metadata in order to be findable through needs. How the IT infrastructure will be created to facilitate this is currently in progress. Further, elaboration on how the metadata will be structured and assigned is considered out of the scope of this thesis.

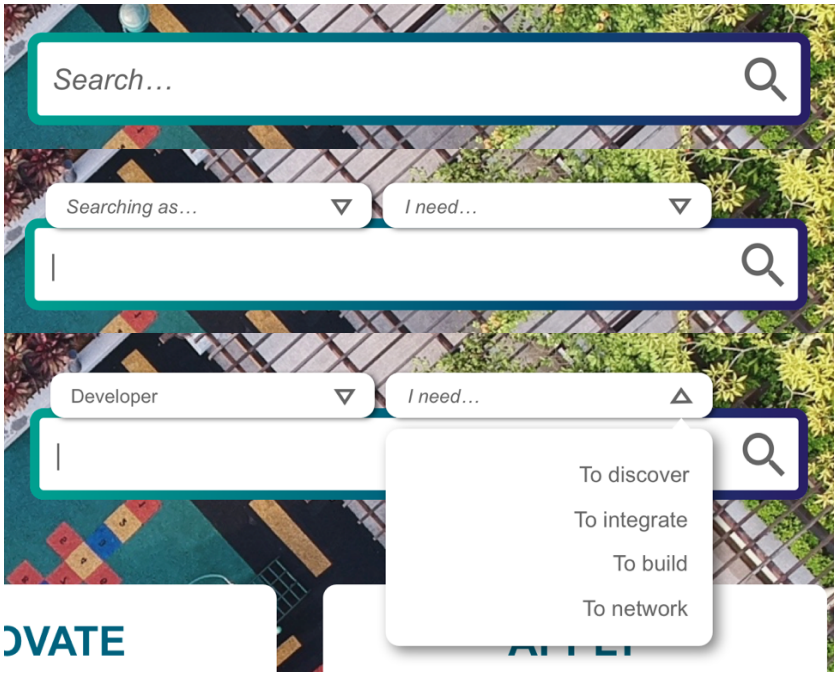


Figure 15: Screenshots of the prototype: search engine

Continuous screen-scraping to update content (3). Users can add their content, but the prototype is also able to generate information pieces itself. The generation of information pieces by the prototype is done through screen-scraping. Screen-scraping, also referred to as web-scraping, is automatically extracting information that is written or present on another website (Glez-Peña, Lourenço, López-Fernández, Reboiro-Jato, & Fdez-Riverola, 2013; Vargiu & Urru, 2013). Especially, standard information such as; contact information, brief descriptions about a specific party, or current projects are suitable for screen-scraping. Extracting websites' information is a snapshot of an existing website. The screen-scraping should be done again in intervals from the same website to keep to information up to date. An example that is used in the UX design is the employer of M4, Novum, see *Figure 16: Screenshot of prototype: Novum example*. The idea is to this for multiple websites that have direct links to the Digicampus. The catalog will provide linkages to other websites, plus a brief description of what is on that website. The linkages to other websites are considered to add value to the catalog, increase the amount of content in the catalog, and therefore increase its utility. The screen-scraping should be governed by the moderator to make sure the right websites are 'screened'. Finally, designing the IT architecture that is required to enable the screen-scraping is considered out of the scope of this thesis. Further design research will be required to create this key feature.

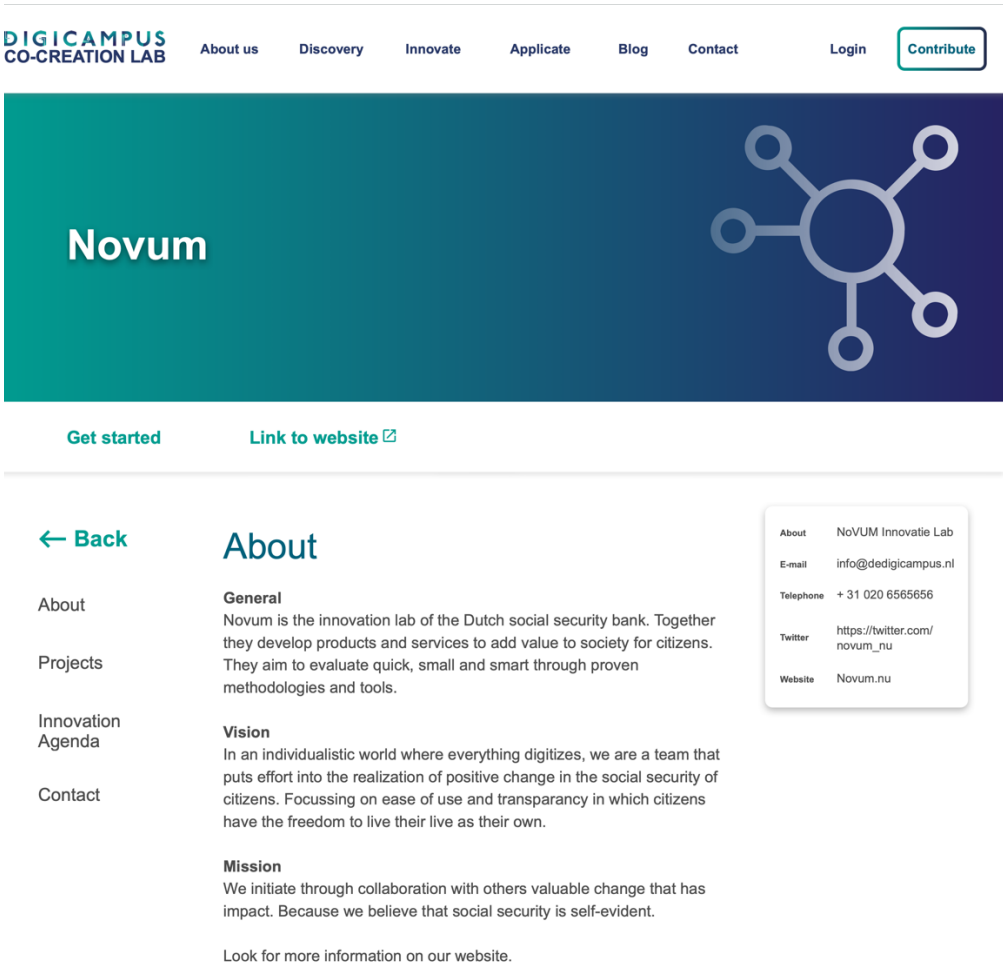


Figure 16: Screenshot of prototype: Novum example

6.4 Prototype evaluation

6.4.1 Method

An interactive workshop evaluates the prototype. As prescribed before in *2.3.3 Phase 3: Creation* , the prototype is used as a case study where the Robson's classification of 'improving' will be practiced. The critical character should be maintained and based on qualitative and qualitative information (Runeson & Höst, 2009). The meeting is recorded and noted. No transcript will be made to spare time. The researcher will make notes from the recording to improve the existent prototype. The interactive workshop should take approximately 45-90 minutes.

The interactive workshop will contain a presentation about the prototype, a moment to fill in the questionnaire, and a group discussion. First, the presentation will show the participants the general structure of the prototype and its key features. The presentation will be a summary of the previous Chapter 6. After the presentation, the participants are asked to fill out a questionnaire about the prototype. The questionnaire will gather quantitative information and an opportunity for qualitative information. The researcher recognizes that some individuals might be less present in the group discussion. The questionnaire should enable the participant to give is his/her opinion besides the group discussion. Lastly, the prototype is evaluated with a discussion where questions can be asked both ways, from researcher to participants and vice versa. In the discussion, participants are urged to ask questions and give direct feedback on the presented prototype. The interaction in the discussion will generate qualitative information in which the researcher can take notes from the recording. The researcher prepares questions in advance to fuel the discussion.

6.4.2 Participants

The participants selected should have the same requirements to enter the interactive workshop as with the semi-structured interviews, see *4.1.3 Interviewee identification and justification*. In *Table 5: Prototype evaluation participants*, the participants are displayed with substantiation for each participant. There should be noted that some participants from the interviews are also in the workshop. The scope of the workshop is slightly different as there is looked for participants who are involved in experiment processes and therefore have possible interactions with the prototype. The aim was to represent all the created user stories in the evaluation. The substantiation for the choice for participants is therefore different than the previous table in Chapter 4.

All participants will be informed about the same ethical guidelines as with the semi-structured interviews. The checklist from Whiting (2008) is used again, and the participants will be asked to fill in the informed consent document according to the TU Delft ethical guidelines. The informed consent form of *Appendix 5: Consent Form for Master thesis of Koen* is slightly altered to create an informed consent form for the prototype evaluation, see *Appendix 22*.

#	Name/ Appointed function	Organization	Position	Justification
1.	J2	Logius	Business Consultant	J2 is a business consultant for Logius. J2 seeks new business opportunities for Logius. As Logius is involved with the creation of the Digicampus, J2 is as well. Jon's responsibility for the SBR-JSON experiment is essential, as the prototype can help him directly in the experiment process. Therefore, his needs and perspective are essential in the evaluation. J2 represents the user role business developer.

2.	T3	Digicampus	Innovation engineer	T3 is the 'quartermaster' of the Digicampus within the Dutch Ministry of Internal Affairs. T3's responsibility is to set up the first operations of the Digicampus. This responsibility also implies the experimental processes. Her responsibility is, therefore, a valuable perspective to take into account. Due to the responsibility for experimental processes, T3 is considered to represent the user role business developer.
3.	M4	Novum (SVB)	Technical developer	M4 works for Novum, the innovation lab of the Dutch Social Security Bank (SVB). M4 is not yet involved with the Digicampus, but knows its existence and what it does. In the future, Novum and Digicampus will collaborate with experiments. His experience and knowledge as a technical developer for public services are essential to understand what the experiments will include. M4 will represent the role; technical developer. M4 has an outsider's perspective to the Digicampus and also to the prototype. Therefore, it is essential to take his perspective into account.
4.	A5	Rijksdienst voor Informatie Gegevens (RiVG)	System Architect	A5 works for the government office of identity data (RiVG). This office is part of the Dutch ministry of internal affairs and is responsible for the identity data of Dutch citizens. A5 is responsible for the implementation of a significant innovation process conducted by the office. In the nearby future, A5 will start a collaboration with the Digicampus to conduct experiments. A5's insights are valuable as he will be a client soon and is an outsider to the Digicampus. His perspective will contribute to understanding how the prototype should support the experiment process. A5 represents the user role policy commissioner because of his responsibilities in his office and the project's linkages with politics.
5.	N6	TU Delft	Researcher	N6 works as a researcher for the TU Delft. He collaborates closely with the Digicampus to advance in his research. N6's needs are an essential perspective to take into account in the evaluation. Nitesh will represent the user role of a researcher.
6.	G6	ICTU/ Digicampus	Innovation consultant/ Quartermaster products and services	G6 works at ICTU as an innovation consultant. G6 is also responsible for the new products and services offered by the Digicampus. From Digicampus's organization, she will work together with A5 to perform the digital identity experiment. She knows what is required from within the Digicampus to perform experiments with outsiders. This perspective is essential to evaluate the prototype if it offers what is required. G6 represents the policy commissioner user role due to her responsibilities in the Digicampus and ICTU.

Table 5: Prototype evaluation participants

6.4.3 Questions for participants

The questions for the participants exist out of three parts, user role validation, the quantitative questionnaire, and the qualitative discussion. First, a couple of questions are asked for the validation of the user role from the participant. The researcher appointed specific user roles to the participants in the previous paragraph. The appointment of user roles has to be validated if the participant agrees with the predetermined perspective. The first part of the presentation will include an explanation about the

user roles and stories. The predetermined user role is prefilled in for the participant, where he/she can agree/disagree and possibly change their user role.

Scientific literature is consulted to create the content-focused questions for the quantitative and qualitative part. A dominant model for evaluation (cited more then 10000 times) is the Delone & McLean Model for Information Systems (IS) Success (Delone & McLean, 2003). Delone & McLean (2003, p. 26) propose the model for the *"capture of multidimensional and independent nature of IS success"*. Their model is displayed in *Figure 17*, does not provide hands-on tools for evaluation but rather dimension to take into consideration. The Delone & McLean model can be applied to different contexts.

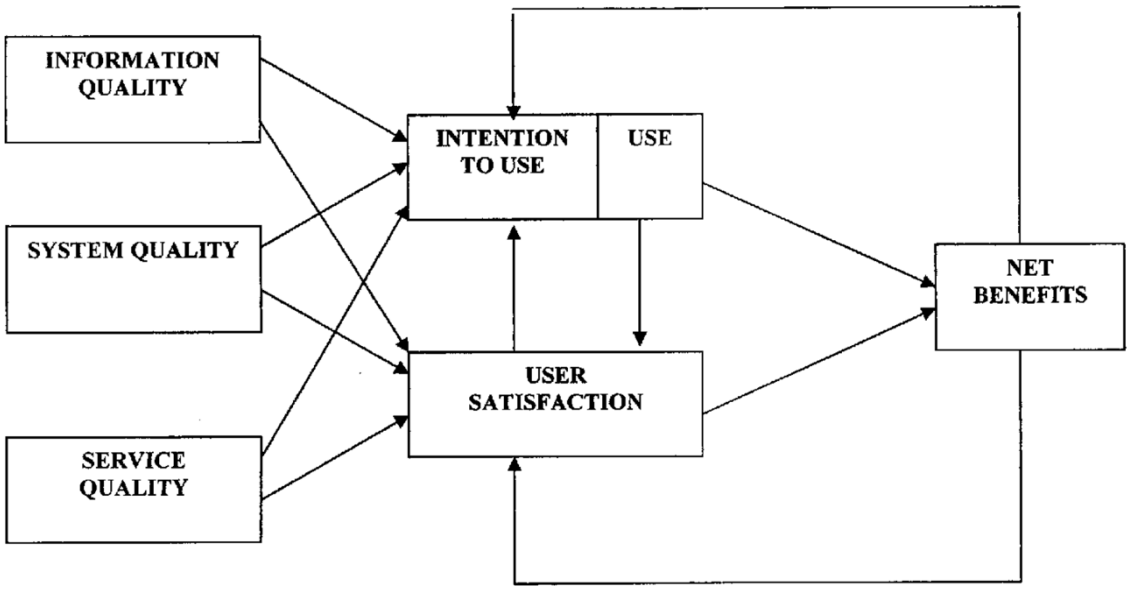


Figure 17: Delone & McLean model for IS success 2003 version (Delone & McLean, 2003, p. 24)

Wang & Liao (2008) apply the model to government context. In their paper they explain that there is a government to government (G2G), government to business (G2B), and government to citizen (G2C) perspective. Wang & Liao choose to continue with the G2C perspective, as this is considered by them to be the most prominent perspective. In their research, they find significance that their Delone & McLean model is viable to measure the success of government ISs.

Looking at the user stories of this thesis and the quadruple helix model of the Digicampus, G2C is part of the scope but not the most significant one. Elling, Lentz, & De Jong (2007) created their Web Evaluation Questionnaire (WEQ). The WEQ is developed for informational websites of the government. The WEQ uses a more general approach for website visitors, including citizens and stakeholders. Therefore, the researcher chose to use the WEQ as a guideline for the questionnaire. The WEQ uses nine dimensions; relevance, comprehensibility, comprehensiveness, user-friendliness, structure, hyperlinks, speed, search option, and layout, which have corresponding questions (Elling, Lentz, & De Jong, 2007). A quick look at the dimensions of Delone & McLean and the WEQ shows overlap. Further research is required to establish definitive links, but the WEQ is chosen as a primary guideline for the quantitative questionnaire due to its target scope and the delivery of hands-on tools for evaluation.

In the application of the WEQ per dimension, one question is selected. The selection is made to make the WEQ fit within the time limit of the workshop, as there should also be remaining time for the qualitative discussion. The dimension speed of the WEQ is neglected, because the prototype will be presented through the prototype function of Sketch. The speed will not represent a real-life situation

when the website is online. An overview of dimensions and the corresponding questions can be viewed in *Table 6: Questions related to the WEQ dimensions*. Elling, Lentz, & De Jong (2007) use a five-point Likert scale to grade the questions in each domain. Some statements were found extra useful in the evaluation based on informative group discussions to evaluate the chosen questions. Therefore, extra room for qualitative deliberation is added to some statements. Also, another two questions were added to judge; trustworthiness, and advisability. These dimensions were added to better correspond with the dimensions of the Delone & McLean model. The questionnaire can be viewed in *Appendix 23: Prototype evaluation graduate project Koen Meijer*.

#	**Questions**	**WEQ Dimension**
1.	I find the information on this website useful.	Relevance
2.	I find the information in this website easy to understand.[2]	Comprehensibility
3.	Certain information I was looking for was missing on this website.	Comprehensiveness
4.	I consider this website user-friendly.	User-friendliness
5.	I find the structure of this website clear.	Structure
6.	It is clear which hyperlink will lead to the information I am looking for.	Hyperlinks
7.	The search option on this website gives me useful results.	Search option
8.	I find the design of this website appealing	Layout

Table 6: Questions related to the WEQ dimensions

To create the questions for the qualitative discussion, the WEQ is used to briefly reflect the basic functionalities of the prototype, the Delone & McLean model is taken into consideration, the functional requirements are taken into account, and the interview results are consulted. The goal is to create five questions that fuel the discussion. Questions can be asked both ways. The following five questions will be used for the discussion:

- Opening question: as the questionnaire is filled in, are there any particular (or missing) topics that come to mind that you want to have discussed within the group? (This question is also used to build upon the two qualitative questions that are asked in the questionnaire)
- In the interviews, requirements for innovation is an important topic, does the prototype help innovation according to you?
- Does the prototype help users perform experiments according to you?
- Does the current set up of use help you to retrieve the information you need?
- What are your expectations for the support provided by the Digicampus while using the website?

6.4.4 Results

Here, the insights resulting from the interactive workshop are described. The insights can be used to improve the prototype, according to the methodology of Robson (2002) and Runeson & Höst (2009). A5 was not able to attend the interactive workshop due to circumstances. The discussion was done with him on a separate occasion alone. The filled-in questionnaires are added in the same supplement as the previous interview transcripts. From the user role validation, only Giulietta noted she was not a policy commissioner. She saw herself more in the user role of a business developer. The user role of policy commissioner was thus less represented in the evaluation than expected.

In the following table, the results of the quantitative questionnaire are displayed, see *Table 8: Quantitative results from prototype evaluation*. There should be noted due to the small sampling size and judgment sampling that these insights cannot be used for causal relations or correlations. The quantitative results should be seen as support for the qualitative assessment.

Likert-scale answer	**Appointed grade**
Strongly disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly agree	5

Table 7: Likert scale scores and appointed grades

Questions for questionnaire	**Average score**
1. I find the information in this prototype useful.	4
2. I find the information in this website easy to understand.	3,2
3. Certain information I was looking for was missing on this website.	3,4
5. I consider this website user-friendly.	3,4
6. I find the structure of this website clear.	3,6
7. It is clear which hyperlink/clickable button will lead to the information I am looking for.	3,2
8. The search option on this website gives me useful results.	3,8
9. I find the design of this website appealing.	4,2
10. Does the website look trustworthy?	4
11. Would you recommend this website to your peers?	3,8
Total average score	**3,7**

Table 8: Quantitative results from prototype evaluation

In general, there can be concluded that the prototype with a grade of 3,7 is received positively. The grade is not convincing yet. The design is perceived as attractive and information can be found. From the qualitative deliberation on the quantitative question, interview participants think this what could be added:

- Search engine optimization
- Overview through specific themes (such as SSI)
- More links to other sites.
- More graphics.
- Visualized data on topics, labs, and IT building blocks.
- Nothing, already too much information.
- Extra info what the prototype solves.

The following insights from the qualitative questions on the form were found:

- A real-life version of the prototype would help in the individual innovation journeys of organizations.
- A real-live version of the prototype is promising to help the Dutch e-government in performing innovation, but still, actions have to be taken. Proposed solutions by participants are active

community building, good search engine optimization, and exposure to innovators in the e-government.
- Researchers also want to build research partnerships. The current 'innovate' axis does not link this need well enough with the researcher's user role.

The insights from the discussion are organized in 'shoulds' and 'mights'. 'Shoulds' are what the prototype should do or be adjusted to, and 'mights' are considerations to the prototype that might be changed. The following insights from the discussion in the interactive workshop were found:

'Shoulds':

- It is crucial for innovators who get contact with the Digicampus for the first time (and might not know it) are properly guided to the right information they need. Understanding their demands precisely, which differ per user role, is one of the primary goals to achieve this. The range of information that the prototype offers should be adjusted to this demand.
- The prototype should support the process of guidance offered by the Digicampus more.
- Getting in touch with employees of the Digicampus to help new innovators is an important aspect. Relationship management is essential to boost innovation projects with Digicampus involvement.
- Put important technical components more visible in the prototype. One of the primary technical components which attracts innovators from the outside is the General Digital Infrastructure (Dutch: Generale Digitale Infrastructuur; GDI) of the Dutch government.
- The Digicampus should be clearly positioned towards the other organizations that form the Dutch e-government. This also helps to manage the expectations of incoming innovators interacting with the Digicampus.
- The design needs a better navigation flow towards getting contact information from parties that are seeking for collaboration in the Digicampus.
- Put the button for signing up and subscription on the homepage.
- Use better hyperlinks towards sources of information from external parties.
- Focus the content of the prototype more. Use the motto: 'Do one thing and do it extremely well'. The displayed content of external parties should be organized towards what is mostly used from the Digicampus website. Analytics of real-usage is required to do this, so this should be taken into consideration in the future.
- Search-Engine Optimization (SEO) should be carried out in order that valuable content on the website is found through external search-engines. Linkage with the search-engine of the website itself should also be considered.
- The content of external parties should be able to be organized through themes of the content. An example is the Self-Sovereign Identity (SSI). Who is involved with SSI? What APIs are involved with SSI? Etc. At the axis of discovery, substantive themes can be added.
- In the current evaluation, there is a Digicampus bias as most people who evaluate are involved with the Digicampus. In the future, the prototype should be tested with people who get in contact with the Digicampus for the first time (and might not know it).
- A more graphical interface can be created through visualizations on how things are connected with each other.
- Categorizing all the innovation labs within the Dutch government is a complex task due to the great variety. Nevertheless, giving an overview would be very beneficial.
- Navigation through the prototype should be evaluated per user role. The home page should also support the navigation perspective per role.

- The right content is disclosed to support the current broad reach of proposed users.
- A roadmap should be made for the implementation of the prototype.
- Purely community-driven content will lead to poor quality of content in the catalog.
- To become a central platform for information costs much effort and requires an active community-building team. Creating the right content on the internet has become a discipline.
- Questions should still be asked about what should the Digicampus do by itself and offer to its users? What happens precisely with screen-scraping? What is precisely added by community members themselves? An allocating overview of these tasks should be made. This discussion should also be conducted more broadly within the Digicampus.

'Mights':

- A community rating of uploaded content could proof viable to scope important information from the Digicampus. A 'like' button of content would be an idea.
- A tool for requests (e.g. requests to start experiments) to the community of the Digicampus could be an idea.
- Now, there is chosen for the form of a website to create the prototype. Other forms of prototypes could be created as well to give insight and overview.
- In the future, the whole UX design should be evaluated with UX designers.

6.5 Chapter Conclusion

6.5.1 Answering research sub-question 5

- How can the co-creation lab be supported through a co-creation tool to improve its experimental processes involving users?

This question is answered through the current form of the prototype. The current form of the prototype is a website that discloses required information to support the innovation journey. The current form aims to achieve the goal to support the co-creation lab in the operations of the experimental process.

To support the experimental process, the involved users have to be supported to enable collaboration for experiments. Based on the insights gained from the use cases, three steps have to be conducted enable this. First, proposed users have to be defined. Within the prototype, four user roles are defined: business developer, technical developer, policy commissioner and researcher. Second, the right needs of those users need to be identified. The user needs are generalized in the three axes of the prototype: discover, innovate, and apply. Third, appropriate information should be disclosed to support the experimental processes. Within each axis, supportive information is disclosed to support the different phases of the experiment, corresponding with the use case phases. 'Discover' is the first initial step in approaching the Digicampus. 'Innovate' is the 'starting up the experiment' phase. 'Apply' is the 'performing the experiment' phase. The last phase of the experiment 'end game of the experiment' contributes back to the discovery need.

Next, the question can be raised of how the co-creation tool actually improves the experimental process? Performing experiments is a part of the innovation process, and improving the innovation process is directly linked to the ability to perform experiments. Disclosing the appropriate information is helpful and can be linked to previous discussed concepts. In the interviews, four participant made explicit that *In order to collaborate, openness and transparency is required to have good communication. Required information should be accessible*. In the literature, the need for disclosing the appropriate innovation is needed in multiple concepts. In general, being able to access the right knowledge is essential for the open innovation model of Chesbrough (2003), where knowledge should flow freely in order for the model to work properly. Janssen & Estevez (2013) argue that using a platform for communication helps bring stakeholders together for innovation and streamlines processes. Disclosing the information to contact each other further helps the communication means.

Disclosing the information to contact organizations willing to experiment also helps the two elements coined by Ramaswamy & Gouillart (2010): network relations and an engagement platform. The contact information enables parties to connect with each other virtually, creating network relations. The network relations are important to realize the engagement platform concept of Ramaswamy & Gouillart (2010). An engagement platform is a sandbox where a select group people collaborate for innovation through experimentation and sequentially learning from experiment results (Ramaswamy & Gouillart, 2010). As this has similarities with the co-creation lab innovation approach, the creation of network relations is deemed important.

To enable recombinant innovation, which is especially suitable for innovating with IT, Bessant & Trifilova (2017) argue that abstract-driven search and brokerage is needed. Abstract-driven search entails being able to find the right content. In order to perform effective brokerage of two of the three factors, disclosure of the right information is needed. Specifically, the following factors are highlighted: *"(1) the availability of rich and varied networks to generate potential partner signals, and (3) the ability to engage potential recipients in exploring outside of their 'normal' search space"* (Bessant & Trifilova, 2017, p. 12). When so many literary concepts and interview participants demand the access of the right innovation,

theoretically the experimental process is improved. However, the co-creation lab still has to be tested in real life in order to confirm this.

Lastly, another essential element is the involved users. Actual human involvement is required to carry out the actions of an experiment. As pointed out during the evaluation, supporting users also occurs as a result of helping the humans in the process. Proper relationship management of innovators that contact the Digicampus is an important part to it. This connects the experimental service of the Digicampus with the guidance service. Proper guidance also helps the experimental service.

6.5.2 Answering research sub-question 6

- What do potential users of the co-creation tool think about the created prototype in this research?

In general, the reception of the prototype from the people close to the Digicampus is positive. The people interviewed are also potential users of the prototype. Therefore, their opinions matter. However, the prototype is also developed from the findings of the participants in the interview. The scope of participants from the qualitative interviews and the evaluation are similar. Logically, the interview participants think positive about the prototype as it based upon their thinking. Further tests with other potential users that are not familiar with the Digicampus is required to gain better understanding if the prototype works. Also, within the evaluation the participants was mentioned that the internet users have short attention spans. The navigation of the UX design should be optimized further to fit internet users that are not familiar with the Digicampus and could become potential users. This requires a new iteration of the prototype.

Also, concludable from the evaluation is the insight that the co-creation tool is still a prototype. To create a co-creation tool that fully functions requires effort in further development. Three key considerations for further development are active content management, community management, and back-end development. To help incoming innovators in the Digicampus, the aim is to give them access to helpful content for their innovation journey. The content should have a particular quality in order to be helpful. The quality and the corresponding quantity of the content that the co-creation tool gives overview and insight of is important. Active content management is required to achieve that. However, what the quality and quantity should be still has to be determined. Second, to make potential users into actual users, active attraction has to take place. Community management is required to convert potential users into actual users and attract new potential users. Third, a couple solutions proposed in the prototype, such as screen-scraping and decentralization of data storage, need further thinking how it is developed. The researcher focused on the UX/UI of the design. However, the solutions are of equal importance to realize the co-creation tool.

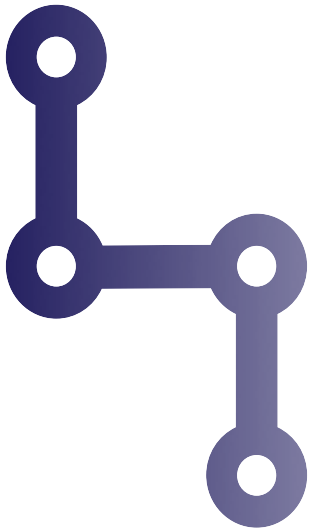
Lastly, in the evaluation a discussion about the operations of the co-creation lab took place. The people involved with the Digicampus discussed about what the exact operations of the co-creation lab should be. As the co-creation tool aims to support the operations of the co-creation lab, an idea is proposed for how the co-creation lab should be operationalized. The researcher made assumptions on what the goal of the co-creation lab is. However, as also described in the answer to sub-question 5, the co-creation lab is linked to the guidance service of the Digicampus. The Digicampus and the co-creation lab are still in development, which can result in fundamental changes on what the co-creation lab is. Fundamental changes mean possible changes on how the co-creation lab should be supported.







Branches
Time
Long - term strategy



Chapter 7: Conclusions & Recommendations

This is the final chapter of this thesis. This chapter answers the main research question and presents the primary conclusions. The researcher reviews the research outcomes with a birds' eye perspective and makes recommendations.

Chapter content:

7.1 Conclusion

7.1.1 Methods to answer the main research question

The goal of the Digicampus is to foster innovations for digital public services. Innovation in the public sector encounters barriers, hampering the innovation process. The co-creation lab is a proposed solution to overcome the barriers with collaboration for innovation and experiments for innovation. However, how the co-creation lab should be operationalized is unclear, which is the main research problem. To support the operations of the co-creation lab, a tool is designed which is the basis for the main research question: *How can a co-creation tool be designed for a governmental innovation platform in which experiments are conducted with governmental IT infrastructures to foster innovation in the Dutch e-government?* The main research question aims to solve the six challenges that are attached to the research problem: meager research into innovation in the public sector, the adoption of the quadruple helix model, enabling co-creation, requirements to perform experiments, the conditions of the technology used in experiments, and enabling use and reuse of already existing knowledge. The main research question is broken down into six research sub-questions to search for relevant scientific literature to the research challenges, discover the current innovation journey through interviews, and sequentially develop use cases of the experiments to discover the experimental process.

7.1.2 Research outcome

The outcome of the design research in this thesis is the co-creation tool. Thereby, the design of the co-creation tool is the answer to the main research question. The co-creation tool is a tool that supports the co-creation lab in its operations to enable collaborations and to perform experiments. The tool's design is a website that discloses the required information to support the innovation journey of innovators in the public sector.

The interview results show the following: *In order to collaborate, openness and transparency are required to have good communication. Required information should be accessible*. Insight, overview, and access are considered essential requirements for enabling the open innovation paradigm of Chesbrough (2003). The open innovation model, where knowledge must flow freely, is a cornerstone to perform experiments for innovation, collaborate for co-creation, and perform recombinant innovation within the public sector. These innovation concepts are the means to overcome the innovation barriers in the public sector, and are beneficial in several ways. Experimentation enhances learning opportunities (Thomke, 2003), increases the effectiveness of innovation processes (Thomke, Von Hippel, & Franke, 1998), and proposes a solution to overcome innovation barriers in the public sector (Borins, 2001; Mulgan & Albury, 2003). Collaboration for innovation increases innovativeness (Ahuja, 2000) and creates ideas that are prone to adoption (Dahl, Lawrence, & Pierce, 2011). Co-creation helps to create added value to new/improved products, services, and processes, as well as legitimizes created solutions to the involved stakeholders (Voorberg, Bekkers, & Tummers, 2015). Using recombinant innovation leads to faster routes for innovation and different paths in the innovation process (Brynjolfsson & McAfee, 2014; Frenken, Izquierdo, & Zeppini, 2012). By utilizing the benefits of these innovation concepts, innovators may be supported in their innovation journey.

Innovators in the public sector come from the different 'helices' in the quadruple helix model, representing the government, the business world, the scientific community, and the public. Within the quadruple helix, users are defined in four different roles: business developers, technical developers, policy commissioners, and researchers. Required information differs for each role and is defined in the user stories (see ***Fout! Verwijzingsbron niet gevonden.)***. However, information to enable collaboration is required for all four roles. Bessant & Trifilova (2017, p. 12) mention the following as part of enabling recombinant innovation: *"(1) the availability of rich and varied networks to generate potential partner signals, and (3) the ability to engage potential recipients in exploring outside of their 'normal' search space"*. Ramaswamy

& Gouillart (2010) mention that network relations are important to realize collaboration for innovation and experimentation. Janssen & Estevez (2013) argue that using communication means helps bring stakeholders together for innovation and streamline processes. Providing innovators with the right information can help to utilize the benefits of the previously described innovation concepts.

As experimentation is part of the proposed solution to overcome innovation barriers in the public sector, the experiment phases from the use cases are utilized to organize the required information. The required information is therefore divided into three axes: discover, innovate, and apply. 'Discover' focusses on providing information for orientation from innovators. 'Innovate' focuses on innovators who actively want to start up experimentation projects. 'Apply' focuses on providing access to existing technologies and methodologies for innovation. Also, the three axes are combined with a specified search-engine that allows users to search according to their needs and be guided to the right information. Users of the tool can contribute back by growing the total information offer by the tool when they upload or provide access to their content. The search engine uses the concept of abstract-driven search of Bessant & Trifilova (2017) to enable recombinant innovation. Abstract-driven search is the search effort to search on a higher level of abstraction based upon the core principles of a question or solution (Bessant & Trifilova, 2017). This enables an organization to 'get out of the box' and levitate from the current perspective of a solution.

7.1.3 Solving the research challenges

In total, there are six research challenges attached to the research problem. The first research challenge, that little research into innovation in the public sector exists, is the only 'unsolvable' challenge. This thesis copes with the challenge through an extensive literature review about the relevant literary topics. The consultations to the existent literature helped to develop a research outcome that proposes a solution on how to deal with the innovation barriers in the public sector. The design of the co-creation tool uses the ideas of the literature to enable the incorporated innovation concepts. Therefore, the co-creation tool is the contribution back to the literature. Other governments can learn from the co-creation tool and use it as inspiration to help improve their government's innovation processes.

The other five challenges are attempted to be solved by the functionalities of the co-creation tool. To solve the second challenge, the co-creation tool gives insight, overview, and access, all parties in the quadruple helix model can use the co-creation tool. Adopting the quadruple helix model requires different parties to co-create together. For the third challenge, to enable co-creation, the co-creation tool provides required information for collaboration. To scope the required information, the information is structured towards the different user roles of the innovators in the quadruple helix. Also, the required information is structured in three axes to help innovators from each helix in different phases in the innovation journey to start experiments in the co-creation lab. For the fourth challenge, to support the experiment process, the co-creation tool is created from functional requirements that are derived from the use cases that map the experimental process. The different phases in the experiment processes have two different focuses: business and technology. The co-creation tool offers information, such as contact information and innovation agendas, to support the business focus. To support the technology focus, it offers access to existing technologies and methods. The end goal of the experiments is institutional, which requires the results to be communicated to external parties to advance in the innovation journey. The co-creation tool stores the experiment results to become accessible for new users to support their innovation journeys after the experiments. The accessibility should help in communication. Next, the fifth and sixth challenge have overlap. The technology used in the experiments is predominantly IT. Due to the characteristics of IT, the conditions of using the technology are that recombinant innovation applies to it. The literature of Bessant & Trifilova (2017) is used to enable recombinant innovation.
Lastly, the prototype of the co-creation tool is evaluated through an interactive workshop. The learnings from the evaluation are displayed next paragraphs, *7.2 Reflection*, and *7.3 Recommendation*.

7.2 Reflection

7.2.1 Literature limitations

The scientific literature behind most innovation concepts is focused on the innovation processes of firms. Initial definitions of digital innovation and service innovation focus on the corporate landscape. However, the environment for innovation in the public sector is different than that of firms. These differences have to be taken into account when applying innovation concepts. In some literature, the differences in innovation environments are not addressed. The researcher converted some innovation concepts to the public sector. The conversions incorporate the concepts of digital innovation, the four elements of Ramaswamy & Gouillart (2010) to enable co-creation, service innovation, recombinant innovation, and Chesbrough's (2003) open innovation paradigm. Nevertheless, these reinterpretations could have led to misinterpretations of the used innovation concepts, due to the different innovation environment of the public sector. Certain innovation concepts might have to be changed for the public sector as the public sector is susceptible to different innovation barriers.

A part of the literature review focused on finding innovation barriers in the public sector. However, innovation barriers might differ between governments globally. For example, the Dutch government is different from the United States government. The question can be asked if specific innovation barriers in the literature apply to the Dutch government specifically. However, this is not addressed in the research.

The Digicampus applies the quadruple helix model. However, as discussed in the literature review, the form of the 'fourth' helix can have multiple forms. The literature does not give an unambiguous answer to what the fourth helix is. This is a limitation of the literature towards the Digicampus. The adoption of the quadruple helix requires a sharp definition of the 'fourth' helix. Otherwise, the quadruple helix might be a different helix model. A helix model that also fits the scope of the Digicampus is a triple helix applied for citizen-centric innovation. In the case of the Digicampus, questions can be asked about what the exact role of the citizen is in the quadruple helix of the Digicampus. This also applies to the co-creation tool. For example, citizen research initiatives can use the tool. However, can those be considered as an equal helix next to the other helices? There is currently no answer to that question from the Digicampus nor the researcher. The quadruple helix used for the Digicampus may in reality be a triple helix model. The adoption of a different helix model for the Digicampus would change the user definitions of the co-creation tool design.

The co-creation tool uses the three routines, abstract-driven search, brokerage, and cyclic adaptation, of Bessant & Trifilova (2017) as inspiration to enable recombinant innovation. However, the paper is only cited nine times (checked on Google Scholar on 24 November 2019). Therefore, their approach lacks credibility and still has to be tested in practice. The researcher chose to use the three routines to enable recombinant innovation as it complied with the existent approach of the Digicampus to foster innovation, and is one of the few papers writing about enabling recombinant innovation. The co-creation tool might experience shortcomings in its functionality if the approach of Bessant & Trifilova (2017) later proves not to be useful in enabling recombinant innovation.

7.2.2 Interview limitations

The literature review and the interviews were not performed in the order the thesis presents it. The real order of execution was a brief literature review, then the conduction of the interviews, and in a later stage the complete literature review. The resulting sequence has the effect that some conclusions from the interviews and the literature review overlap. The prime example of this in the research is the search for government innovation barriers. Even though there is little research in the literature about innovation barriers, multiple literary sources describe barriers. The discovered barriers in the literature

could have been judged with the interviews in the Dutch government context. Still, the interviews were useful to discover challenges in the innovation journey within the Dutch government. However, the interviews could have been connected more with the literature.

The interview participants were predominantly comprised of people involved with the Digicampus. The choice to interview people involved and close to the Digicampus leads to two biases. The first bias is that the outside perspective is lacking. This is a shortcoming of judgment sampling, as the researcher choose the persons eligible for the interviews. The interview results lead to requirements for fostering innovation based on the perceived needs of the people involved within the Digicampus. Outsider perspectives about fostering innovation in the public sector were not covered with the interviews. Thereby, essential insights about fostering innovation in the public sector may have been missed. Second, as the Digicampus is still a small organization, the interview participants knew each other. This leads to participant bias. Interviewees might have said what they believed the Digicampus expected them to say instead of giving their own opinions. The research might, therefore, portray too much about what the Digicampus wants to achieve instead of neutrally addressing the goal of overcoming the innovation barriers in the public sector.

7.2.3 Reflection on the co-creation tool design

From the perspective of the researcher, the government is a complex multi-actor network. The role of the government in the Digicampus is multi-dimensional. The government is a stakeholder, executioner, and judge for its innovations. Nevertheless, the Dutch government is a large institutional organ divided into multiple organizations. These organizations exist out of teams and individuals. The co-creation tool focuses on these innovators, who are the teams and individuals pushing innovations. The researcher categorized different innovators into user roles, and sequentially created user stories. The user definitions are the basis for the co-creation tool design. However, the researcher is aware that fulfilling the innovators' needs is a complicated task due to the diversity of the innovators. In the future, user definitions might change because of that diversity. Also, overarching organizations have a significant influence on the innovators. Helping the innovators to legitimize their innovation journey through co-creation and testing innovations in experiments before implementation should help the innovation process. In the end, the benefits of innovation should outweigh the political barriers of government organizations. The need to solve problems and innovate will always exist.

The researcher is aware that the current design of the co-creation tool is a minimum viable product. The form of a future real co-creation tool might differ. The contributions of the current design to a future co-creation tool are its user definitions and the idea of supporting the process to start up experiments through the three axes. The core idea of what an experiment is and what it should achieve will not change in the future. Therefore, the user definitions and the three axes can be used as inspiration or directly adopted for the next generation of the co-creation tool for the co-creation lab. The other functionalities of decentralization of storage, search-engine based on needs, and continuous screen scraping face back-end development challenges. Realizing these functionalities requires proper resources and a development team. In the future, ideas might change about how to serve the incoming innovators. The Digicampus could choose for a different allocation of its resources or choose to develop other functionalities.

The researcher notices that the process of setting up experiments and the Digicampus services; matchmaking and guidance, have overlap. The aim of the co-creation tool to connect the right parties for experiments is similar to the matchmaking service. The researcher considers the other services of the Digicampus to be out of scope for this research. However, the current design of the co-creation tool can to contribute to these other services as well.

The researcher is aware that the UX design is a 'first' in his research career. So-called 'beginner mistakes' could be present in the current design.

The researcher is aware that the designed prototype is not evaluated on how well the prototype fulfills the functional requirements. Instead, the researcher used the functional requirements as a checklist during the design of the prototype. Evaluation of how well the functional requirements are fulfilled can still be performed in a future research.

For further adopting the co-creation tool, it is important to recognize that the co-creation tool in itself is susceptible to the innovation barriers in the public sector. The co-creation tool is also a digital innovation. Kamal (2006) lists 42 critical factors for digital innovation adoption in the public sector. Successful adoption is a great challenge. Nevertheless, advice from this thesis can be used to improve the innovation journey of the people adopting the co-creation tool. Involving the right stakeholders to perform co-creation can result in legitimization for the choices in the innovation journey. In addition, the researcher has the opinion that the involvement of high-ranked government officials and the organization's dedication are drivers to overcome the innovation barriers. With the involvement of State Secretary Knops and the current dedication of the organization that already has formed exciting collaborations, the researcher thinks that the Digicampus is on the right way towards an established position within the Dutch government to foster innovations. Only time will tell if the Digicampus will succeed.

Lastly, the research of this thesis is conducted in the beginning phase of the Digicampus. The Digicampus will continue to evolve and could change in the future. Changes in the Digicampus might influence how the co-creation lab will be operationalized. Therefore, fundamental changes in the Digicampus will have implications on the co-creation tool design.

7.3 Further research & Recommendations

The last part of this chapter addresses specific areas for further research in scientific literature and makes recommendations for further development of the co-creation tool.

7.3.1 Further research on scientific concepts

This research uses the concepts of Bessant & Trifilova's (2017) in the design of the co-creation tool. However, further research is required into Bessant & Trifilova's (2017) method to enable recombinant innovation. As the citation amount is low, the methods still have to be tested in practice in order to judge its viability.

This research applies innovation concepts such as digital innovation, service innovation, and recombinant innovation to the public sector. However, more research is required on the topic of applying innovation concepts to the public sector as most innovation literature focuses on the corporate environment. Certain innovation concepts might have to be changed for the public sector as the public sector is susceptible to different innovation barriers. This research encourages the concepts of digital innovation, service innovation, and recombinant innovation to be applied in the public sector.

The researcher discovered that the literature does not elaborate on the individual government differences for innovation. Each government around the globe is different, and the innovation barriers differ within each government. Research should discover the differences on continental or national bases.

Lastly, examples of adopting the quadruple helix model in practice are not present in the literature. The Digicampus provides a case of adopting the quadruple helix model. However, further research into different cases of quadruple helix model adoption would help future adopters of the model.

7.3.2 Recommendations

Questions such as; 'will the co-creation lab be able to conduct successful experiments?' or 'will the Digicampus successfully foster innovation?' are left unanswered. The Digicampus has the responsibility to develop the co-creation lab further, and realize its goal, fostering innovation for digital public services in the Dutch government. The co-creation tool supports the co-creation lab, but the human element in the experiments and the innovation processes are determinative for the outcomes. Humans, as users, perform the actions within the co-creation lab. Especially in the first phase of 'setting up the experiments', the incoming innovators need guidance towards starting the experiments. Therefore, relationship management of incoming innovators is essential for the operations of the co-creation lab. Also, the Digicampus needs to have capabilities to set up teams to help the incoming innovators to perform experiments. The recommendation is to *create relationship management for incoming innovators and internal capability to set up experimentation teams.*

In the co-creation lab, interactions are based on a multi-actor environment where actors hold different interests. The situation where multiple parties are involved in conducting experiments is inevitable. In order to work efficiently, the interview participants suggest; *an assessment for a new party is needed when it joins an experiment trajectory (factors A5 mentions as decisive: content, process, culture, and relations)*. An assessment helps to develop trust and requires openness and transparency, which are mentioned by the interview participants to be requirements for innovation. The recommendation is to *Assess new parties joining experiment trajectories.*

The operations of the co-creation lab as an experimental platform also touch the matchmaking and guidance services of the Digicampus. While setting up experiments, the right people need to be

matched and guided to performing experiments for innovations. This is a crucial consideration, as this thesis only focuses on the co-creation lab. The needs of the co-creation lab are similar to that of the whole Digicampus. The similarity in needs sparks a discussion on what the positioning is from the co-creation lab within the Digicampus. To conclude, how the other services of the Digicampus can be realized and tie in with the co-creation lab requires further research. This further research can be built upon the already researched co-creation lab and correspondingly designed co-creation tool in this thesis. The recommendation is to *improve the positioning of the co-creation lab towards the other services of the Digicampus.*

A part of the co-creation tool is that users can upload or give access to their content. There are three challenges bound to this function. First, building a community where users actively upload or disclose content takes time, resources, and effort. Building a community requires people to monitor and stimulate the community actively. This will require the Digicampus to hire new people and use resources to realize this. These requirements are an important consideration of the community building, as it will imply a strategy for execution. Secondly, within the Dutch government, there already are existent initiatives to create platforms for disclosing information. Examples are developer.overheid.nl for APIs and dataplatform.nl for governmental datasets. The idea is to link these platforms to the co-creation tool. However, that will require an active acquisition effort in order for those platforms to collaborate with the Digicampus. Third, the uploaded content through the community members will have to contain a value for other innovators. Obtaining good value will require monitoring and approval for uploading content. Assessing the quality of uploaded content will become a complicated task if the scope of the information is broad. Therefore, the recommendation is to scope and make a strategic proposal of the type of information the Digicampus wants to disclose. Further research into the proposed users of the co-creation tool can be used to map user needs more specifically to scope the disclosed information. The recommendation is to *create a strategic proposal for disclosing the required information to innovators.*

During informal talks with the UX team of Logius, they pointed out that the current design still has steps to take in visual presentation and navigation flow. Hiring a UX designer for further development would be beneficial because their experience in creating user experiences will improve the current design. Also, the current co-creation tool has only been tested through people affiliated with the Digicampus. Important for further development is that the UX continues in development. The scope of the users with four user roles is broad and challenging for UX design. People who are not affiliated with the Digicampus and have different user roles should test the co-creation tool for further insights. So-called 'blind' tests will generate useful information to improve the UX. Improving the UX is vital to coping with the diversity of incoming innovators. The recommendation is to *hire professionals to develop the UX/UI design of the co-creation tool.*

The role of the 'fourth' helix in the Digicampus is still unclear to the researcher and for the Digicampus itself. The researcher recommends to the Digicampus to define who the 'fourth' helix is. Now, the Digicampus claims to adopt a quadruple helix model, but this might not be the case in reality. Changing to a better suiting helix model would help the Digicampus to define its position within the government and focus better on whom it wants to serve. The recommendation is to *define the 'fourth' helix in the Digicampus.*

To conclude, the researcher is convinced that the creation of the co-creation tool to the co-creation lab can help to foster innovation in the Dutch public sector. The prototype is expected to be used for further development and become a real supportive Information System to the co-creation lab.

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Footnotes

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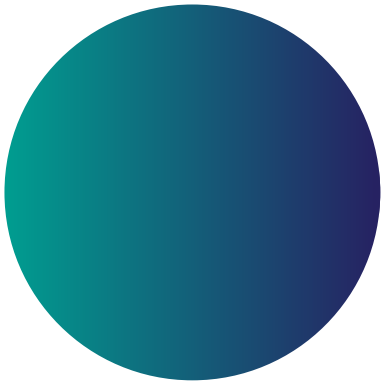


Appendices

Appendix 1: Definition list

Definition	*Explanation*	*Source*
Absorptive capacity	Absorptive capacity is the ability to recognize the value of new external knowledge, assimilate it, and apply it.	(Bessant & Trifilova, 2017; Cohen & Levinthal, 1990).
	Absoptieve capaciteit is de vaardigheid om waarde te herkennen in nieuwe externe kennis en vervolgens op te nemen en te gebruiken.	
Co creation	Co-creation is the collaboration in creating added value to new/improved products, services, processes between different involved parties on equal terms.	Tentative definition
	Co-creatie is de samenwerking tussen betrokken partijen om gelijkwaardige voet om waarde toe te voegen aan nieuwe/verbeterde producten, services, processen	
Co-creation lab	The co-creation lab is the experimentation service of the Digicampus. Here, solutions and innovations are designed and tested to realize challenges involving the usage of different/combined IT infrastructures.	Tentative definition
	Het co-creatie lab is een experimentatie service van de Digicampus. Hier worden oplossingen en innovaties ontworpen en getest om uitdagingen te realiseren die te maken hebben met verschillende en gecombineerde IT-infrastructuren.	
Digicampus	The Digicampus is a quadruple helix collaboration for innovation to improve the digital public service of the Dutch government.	Tentative definition
	De Digicampus is een samenwerking in quadruple helix verband voor innovatie om de digitale publieke dienstverlening van de Nederlandse overheid de verbeteren.	
Digicampus experiments	Digicampus experiments are experiments conducted in the co-creation lab. The experiments include testing of new digital solution involving the Dutch government.	Tentative definition
	Digicampus experimenten zijn experimenten die worden uitgevoerd in het co-creatie lab. De experimenten houden het testen in van nieuwe digitale oplossing met betrekking van de Nederlandse overheid.	
Digital interaction	A digital interaction is an interaction between two actors that takes place through a digital platform which is built from IT infrastructures.	Tentative definition
	Een digitale interactie is een interactie tussen twee actoren die plaatsvindt door middel van digitaal platform die op is gebouwd uit IT-infrastructuren.	
Digital platform	A digital platform is a collection of hardware and software elements that enable value-creation interplay among various groups of consumers e.g. buyers and sellers.	(de Reuver, Sørensen, & Basole, 2018; Parker, Van Alstyne, & Choudary, 2016).
	Een digital platform is een verzameling van hardware- en software-elementen die waarde-	

	creatie mogelijk maken in wisselwerking met verscheidene groepen van consumenten en aanbieders.	
Digital public service	Digital public services are public services that are provided through digital platforms. The performance is measured through the eight indicators of the European Digital Economy and Society Index (DESI).	Tentative definition. (DESI - European Commission, 2019)
	Digitale publieke dienstverleningen zijn dienstverleningen die worden verleend door middel van digitale platformen. De kwaliteit en de uitvoering wordt gemeten door de acht indicatoren van de Europese Digitale Economische en Maatschappelijke Index.	
Digital society	The digital society is the human-activity that takes place online.	Tentative definition
	De digitale maatschappij is de menselijke activiteit die plaatsvindt online.	
E-government	The e-government (electronic government) is the usage of IT to improve governmental organizations.	(Janssen & Estevez, 2013)
	De e-overheid (elektronische overheid) is het gebruik van informatietechnologie om overheidsorganisaties te verbeteren.	
General Purpose Technology (GPT)	GPTs are defining innovation that change the global prosperity (e.g. inventions such as the printing press, the steam-engine and the fossil-fuel-engine).	(Bresnahan & Trajtenberg, 1995)
	Algemene vooruitgang technologieën zijn bepalende innovaties die verandering brengen in de globale vooruitgang (bijv. uitvindingen als boekdrukkunst, stoom machine en de brandstofmotor).	
Incremental innovation	Incremental innovation is a smaller innovation involving current technology and organizational capabilities.	(Norman & Verganti, 2014; Dewar & Dutton, 1986).
	Incrementiele innovatie is een kleinere innovatie waarbij hedendaagse technologie en organisatie capaciteiten bij betrokken is.	
Innovation	"Innovation is the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, improve and differentiate themselves successfully."	(Baregheh, Rowley, & Sambrook, 2009; De Vries, Bekkers, & Tummers, 2016; Mulgan & Albury, 2003).
	Innovatie is een proces dat bestaat uit meerder stappen waar organisaties ideeën transformeren tot nieuwe verbeterde producten, services of processen, om te verbeteren, voor uit te gaan of zichzelf te differentiëren in hun huidige of nieuwe opererende plek.	
Innovation Agenda	An agenda with strategic goals to enable innovation in specific chosen domains	Tentative definition
	Een agenda met strategische doelen om innovatie mogelijk te maken in specifieke gekozen domeinen.	
Innovation Community	An innovation community is a system of strongly-linked stakeholders who are directly involved with each other and where knowledge flows freely between the stakeholders to innovate.	(Lynn, Reddy, & Aram, 1996)

	Een innovatie gemeenschap is een system van sterk verbonden belanghebbenden die met elkaar betrokken zijn om te innoveren waar kennis tussen de belanghebbenden vrijelijk vloeit.	
Innovation journey	An innovation journey is the pathway of an innovation from its creation to a working implementation.	(Cheng & Van de Ven, 1996)
	Een innovatiereis is een weg die een innovatie van het moment van bedenken tot werkende implementatie doorloopt.	
Innovation methodology	A methodology to enable a process to innovate.	Tentative definition
	Een methodologie om een proces van innovatie mogelijk te maken.	
Innovation platform	An innovation platform is a physical or a virtual forum which allows interplay and learning among stakeholders to enable joint problem diagnosis, joint exploration for opportunities, and research for solutions to fuel innovation in a selected expertise.	Tentative definition based on (Adekunle, Fatunbi, & Jones, 2010)
	Een innovatie platform is een fysiek of een virtueel forum die wisselwerking en kennisuitwisseling mogelijk maakt tussen belanghebbenden om gezamenlijke probleemdiagnose, exploratie voor kansen en onderzoek naar oplossingen uit te voeren voor innovatie in een geselecteerde expertise.	
Lean government	Lean government is about 'doing more with less' by streamlining organizational processes and at the same time stimulating innovation by stakeholder involvement.	(Janssen & Estevez, 2013).
	'Lean' overheid gaat over meer doen met minder door organisatie processen te stroomlijnen en tegelijkertijd innovatie te stimuleren door belanghebbenden erbij te betrekken.	
Locked-in technology	A locked-in technology is a technology stuck to a trajectory, because of alternate influences.	(Spulber, 2002).
	Een ingekapselde technologie is een technologie die vast zit aan bepaald traject door invloeden van buitenaf.	
IT "Building block"	A service of an existing IT infrastructure within the government that are eligible for experimentation.	Tentative definition
	Een service van een bestaande IT-infrastructuur die binnen de overheid beschikbaar is voor experimentatie.	
IT Infrastructure	IT infrastructures are the network of components of hardware and software modules needed to provide a digital service.	(Laan, 2017).
	Een IT-infrastructuur is een netwerk van componenten van hardware en software modules benodigd voor digitale services.	
Market-pull innovation	Market-pull innovations are innovations based upon adapting and improving an existing technology to current user needs.	(Norman & Verganti, 2014)
	Mark-specifieke innovaties zijn innovaties die gebaseerd zijn om het aanpassen en verbeteren van technologie tot bestaande gebruikers' behoeften.	

Meaning-driven innovation	Meaning-driven innovations are innovations which apply existing technology into a new context. The technology and its usage are given a different meaning.	(Norman & Verganti, 2014)
	Context-gerelateerde innovaties zijn innovaties die bestaande technieken gebruiken om die vervolgens in vernieuwde context te plaatsen. De techniek en haar gebruik hebben zo een andere betekenis gekregen.	
Open innovation	Open innovation is about innovating parties using external ideas and internal ideas as well as different internal and external paths from ideas to the market.	(Chesbrough, 2003)
	Open innovatie gaat over innoverende partijen die extern gecreëerde ideeën en intern gecreëerde ideeën zowel als verschillende interne en externe paden van idee tot aan markt gebruiken.	
Quadruple Helix	A collaboration model between government, businesses, scientific community and users/civilians to create innovations.	(Arnkil, Järvensivu, Koski, & Piirainen, 2010; Carayannis & Campbell, 2009)
	Een samenwerkingsmodel tussen overheid, bedrijven, de wetenschappelijke gemeenschap en gebruikers/burgers om innovaties te creëren.	
Radical innovation	Radical innovation changes the perspective, implying a revolutionary change that disrupts the current state of technology and organization.	(Norman & Verganti, 2014; Dewar & Dutton, 1986).
	Radicale innovatie verandert het huidige perspectief, wat een revolutionaire verandering inhoudt die de huidige status van technologie en organisatie interrumpeert.	
Recombinant innovation	Recombinant innovation is recombining existing ideas into new innovations.	(Brynjolfsson & McAfee, 2014; Griffith, Lee, & Straathof, 2017; Weitzman, 1998).
	Recombinante innovatie is het recombineren van bestaande ideeën tot nieuwe innovaties.	
Technology epiphanies	Technology epiphanies are innovations which proposes radical changes in both technology and meaning.	(Norman & Verganti, 2014)
	Technologie openbaringen zijn innovaties die radicale verandering inhouden in zowel de achterliggende technologie als de context van gebruik.	
Technology-push innovations	Technology-push innovations are innovations only based upon technology changes. The technology is altered while its application remains the same.	(Norman & Verganti, 2014)
	Technologie-push innovatie zijn innovaties die alleen gebaseerd zijn op veranderingen in de technologie. De technologie veranderd, maar de context van gebruik blijft hetzelfde.	
Triple Helix	The triple helix model is a model for innovation where knowledge flows between three defined parties, industry, government, universities	(Leydesdorff & Etzkowitz, 1998)
	De 'triple helix' model is een model voor innovatie waar kennis tussen drie partijen vloeit, de industrie, de overheid en universiteiten.	

User-centered design	User-centered design is an overlapping definition for design processes where the end-user is taken as means for design decisions.	(Abras, Maloney-Krichmar, & Preece, 2004)
	Gebruiker-gecentreerd ontwerpen is een overlappende definitie voor ontwerpprocessen waarin de eindgebruiker als doel wordt gebruikt voor ontwerpkeuzes.	

Table 1: Definitions list with Dutch translations

Appendix 2: Innovation: the literary definition

Innovation in general

Already addressed in the introduction, innovation is a keyword in this thesis. Innovation is an underlying definition of a lot of other definitions in this thesis. To understand the definitions incorporating innovation, first, the basis of innovation should be understood.

The term innovation is, for the first time in history, seriously addressed in scientific literature by Joseph Schumpeter in the 1930s. Joseph Schumpeter (2017) defines five types of innovation (the new date resembles a renewed translation of Schumpeter's work):

- Introduction of a new product or new quality of an existing product
- Introduction of a new method of production/handling a product
- Creation of a new market
- A new supply of input (e.g., a material)
- An organizational change

Baregheh, Rowley, & Sambrook (2009) argue that the broad scope of innovation spiraled in the world and found in each industry its application. The definition proposed by Schumpeter allows for a broad interpretation of what innovation is. To converge, Baregheh, Rowley, & Sambrook (2009) created a multidisciplinary definition of innovation based on their literature review. *"Innovation is the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace"* (Baregheh, Rowley, & Sambrook, 2009, p. 1334). Even though this is a widely used definition of innovation, the usage of the words 'marketplace' and 'compete' assumes a corporate environment. The scope of this thesis is a government context. The articles and research of Mulgan & Albury (2003) and De Vries, Bekkers, & Tummers (2016) focuses specifically on innovation in the public sector. The definition of Mulgan & Albury (2003) is similar to the Baregheh, Rowley, & Sambrook (2009) definition focusing on products, services, and processes. The difference is the focus on implementation for *"improvements in outcomes of efficiency, effectiveness, and quality"* (Mulgan & Albury, 2003, p. 3). De Vries, Bekkers, & Tummers (2016) that an innovation definition should have three domains, perceived novelty, adoption of an idea, and discontinuity of the current state. Taking Mulgan & Albury (2003) and De Vries, Bekkers, & Tummers (2016) into account, the definition of Baregheh, Rowley, & Sambrook (2009) is slightly altered. That creates the following definition:

"Innovation is the multi-stage process whereby organizations transform ideas into new/improved products, service, or processes, in order to: advance, improve, and differentiate themselves successfully."

The next paragraph discusses different innovation types, which can be recognized.

Innovation types

There are two types of innovation; radical innovation and incremental innovation (Norman & Verganti, 2014; Dewar & Dutton, 1986). Based on the definitions in the articles, incremental innovation is a smaller innovation involving current technology and organizational capabilities. Incremental innovation is "doing better what we already do" (Norman & Verganti, 2014). Radical innovation changes the perspective, implying a revolutionary change disrupting the current state of technology and organization (Norman & Verganti, 2014; Dewar & Dutton, 1986). Norman & Verganti (2014) argue in their paper that the dichotomy causes mislabeling of some innovations. An innovation applied

to a different context is considered as incremental, but on the contrary, such innovations can have a significant impact.

An example is the multi-touch technology that Apple applied in its iPhone in 2007 (Apple, 2007). Multi-touch technology was already an existing technology at the time. However, its application to the iPhone was a new context for its usage. As the iPhone continued to become revolutionary, it raises the question about multi-touch technology, is it an incremental innovation or a radical innovation? To overcome these questions, Norman & Verganti (2014) subdivide two new types of innovation from the radical and incremental division, creating the following matrix.

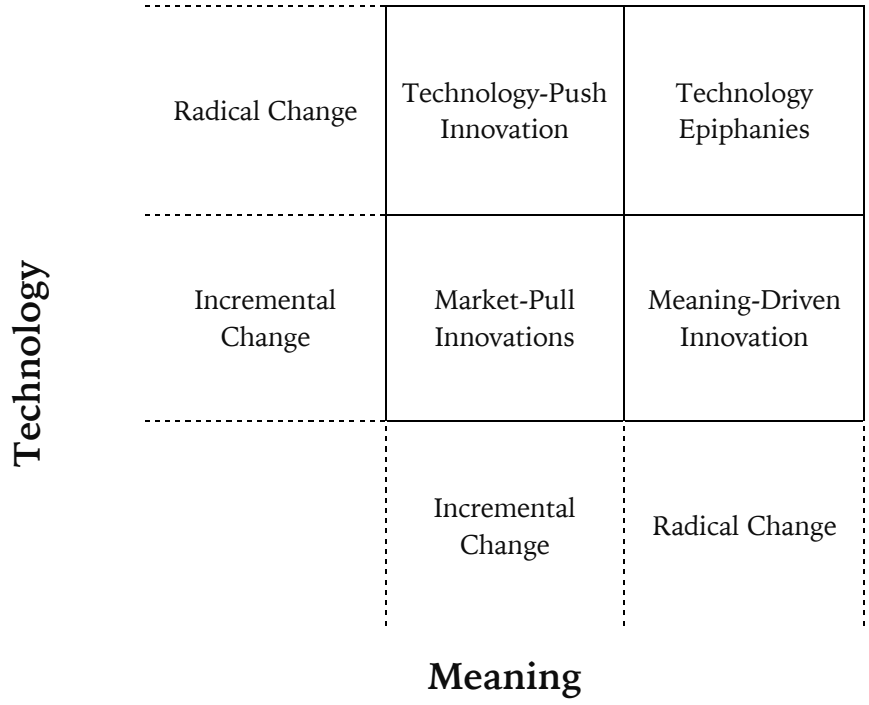
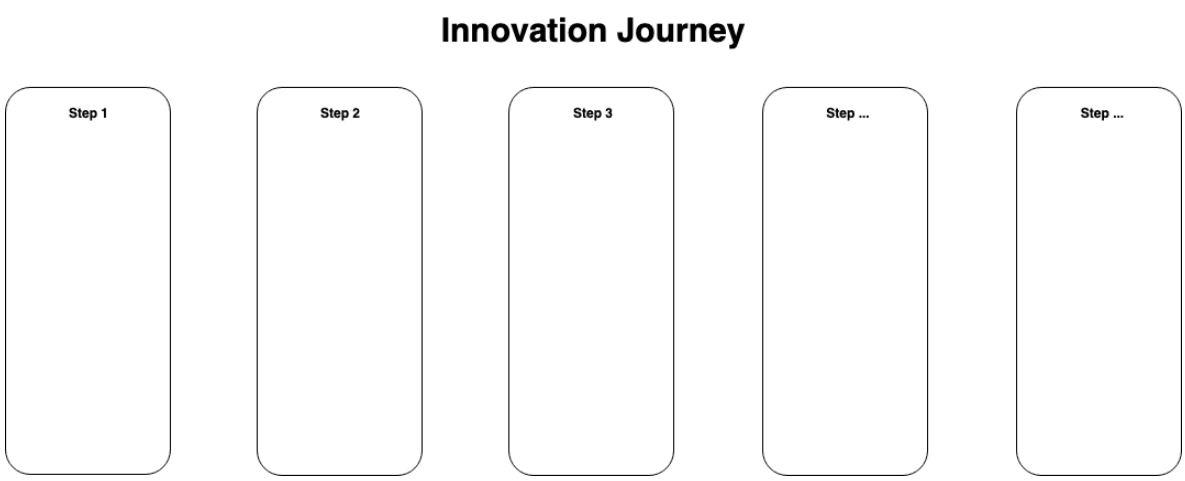
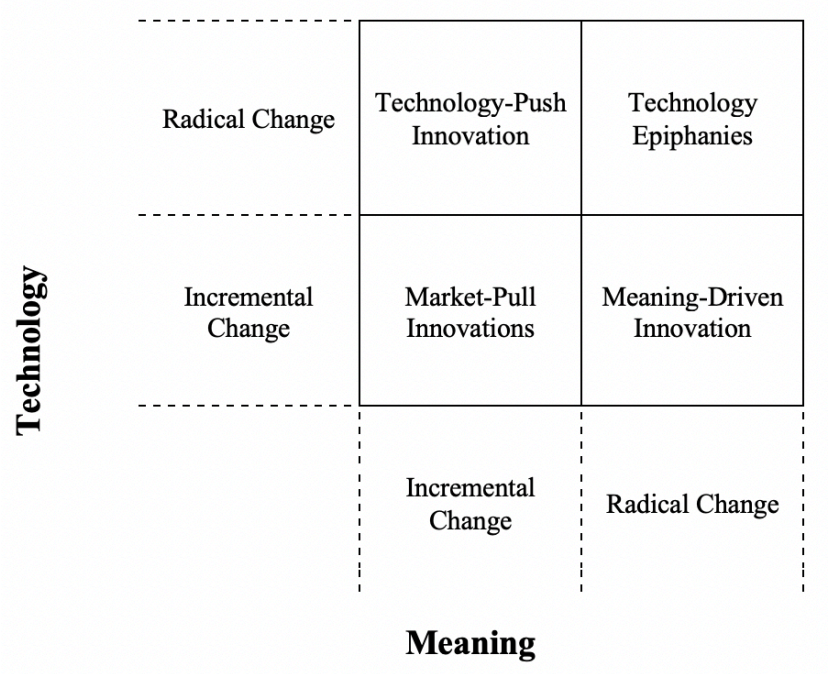


Figure 1: The two dimensions and four types of innovations (Norman & Verganti, 2014)

Technology-push innovations are innovations only based upon technology changes (Norman & Verganti, 2014). The technology changes, while its application remains the same. Meaning-driven innovations are innovations that apply existing technology into a new context (Norman & Verganti, 2014). Meaning-driven innovation gives the technology and its usage a different meaning. Market-pull innovations are innovations based upon adapting and improving existing technology to current user needs (Norman & Verganti, 2014). Technology epiphanies are innovations that propose radical changes in both technology and meaning (Norman & Verganti, 2014). For example, a GPT, as mentioned in the introduction, is considered a technology epiphany.

Appendix 3: Interview design

Topics	Questions
Introduction	- Starting with 'Coffee chit-chat' - Personal introduction - Asking what the participant does and how he/she is affiliated with the Digicampus to build up trust - Purpose of the interview - Clarification of topic under construction - Format interview - Approximate length of the interview - Assurance of confidentiality - Ask permission to record conversation - (Assure participant that he or she may seek clarification of questions.) - (Assure participant that he or she can decline to answer a question.) - (Assure participant that there will be opportunity during the interview to ask questions.)
Innovation Journey	1. What are recent innovations that the organization that you work for created?
	2. Fill in how you experience the Innovation Journey → Take a specific case 
	3. What approaches/methods do you use to innovate?

	4. What is the innovativeness of the chosen innovation process? Ask questions so the innovation can be located in the Norman & Verganti matrix! (No technology epiphanies!) *Follow-up:* What technologies lie at the basis of the innovations, unproven or proven technologies? 
	5. What is the complexity of the chosen case? (Use value judgement scale) *Easy innovation* | *Slightly complex innovation* | *Neutral complex innovation* | *Complex innovation* | *Highly complex innovation* If the participants can base its values judgement on the following complexity indicators: 1. Uncertainty (how, what) 2. Number of components 3. Dependencies 4. Experience (within the organization)
	6. What are problems in the current innovation journey? (Examples: resources, time, too long) *Follow-up*: which techniques do you use to address/solve these challenges?
Requirements	7. What is required to realize a perfect innovation journey? *Follow-up:* what do <u>you</u> need for a perfect innovation journey? a. Organizational b. Technical (IT infrastructures)
Use case identification	8. How would an exemplary experiment in the Digicampus look like according to you? *Follow-up:* And how would it fit in your innovation journey? *Follow-up:* Which layer of the co-creation lab would it fit in?

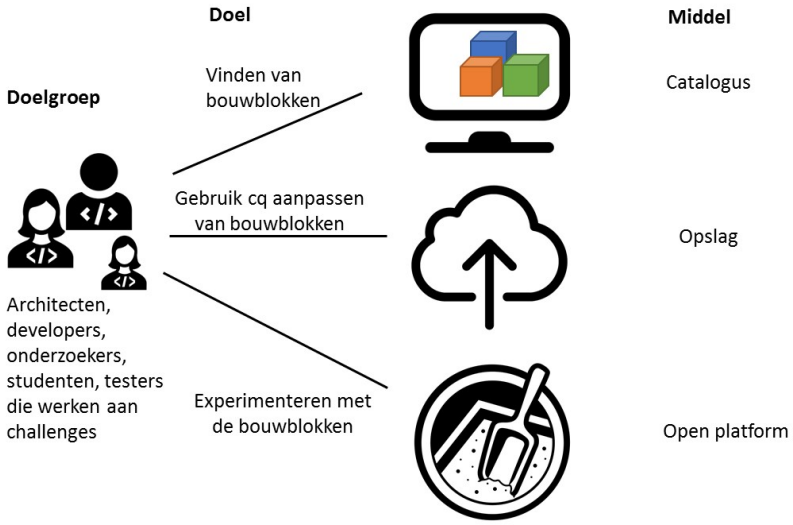
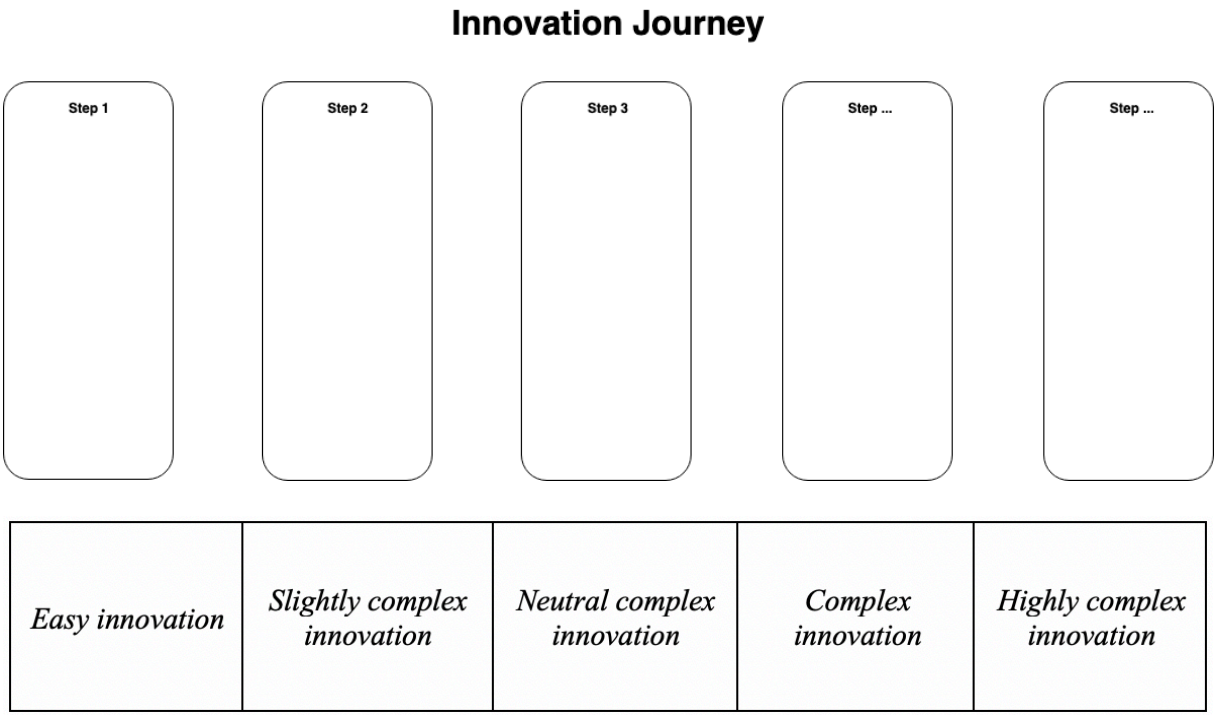
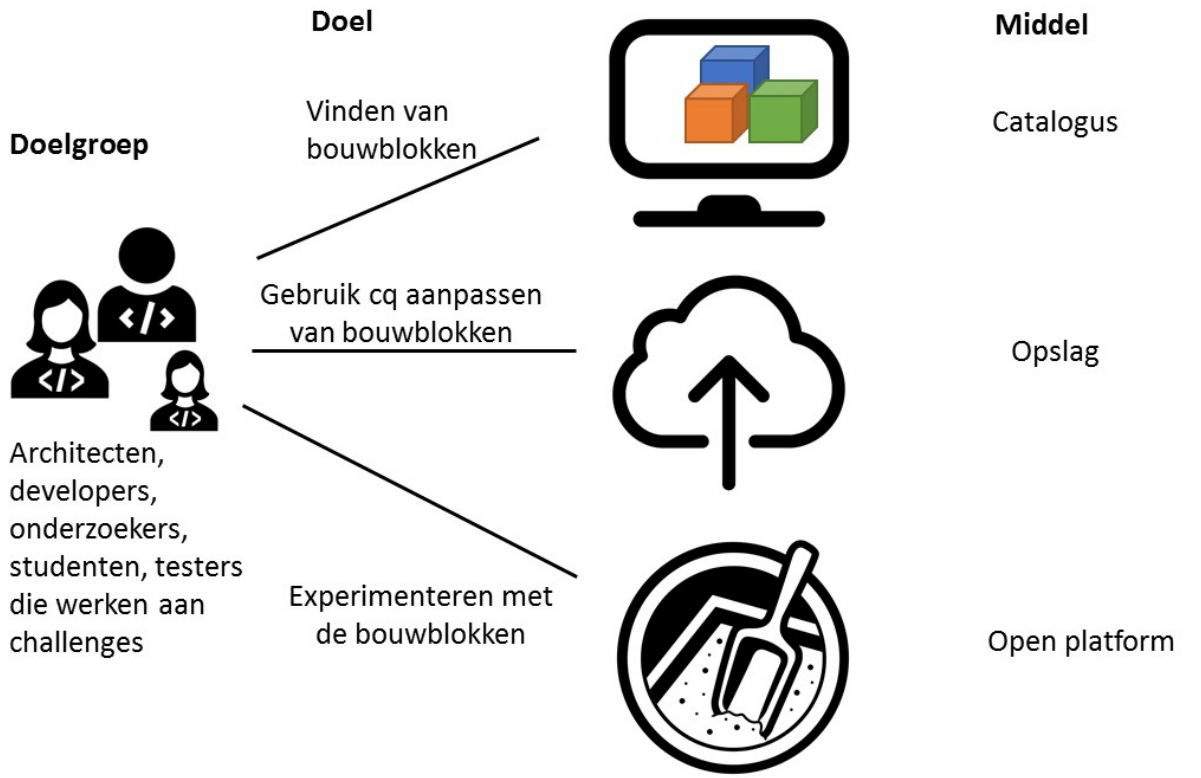
	
Users	9. Who is involved in the innovation process? *Follow-up:* And what are the roles of the persons mentioned?
Outro	- Thanking the participant for the interview - Final 'chit-chat' after the interview

Table 2: Interview design

Appendix 4: Interview hand-out pictures





Appendix 5: Consent Form for Master thesis of Koen

Please tick the appropriate boxes	Yes	No
Taking part in the study		
I have read and understood the study information dated [05/ 07/ 2019 (DD/MM/YYYY)], or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	□	□
I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.	□	□
I understand that taking part in the study involves an audio-recorded interview recorded with the researcher's phone and the researcher actively taking notes during the interview. I know the audio recordings will later be deleted/destroyed.	□	□
Use of the information in the study		
I understand that the information I provide will be used for the thesis of the researcher to create an exploratory view on his defined research problems and I understand that the interview results will be processed according scientific qualitative data processing methodologies.	□	□
I understand that personal information collected about me that can identify me, such as my name, my work position, the sound of my voice, will not be shared beyond the study team.	□	□
I agree that my information can be quoted in research outputs	□	□
I agree that my real name can be used for quotes	□	□
Future use and reuse of the information by others		
I give permission that the summary of the interview (not including: the interview transcript and corresponding audio files) that will be based on the interview that I provided to be archived in *TU Delft thesis repository*[2] so it can be used for future research and learning.	□	□
I would like that my name is anonymized when the master thesis will be uploaded the *TU Delft thesis repository.*	□	□

Signatures

_____ _____ _____

Name of participant [printed] Signature Date

I have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

_____ _____ _____

Researcher name [printed] Signature Date

Study contact details for further information: [*Nitesh Bharosa, +31 6 42 75 18 70, N.Bharosa@tudelft.nl*]

[2] This is an open repository for reports created by people affiliated with the TU Delft through https://repository.tudelft.nl/

Appendix 6: Open coding screenshot

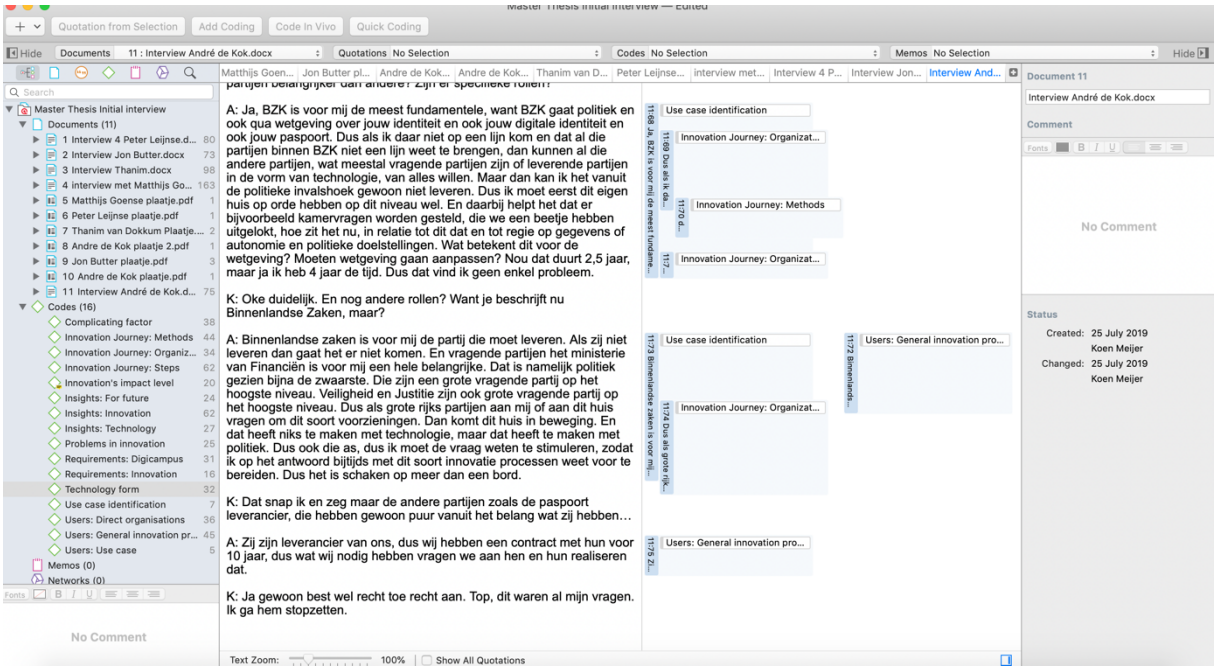


Figure 2: Open coding screenshot

Appendix 7: Axial coding category subdivisions

1. What are the wishes of the stakeholders using the co-creation lab as platform for performing experiments?

   1.1 What is the current innovation journey?
   1.2 What are problems in the current innovation journeys the Dutch government?
   1.3 What do participants think is needed for successful innovation?
   1.4 What do the participants expect from the Digicampus?
   1.5 How do participants see the future of innovation in the Dutch government?

2. What are the different governmental IT infrastructures within the Dutch government that are eligible for the experimentation in the co-creation lab?

   2.1 What are technologies used in the Digicampus?
   2.2 What innovation methods are used?
   2.3 What kind of innovation takes place within the Dutch government?
   2.4 What does technology implicate for the innovation process of the Digicampus?

3. How are potential users of the co-creation lab interacting with each other and accessory IT infrastructures to perform experiments? (This research question will not be answered in chapter 4 but vital information is obtained during the interviews answer the question in chapter 5).

   3.1 Who are all the users in the Digicampus?
   3.2 What are the use cases?
   3.3 What are user insights?

Appendix 8: Interview reflection

All interviews, except one, where between the 30-60-minute scale. The data collected represents the perspective of the participant and complies with the role/job the participant carried out. No struggles where met while asking about the usage of the data and all interviews are recorded. Although the process of the first interview was somewhat capricious. The interview not only was 15 minutes to long but some of the structure predefined was lost during the interview. The participant was negligent to fill the innovation journey form, as he had an own vision on how to explain this It was also hard to keep the participant to the primary storyline of the interview questions. The researcher was warned beforehand that this participant might be difficult to interview. It was due a cancellation that this accidentally became the first interview for the researcher. It is not clear if the researcher made rookie mistakes or the participant was difficult to interview. Still, the long interview provided a lot of data to analyze. To the researcher's opinion the interview process during each interview improved as more interview were conducted.

For the Dutch readers of this thesis a word cloud is made with the most used words in the transcripts to create a small impression. A selection is made and a Dutch stop list is used while making the word cloud. The word cloud is portrayed in *Figure 3: Word cloud of transcribed documents*.

Figure 3: Word cloud of transcribed documents

Appendix 9: Visual overview of the selective codes

Codes	Code subdivisions		
Digicampus Needs	Accessing the Network	Collaboration	
		Openness & Insight	
	Experimentation	Catalog	
		Requirements experiment	
	Ease of Use		
Future Insights	Digicampus Organization		
	Faster cycle times		
	Finances		
Innovation Journey	Methods	Currently used	Traditional
			New
		To support technology development	
	Steps	Initial steps	Causes
			First hand processing
		Struggle zone	
		Final steps	
Problems in Innovation	Organizations	Process	Politics
			Rigidities
			Other
		Own organization	
		Stakeholders	
	Uncertainty		
	Laws		
	Knowledge		
	Finance		
Requirements	Supporting Collaboration	Culture	
		Diversity	
		Accessibility	
		Other	
	Short cycle evaluation		
Technology	Form	Applied/specific	
		Holistic	
	Impact level	Meaning-driven	
		Radical	
	Insights	Access	
		Technology assessment	
		Requirements Digicampus experiments	
Users	Roles		
	Insights		
	Job functions		
	Direct organizations		
	Use case		
	Use case identification		

Table 3: Visual overview of selective codes

Appendix 10: Interview results: Problems in innovation

Problems in Innovation				
Code subdivisions			**What?**	**Who?**
Organizations	Process	Politics	First policy has to be created and then technology can be utilized. Often, everything has to be answered for. This hampers creativity.	J2, T3
			If current business processes are changed within the government first a political discussion takes place about money, power, and influence. This generates negativity around the innovation and delays.	P1, T3
			Political-loaded processes are often slow and rigid	T3
		Rigidities	The government works in sequential steps. This is costly, as a lot of coordination is required. It also disables learning opportunities and redoing previous phases where mistakes were made.	P1, J2
			The government is very risk averse and at the beginning of project creates a lot of constraints for itself (e.g. time planning). This disable learning opportunities.	P1, J2
			The government is stuck to its IT contracts with businesses. In order to change a complete process has to be changed.	T3
		Other	The innovation journey is situational and context specific.	T3
			IT development is continuously going faster. The government was already slow, but the gap is growing bigger and bigger	T3
	Own organization		Managing a multidisciplinary team is complicated. To gather an appropriate diverse team, resources from multiple organizations need to consulted	M4
			The government does not have the right resources to implement state of the art technology, as it lacks dissenters.	T3, A5
			The government is traditionally not an innovator. Government offices are large organization with old fixed processes, which require effort to gain room for innovation.	M4, A5
			By doing nothing as government organization you fall behind on technological developments	T3
			The perspective of government offices (e.g. UWV, SVB) themselves is leading in what it thinks it is required to do, this differs vastly between different government offices	P1, M4
			If you do not have the right resources as government office you need to start lobbying to gain room for innovation.	P1,

		To create a successful lobby to align everybody strategically and generate the appropriate resources to innovate, first or own organization should well-organized and have the appropriate content.	A5
		Strategic aligning with policies is needed for successful innovation. Otherwise work can be done double simultaneously	M4, A5
	Stakeholders	Communication from and to different stakeholders is difficult	M4, A5
		The more parties there are involved, the more complex innovation projects become. Even though in government context a collaboration between multiple stakeholders is required to create impact. It creates more risks and lobby is required to create focus.	P1, J2, T3
		The target group of the government service providers is huge. Even a sub group in the population can exist out of 100 000 people. This creates complexities.	P1
Uncertainty		There is a lot uncertainty in innovation in government context. Traditionally the government seeks for certainties. The government is not used to work with uncertain processes	P1, T3, A5
Laws		The Dutch law prescribes actions how business processes within the Dutch government are to be conducted. This is complex because of the large number of laws that need to be taken into consideration. It causes rigidities.	P1, T3, M4
Knowledge		In terms of information architecture, the government is complex.	P1, J2
		There is a lack of knowledge about work culture and people-networks between different parties (universities, government offices, and businesses)	M4, A5
		Communication practices and knowledge systems between Dutch government offices are often closed	P1, T3
Finance		Large amounts of money are used to advance in an innovation project	A5, J2
		Funding is influenced by power and political influence. Disability to innovate because of lack of funding is a repeating discussion	P1

Table 4: Problems in innovation

Appendix 11: Interview results: Innovation Journey Methods

Innovation Journey Methods		
Code subdivisions	**Codes**	**Who?**
Currently used: Traditional	Waterfall method, a sequential method of performing actions. Because everything needs to be accounted for waterfall is used to deal with the uncertainties	P1, J2, T3
	Classic policy cycle from Hoogenwerf	T3
	User research	P1
Currently used: New	Continous interaction: pivot or persevere	M4
	Agile methodologies	J2, M4
	User-centered methodologies: human-centered design and design thinking	M4
	Permanent interaction in sprint from 2 to 4 weeks	A5
	Greenfield methodologies, such as hack-a-thons, design sprints, and moonshots	T3
	Creating alternative services next to the traditional service for iteration	P1

Table 5: Innovation Journey methods currently used

Innovation tools and methods	
Codes	**Who?**
It is important to apply the right methodologies into the right innovation context. (e.g. when do I use design thinking, human-centered design, and prototyping)	M4
Beta testing is to put a pre-version (beta) of the real product online in order test it. This removes the hardship of final requirements of a real version, as mistakes can still be made.	P1, M4
Testing an alternative new version besides the old version to gather feedback to improve the alternative new version.	P1
Putting an API on the developed product/service in order to create access for other parties to use your product/service	P1
Performing an open-source development program where all progress and developed objects are shared.	P1
Performing development events, such as hackathons. In this way a dedicated party opens up their systems for developers for a brief moment of time.	P1

Table 6: Innovation tools and methods

Appendix 12: Interview results: Innovation impact level

Innovation impact level		
Code subdivisions	**What?**	**Who?**
Meaning-driven	Primarily within the government, existent and proven-technology is used for innovation. These technologies are searched for and then put into a different governmental environment, scale, and use.	P1, J2, M4
	Performing radical innovations is rare due the way the government's nature and how it is technically organized.	P1
Radical	The technology that is used in my project is not technological advanced, but its implementation and its impact will be enormous. It will cause a revolution.	A5
	In my innovation lab we would like to do radical innovation, but we did not succeed yet.	M4
	Radical innovation within the government happens if the required technology (e.g. privacy and security) to realize it does not exist yet. These are exceptions.	P1

Table 7: Innovation's impact level

Appendix 13: Interview results: Requirements for Innovation

Requirements for Innovation			
Code subdivisions		**Codes**	**Who?**
Supporting Collaboration	Culture	The organization culture is key for innovation. There needs to be trust, openness, transparency, collaboration, and room for innovation within an organization.	P1, T3, M4, A5
	Diversity	There needs to be diversity in multidisciplinary teams in order to make innovation happen. Managing diversity and making sure all the expertise is in your team is important for appropriate collaboration that is required create a digital society and innovation.	T3, M4
	Accessibility	In order to collaborate, openness and transparency is required to have good communication. Required information should be accessible.	P1, J2, T3, M4
	Other	In order to innovate, enough financial resources are required especially at the beginning of the project.	M4
		Successful innovation projects in the past that went quickly had a clear mission statement.	T3, M4
Short cycle evaluation		It is important to work with innovations in short cycles, in order to recognize mistakes and failures quickly to learn from and make changes. It requires evaluation loops, work culture changes, and systems that support such a work method.	P1, J2
		A project where the goals are to do one big delivery in 3 years and to do everything perfect disables learning effects. Coordination needs to loosen up in order to become more dynamic and flexible.	P1

Table 8: Requirements for innovation

Appendix 14: Interview results: Digicampus's Needs

Digicampus's Needs			
Code subdivisions		**Codes**	**Who?**
Accessing the Network	Collaboration	Because of Digicampus special position in the Dutch government they should be able to connect private and public parties to collaborate in a quadruple helix.	J2, M4, A5
	Openness & Insight	Openness and insight into different information architectures between different government offices is needed to advance in the digital society of the Netherlands. This accessibility is needed for innovation and enables reuse of other findings of different parties.	J2, T3, A5
		A tool is needed to give insight to learn about government processes and IT infrastructures that is required for innovation.	P1, J2, A5
Experimentation	Catalog	A catalog to find different "building blocks" is required to support the experimentation. A "building block" should be editable in order to be useful for experimentation	P1, A5
		Experimentation with the 'building blocks' is a need within the government because of its closedness	T3
		The "building blocks" should be developer friendly. Use already well documented APIs as a format for the "building blocks"	M4
	Requirements experimentation	Experimentation should have an easy approach to it to enable multiple parties to collaborate and learn. A test environment has to be existent to allow failure which is needed for enabling good experimentation.	J2, T3, M4
Ease of Use		The Digicampus should be developer-friendly and speed up the creation of experiments. The process toward experimenters should be smooth and useful for the developers.	T3, M4, A5

Table 9: Digicampus's Needs

Appendix 15: Interview results: Future insights

Future insights		
Code subdivisions	**Codes**	**Who?**
Digicampus Organization	Creating more open source-based IT within government organizations allows more developers to work on different IT infrastructures to innovate	P1
	The civilian cannot be incorporated in the innovation process straight away. First, technically and organizationally an organization should function before the civilian can be actively involved into the process. It is only up till this point the perspective of the civilian is useful.	A5
	Lobbying can start at the same time or during when an experiment is conducted	T3
	It will be useful when there is someone checking experiment results and improving experiment processes. The Digicampus will learn then from itself.	P1
	A valuable "building block" from a renowned party will allow other organizations to justify its usage and become a political argument	M4
Faster cycle times	More sources of feedback loops to improve services are needed (e.g. a DigiD helpdesk)	P1
	Extra evaluation rounds in innovation projects are needed to prevent big project deliveries with mistakes in it. The extra evaluation rounds enable pivots to reduce mistakes and the costs of mistakes.	P1, J2
	Policy and technology have to work together. If both lobby trajectories and technology projects are performed parallel, this will speed up innovation processes.	J2, T3
	Just do it mentality	M4
	To improve the digital society the first two innovation steps should be better organized	T3
Finances	Funding for the first phase of innovation is important and often difficult to acquire. This should change.	M4

Table 10: Future insights for the Digicampus

Appendix 16: Interview results: Technologies mentioned during interviews

Technologies	
Holistic	**Applied/Specific**
Artificial Intelligence (AI)	Text signature compatible with XBRL standard
Blockchain	XBRL standard compatible with the xSML-syntax
Data analytics	New code for Microsoft services
Open data and data predictive tools	Real time analytics to support decision making
App	Data model based upon Google search results
Facial recognition	General Infrastructure of Logius
Web-app	API of the border customs
3G Connection	Using Artificial Intelligence for sorting
Native App	Old internet browsers on old smartphones do not support the usage of the camera
Application Programming Interface (API)	Javascript code is proven technology
Log-in tool	Connecting with a service to use a complicated AI facial recognition algorithm
Facial recognition algorithms	Azure environments
	Amazon web service environments
	Mijnoverheid = web service of Dutch government
	Basic registration tools

Table 11: Overview of mentioned technologies during interviews

Appendix 17: Interview results: Technology insights

Technology insights		
Code subdivisions	**Codes**	**Who?**
Access	The IT infrastructure "building blocks" from the government are closed off and inaccessible for developing parties	T3
	Now, in order to edit "building blocks", there needs to be referred to external parties. Someone who is involved with the Digicampus should be able to simply edit "building blocks".	J2
	The IT back-end of the government is not accessible. There should be a test environment which is accessible if a party has the right permission by law.	P1
Requirements Digicampus Experiments	Some security is needed in order for parties to be able access building blocks.	P1
	"Building blocks" should have quality. It should be helpful during experimentation and they need to be easy understandable in order to be used. (Important quote "If the quality does not exceed downloading something of Github, just put the link to github on the website")	M4
	At the beginning experiments should be simple and there should not be too much emphasis on technical constraints. Just try it out. A possibility is too use services that provide tools to use technologies (such as facial recognition).	M4
Technology assessment	Technology that is used is not complex and is often already proven technology.	P1, M4, A5
	A "building block" can be a service to perform an experiment. A "Building Block" can be for example a source code or a test API to use a certain service of the chamber of commerce.	P1, J2, A5
	A technology can have its ethical implication when it is implemented. This is societal and economical complex.	A5
	Creating the back-office integrations based from prototypes and matching it with all the other processes is complex. It expensive and takes long.	M4
	In order to create a solution for an end-user it is a mix of different technologies.	M4
	Using readymade IT infrastructures of low-code platforms not only speeds up the development process. It also makes it easier to scale-up and solves compliance issues.	M4

Table 12: Technology insights

Appendix 18: Interview results: users mentioned during interviews

Quadruple helix	Party categories	Identified organizations	Functions of individuals
*Government** *Owner of the business process in the case of the Digicampus	Dutch Ministerial sub-organizations	Digicampus	Quartermaster Ecosystems
		Logius	System architect
			Business consultant
			Strategic advisor
		Dutch Block Chain coalition	
		RvIG	System architect
		DIO	
		Data science initiative	
		IND	
		Police	
		RVO	
		Tax authorities	
		DUO	
	Dutch Ministries	Ministry of Internal affairs	
		Ministry of Economic affairs	
		Ministry of Finance	
		Ministry of Justice and Security	
		Ministry of Social Affairs and Employment	
	Dutch government executional offices	UWV	
		SVB	
		Chamber of Commerce (KvK)	
		CBS	
		Nederland ICT/NL Digital	
	European context	European commission	
		Collaboration consortium of 14 countries	
	Innovation labs	Novum	Portfolio manager
			Workshop designer
Scientific community	Universities	TU Delft	Scientist
			Professor
			Student
	Research institutes		
Businesses	Start-ups		Entrepreneur

			Technician
	Developers		Software programmer
			Technician
			Designer
			AI/Machine learning specialist
			Blockchain expert
	Accountant organizations		Accountants
	Intermediaries		
	Software-suppliers/suppliers	Visma	Technician
		Idemia	
		Capgemini	
	Banks	ING	
	Media	Financieel Dagblad	
Users	Civilians		
	Employees		Accountants
			Responsible employees for process

Table 13: Overview of mentioned users during interviews

Appendix 19: Interview results: user insights

User insights	
What?	**Who?**
Different target audience per experiment (e.g. employee, citizen, developers)	T3, M4
Different parties with different roles and corresponding concerns are involved into an issue per experiment	T3, J2, A5
The citizen can only be involved in the development process if certain technology and policy processes are already finished.	A5
Multidisciplinary teams are needed for innovation	M4
An assessment for a new party is needed when it joins an experiment trajectory (factors A5 mentions as decisive: content, process, culture, and relations)	A5, J2

Table 14: User insights

Appendix 20: Use case 1: Digitized identification use case diagrams

Use case diagram 'Starting up the experiment'

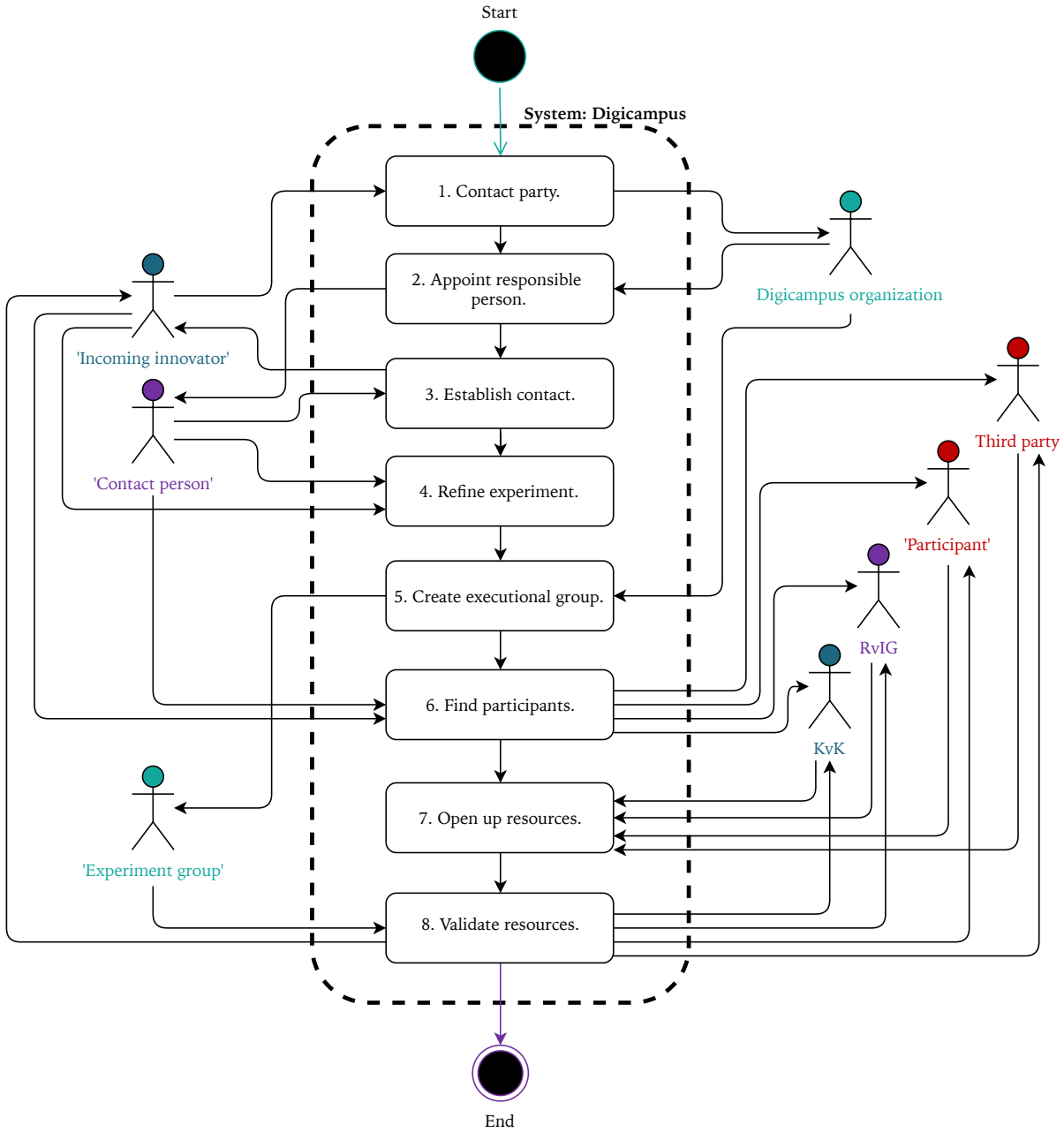


Figure 4: Digital Identity Use case diagram: Starting up the experiment

Use case diagram 'Performing the experiment'

In this use case diagram, it is chosen to create one subsystem. The subsystem represents the tests that is required to be performed in this use case. As the sub-actions in the extension of the use case action is more elaborate, it chosen to provide more detail. More detail will provide more understanding of what is required to perform the test. Also, the test are the most important actions in this phase, because the all other actions contribute to these actions.

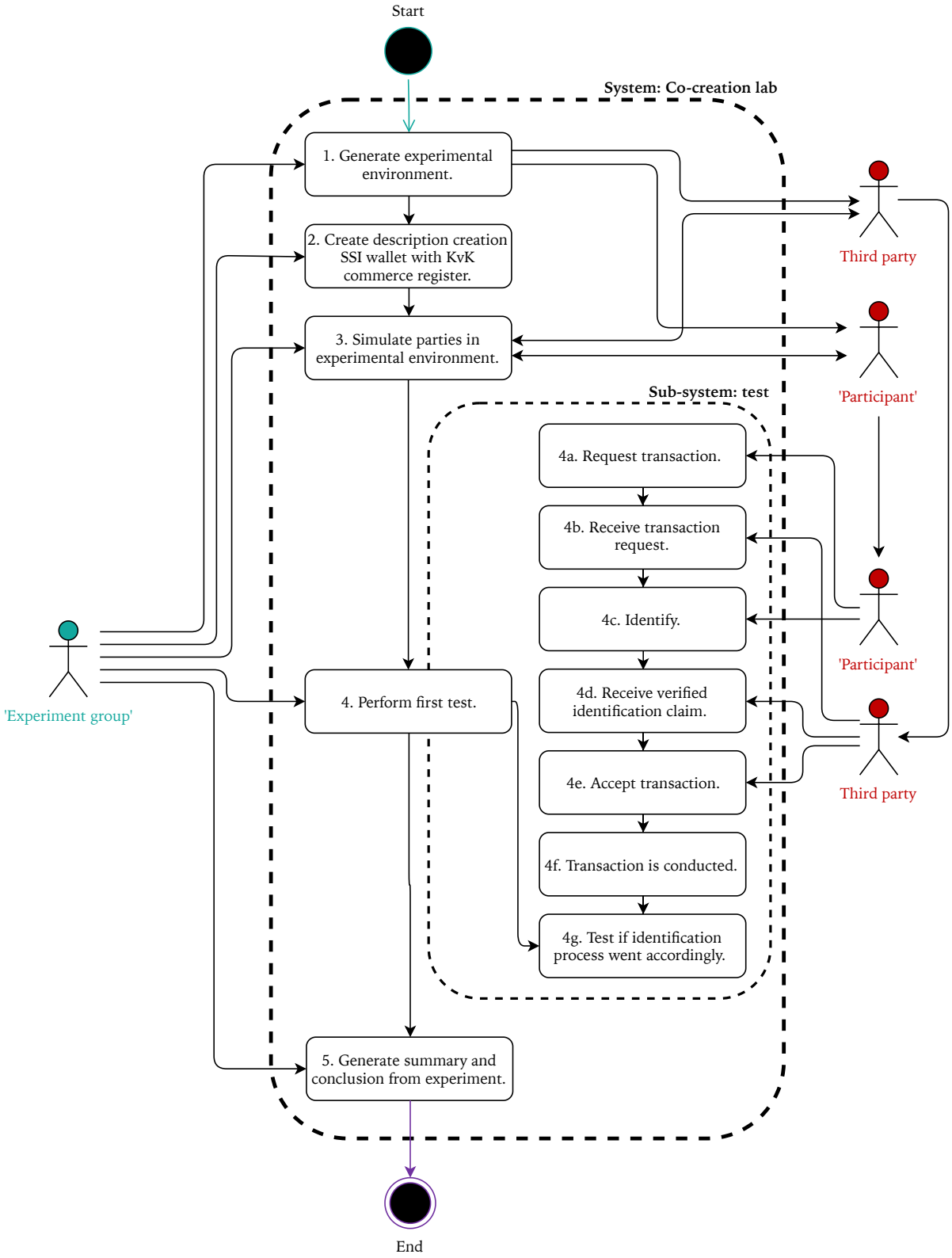


Figure 5: Digital Identity Use case diagram: Performing the experiment

Use case diagram 'End game of the experiment'

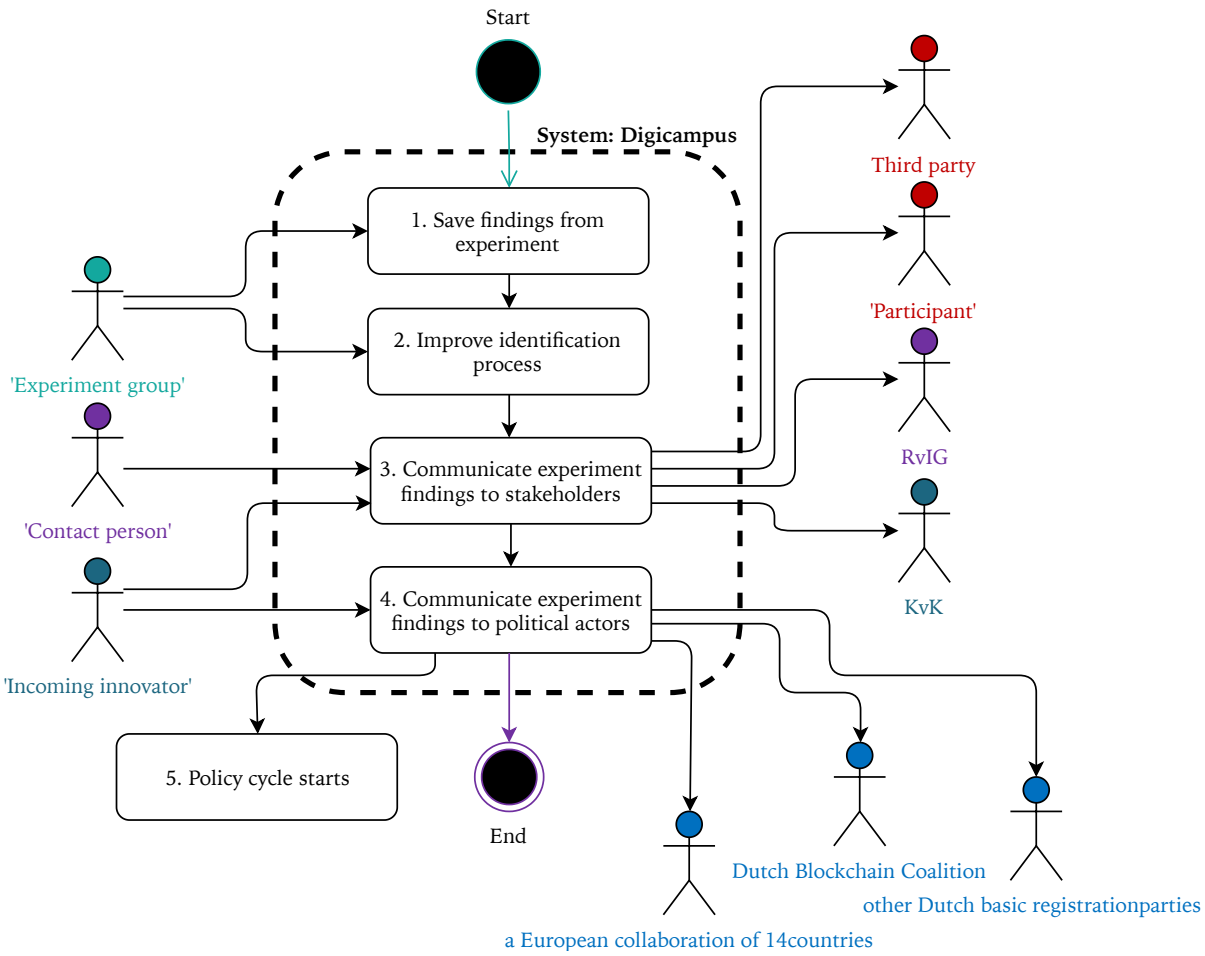


Figure 6: Digital Identity Use case diagram: End game of the experiment

Appendix 21: Use case 2: SBR with JSON use case diagrams

Use case diagram 'Starting up the experiment'

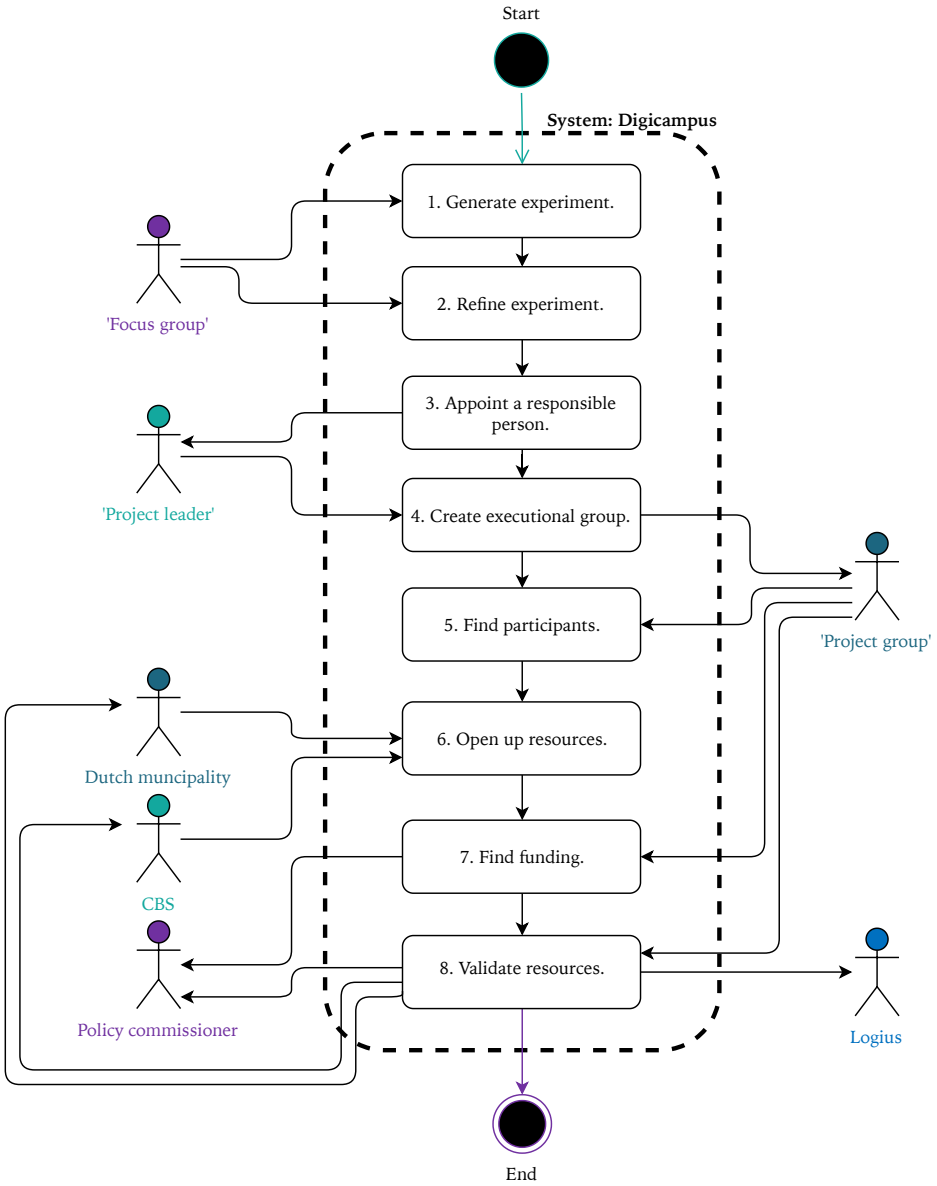


Figure 7: JSON-SBR Use case diagram: Starting up the experiment

Use case diagram 'Performing the experiment'

In this use case diagram, it is chosen to create two subsystems. The two subsystems represent the two tests that are required to be performed in this use case. As the sub-actions in the extension of the use case action is more elaborate, it chosen to provide more detail. More detail will provide more understanding of what is required to perform the tests. Also, the tests are the most important actions in this phase, because all other actions contribute to these actions.

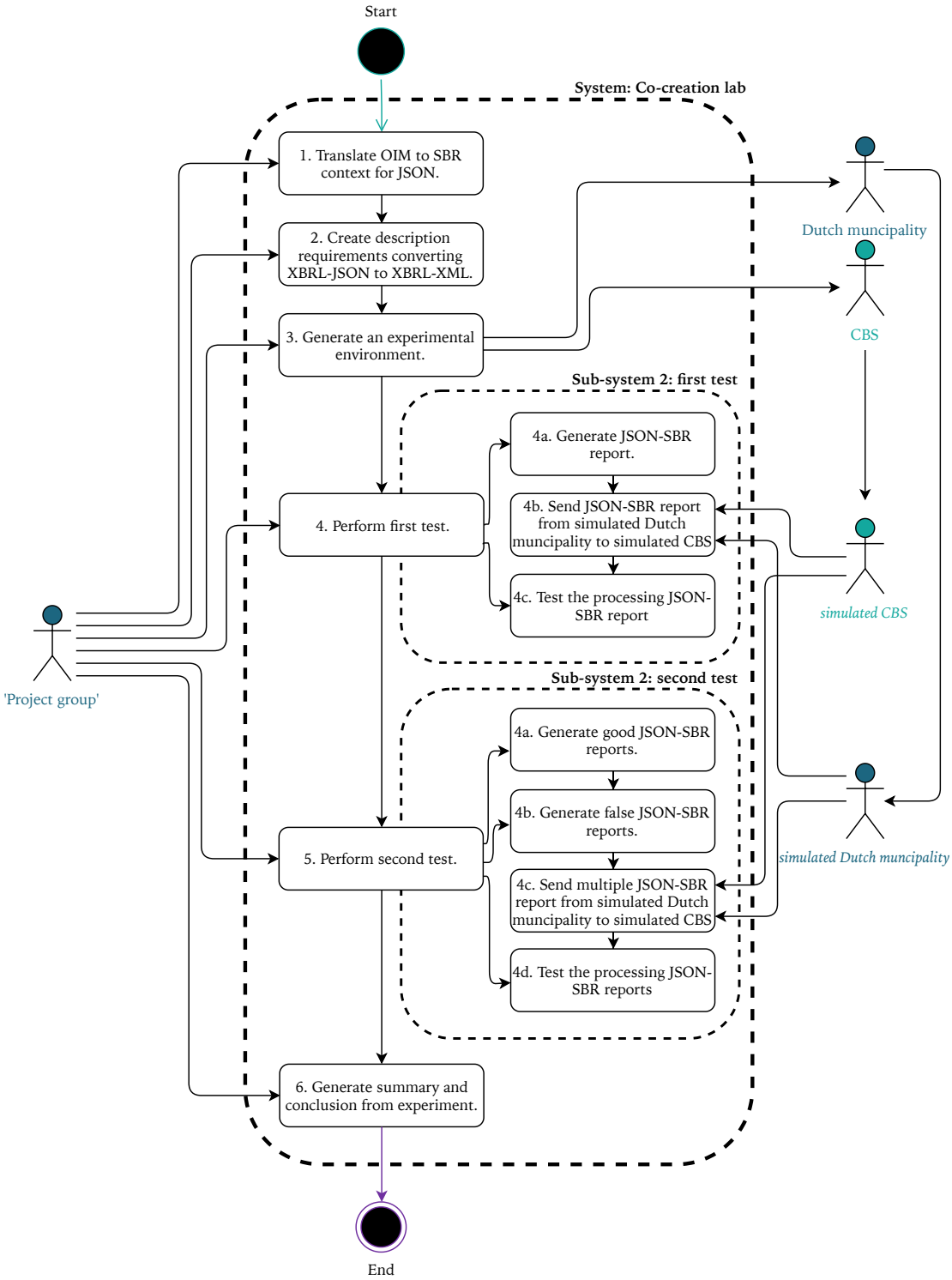


Figure 8: JSON-SBR Use case diagram: Performing the experiment

Use case diagram ‘End game of the experiment’

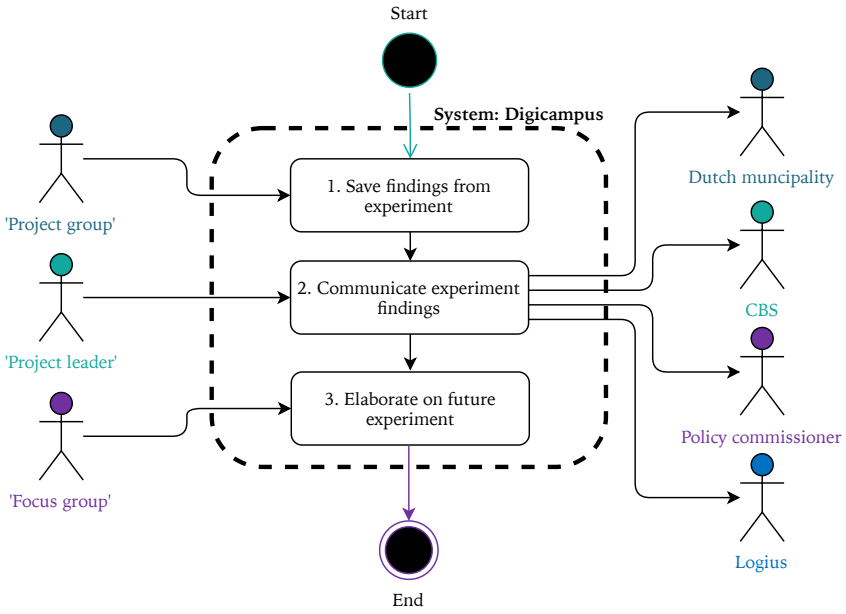


Figure 9: JSON-SBR Use case diagram: End game of the experiment

Appendix 22: Consent form for prototype evaluation

Please tick the appropriate boxes	**Yes**	**No**
Taking part in the study		
I have read and understood the study information dated [28/ 10/ 2019 (DD/MM/YYYY)], or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	□	□
I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.	□	□
I understand that taking part in the study involves an audio-recorded interview recorded with the researcher's phone and the researcher actively taking notes during the interview. I know the audio recordings will later be deleted/destroyed.	□	□
Use of the information in the study		
I understand that the information I provide will be used for the thesis of the researcher to evaluate a prototype as a result of the thesis's research and I understand that the interview results will be processed according scientific qualitative data processing methodologies.	□	□
I understand that personal information collected about me that can identify me, such as my name, my work position, the sound of my voice, will not be shared beyond the study team.	□	□
I agree that my information can be quoted in research outputs	□	□
I agree that my real name can be used for quotes	□	□
Future use and reuse of the information by others		
I give permission that the summary of the interview (not including: the interview transcript and corresponding audio files) that will be based on the interview that I provided to be archived in *TU Delft thesis repository*[3] so it can be used for future research and learning.	□	□
I would like that my name is anonymized when the master thesis will be uploaded the *TU Delft thesis repository.*	□	□

Signatures

_____ _____ _____

Name of participant [printed] Signature Date

I have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

_____ _____ _____

Researcher name [printed] Signature Date

Study contact details for further information: [*Nitesh Bharosa, +31 6 42 75 18 70, N.Bharosa@tudelft.nl*]

[3] This is an open repository for reports created by people affiliated with the TU Delft through https://repository.tudelft.nl/

Appendix 23: Prototype evaluation graduate project Koen Meijer

This questionnaire is meant to evaluate the created prototype by Koen Meijer for his graduation project for the Digicampus. The questionnaire exists out of 3 pages, containing a total of 17 questions. The first three questions will validate your user perspective. The second 12 questions include 10 statements which can be graded using a five-point Likert scale and 2 questions for further deliberation. The last 2 questions include two qualitative questions about the prototype in general. The questionnaire will be followed by an interactive discussion. For convenience the discussion questions are added to the questionnaire, no answer is required to fill in.

User role questions

1. My user role is: ☐
2. Is this correct? O Yes O No
3. If answered no, what then? ☐

Grade the following statements with the five-point Likert scale:

1. I find the information in this prototype useful.

O	O	O	O	O
Strongly disagree	Disagree	Neutral	Agree	Strongly Agree

2. I find the information in this website easy to understand.

O	O	O	O	O
Strongly disagree	Disagree	Neutral	Agree	Strongly Agree

3. Certain information I was looking for was missing in this website.

O	O	O	O	O
Strongly disagree	Disagree	Neutral	Agree	Strongly Agree

4. What do you miss?

☐

5. I consider this website user friendly.

O	O	O	O	O
Strongly disagree	Disagree	Neutral	Agree	Strongly Agree

6. I find the structure of this website clear.

O	O	O	O	O
Strongly disagree	Disagree	Neutral	Agree	Strongly Agree

7. It is clear which hyperlink/clickable button will lead to the information I am looking for.

O	O	O	O	O
Strongly disagree	Disagree	Neutral	Agree	Strongly Agree

8. The search option on this website gives me useful results.

O	O	O	O	O
Strongly disagree	Disagree	Neutral	Agree	Strongly Agree

9. I find the design of this website appealing.

O	O	O	O	O
Strongly disagree	Disagree	Neutral	Agree	Strongly Agree

10. Does the website look trustworthy?

O	O	O	O	O
Strongly disagree	Disagree	Neutral	Agree	Strongly Agree

11. Would you recommend this website to your peers?

O	O	O	O	O
Strongly disagree	Disagree	Neutral	Agree	Strongly Agree

12. Could you deliberate on your answer of the previous question?

Write your answer down for the next two questions:

1. Do you think a real-life version of the prototype will help you in your innovation process?

2. Do you think a real-life version of the prototype will help the government to conduct better innovation for the Dutch digital society?

Questions to fuel the discussion, DO NOT ANSWER HERE.

- Opening question: as the questionnaire is filled in, are there any particular (or missing) topics that come to mind that you want to have discussed within the group? (This question is also used to build upon the two qualitative questions that are asked in the questionnaire)
- In the interviews, requirements for innovation are an important topic, does the prototype help innovation according to you?
- Does the prototype help users perform experiments according to you?
- Does the current set up of use help you to retrieve the information you need?
- What are your expectations for support provided by the Digicampus while using the website?