FROM THINGS TO SYSTEMS, AND BACK:

A thing-centric approach to protein transition in the Netherlands

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A project in cooperation with TU Delft and RVO

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Photograph by Sen Lin (Thing-Centered Design master class)

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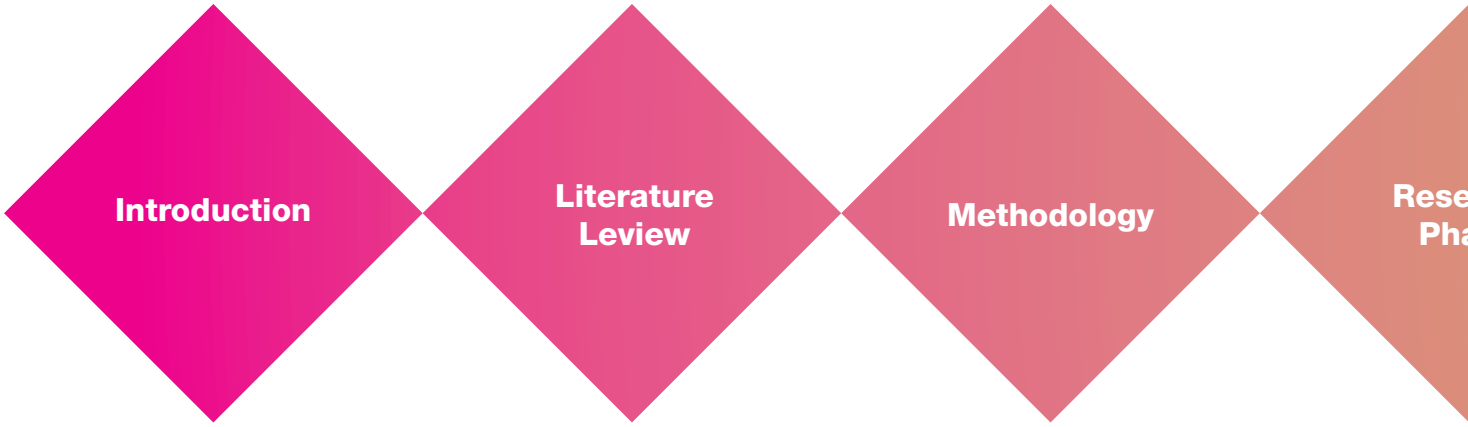
Executive summary



Why 'Protein Transition'?

- Dutch people eat more animal-based protein than plant-based protein.
- Excessive meat production gives negative influences on the environment.
- The Dutch government tries to design an effective intervention on food consumption.
- The research questions:

1) How to design a transition in everyday life?

2) How to amplify a transition to all system levels?

Transition Design

- Governments require service design methods.
- Why, what, and how service design can help policymakers.
- Transition Design is a system-centric design approach for service:

1) Everyday life approach
2) Spatio-temporal scale
3) Future vision
4) Sustainability

- Individual and collective change in everyday life can be designed with practice theory and commons & "commoning" approach.

A thing centric method for change in everyday life

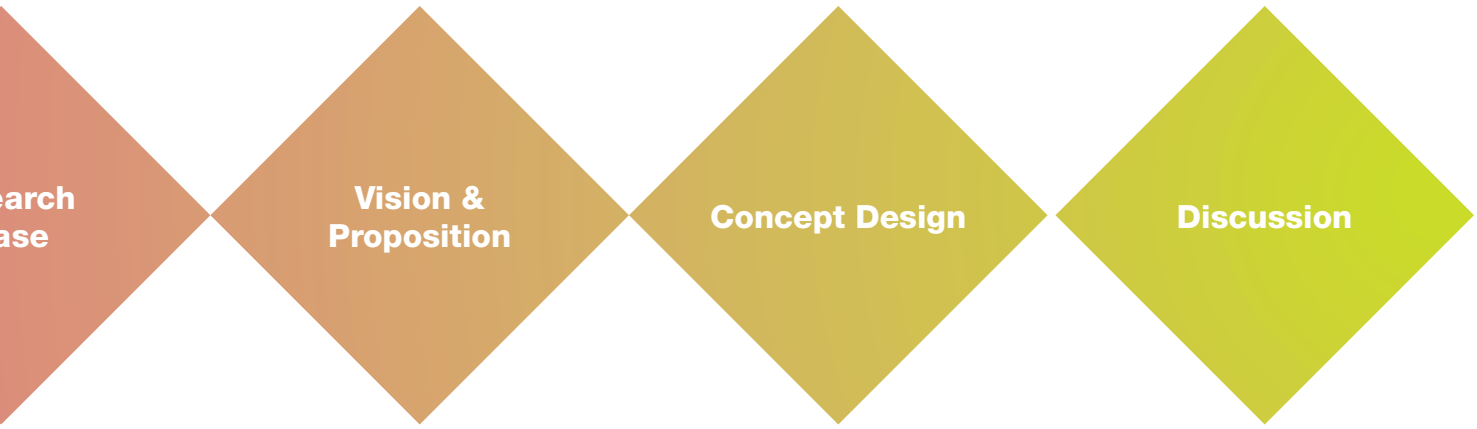
- Things can form, indicate and influence habitual behaviour.

A system diagram for validating scalability of the outcome

- PTF tool can evaluate this study result to answer second research question.

Home kitche & Cooking base thing eth

- Kitchen is a temporal ax commons.
- Kitchen too daily diet.
- Kitchen con transformed knowledge transition.
- Cooking se essential to (uncodified) through pra experience.
- To make a r new experie kitchen con kitchen and session kitc be constant



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Kitchen-ing Loop framework with cooking sessions and Kitchen-ing codebook

- Vision: "I want to seek a possibility of change in consumer values and practices from kitchens by helping them to reconfigure familiar things effortlessly."
- Cooking sessions: A driving force to help people experience new recipes.
- Kitchen-ing codebook: A repository to store data (dictionary) and create new data (document). It analyzes personal & general data and recommends new recipes (personalized).

Eat.Q (final concept): An open platform service for smart cooking

- An integrated system with cooking sessions (practical experience) and Kitchen-ing codebook (recommender system).
- Eat.Q considers personal data (home kitchen context and preference) and suggests cooking sessions which suit users' context. Furthermore, it helps you keep practicing at home.
- The open platform consists of two users (end users, food industry), platform providers (a board of public and business sectors), and a platform sponsor (IT company).

Stakeholder feedback for Eat.Q business model

- Eat.Q will help users to:

1) Step out of the comfort zone.
2) Experience benefits of cooking sessions.
3) Create collective impact in society.

- Eat.Q needs to consider:

1) Cooking sessions not for everyone.
2) Information risk management regarding privacy protection and transparency of commercial information.
3) Clarification an unique value for potential users.
4) Improvement of technological emplementation
5) Stakeholder conflict.

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1. Introduction

1.1. Food policy in the Netherlands

According to research by the Dutch government (Green Protein Alliance, 2015), today's Dutch population consumes more animal-based proteins than plant-based proteins. They furthermore anticipate that this trend will have a negative impact on the future of food sustainability. Moreover, the assertion that people should eat less meat is not limited to the Netherlands; it has already been discussed and acknowledged globally (Heinrich-Böll-Stiftung, Chemnitz & Becheva, 2014).

The Food and Agriculture Organization (FAO) claims a 70% rise in the demand for animal proteins with a rapid-growing population. Meeting this demand will require almost endless natural resources and energy. In addition, it might cause unacceptable pollution by producing greenhouse gases (GHG). Ultimately, it will become a matter of global ecosystem instability related to biodiversity and climate change.

In the meantime, the over-consumption of animal protein is also a health problem at the level of the individual. The World Health Organization (WHO) and national food guidelines note that the high intake of processed and red meat could be a major health risk. This leads to problems such as accumulation of antibiotics from livestock, such as antimicrobial resistance (AMR), as well as unbalanced or excessive ingested nutrients (Heinrich-Böll-Stiftung et al., 2014; Robinson & Pozzi, 2011).

In fact, food sustainability is a comprehensive concept. Its meaning extends beyond 'eating more plants and less meat. For human and environmental health, people need greater diversity in their diet and not merely consume limited diets of beef, pork, chicken, wheat, and rice. Many governments have explored and promoted alternative protein sources. The alternatives include seaweed, niche grains, peas, insects etc. (Thijs, 2017). These are known as 'Green Protein'.

Thus, the Rijksdienst voor Ondernemend Nederland (RVO) began to take action to better support the Dutch government's intervention towards future sustainability. They named this project the 'Protein Transition' and applied the three-stage theory of change, which was adapted from NewForesight as shown in Figure 1 (Green Protein Alliance, 2015).

Following the first stage, the Dutch government formed an alliance with key stakeholders in the Dutch food industry. The Green Protein Alliance (GPA) has an ambitious but achievable goal – a 50:50 ratio of the national consumption of animal proteins and plant proteins by 2025.

The second stage includes mapping the current and desired future situation. They determined that the main issues of the current situation are:

- Excessive protein consumption by the Dutch population.
- Increased use of specific natural sources for their eating.
- Growing greenhouse gas emissions.

To achieve their goal, the GPA might focus on:

- Lowering overall protein consumption.
- Replacing animal protein with sustainable protein.
- Identifying possible forces that can steer the transition.

Figure 1. Theory of change, NewForesight

The third stage shows the challenges that the Dutch government need to consider in order to solve these issues:

- Most producers of the Dutch food industry are depending on meat processing industry and livestock industry.
- Governments are likely to impose more taxes when they want to control some social issues. However, self-preference strongly influences food choice. For example, researchers at Oxford University conducted a study on this subject and predicted unwanted side effects of taxing meat (Thijs, 2017).

Food is not just a need but it is also very personal. For example, food can extend to individual preferences, family traditions, and social culture. The food industry is a mammoth system with various levels of interest from farmers, distributors, chefs, and policymakers. However, each person is also a consumer, regardless of their position of interest.

In this project, we investigated individual consumption and we found more possibilities for the Protein Transition. If individuals make small changes in their daily consumption habits, they can affect other levels of the food system. For instance, when consumers have a strong demand for specific products, the distributors will want to profit from it, and in turn place pressure on their suppliers and manufacturers, such as farmers. An example of this was the 'superfood' trend, where blueberries and quinoa were in such high demand that there was not enough production to supply the supermarkets and farmers had to adapt to this new demand (CBI, 2015).

1.2. Project aims and research questions

Researchers have produced transition designs, but few have been tested in a practical way. Hence, this thesis aims to explicitly explain how to create an empirical method for 'Transition Design' through a single explorative case. To achieve this goal, the following research questions are addressed:

- How to design a transition in everyday life?
- How to amplify a transition to all system levels?

This master thesis aims to produce a design tool to empower designers acting as change agents throughout government. In this sense, a designer is anyone who is willing to design strategic plans

to achieve a goal. Thus, it can be a politician, businessperson, researcher, end-user, and so on. By offering entry points to create transitions in food consumption, the designers can help policymakers understand the macro-level challenges required for a change towards a more sustainable future.

In this research, a design method was created through a specific case and evaluated for its influence. In detail, this study consists of a way to determine the critical elements for a transition on a daily basis and to scale these aspects to the system level. The entire process is developed through an empirical experiment that anyone can apply to other cases.

1.3. Project client and stakeholders

RVO

The Rijksdienst voor Ondernemend Nederland (RVO) is part of the Ministry of Economic Affairs and Climate, and it encourages entrepreneurs in sustainable, agrarian, innovative and international business. It offers grants, finds business partners, provides expertise, and facilitates policy compliance. Policymakers and their advisors now face more complexity than ever due to constantly shifting and conflicting interests of different stakeholders, and changes in technology and society that are reshaping public services.

A special unit called XLAB within RVO focuses on how to help policymakers think bigger and bolder in the development and implementation of public policy. XLAB is making it possible for policymakers and entrepreneurs to think in systems, services, and transitions by using design approaches.

Majid Iqbal (Mentor)
Mr Iqbal is a co-founder of an experimental unit called XLAB and he specializes in creating and implementing service and system designs.

Stephan Jenniskens (Colleague)
Mr Jenniskens is also a co-founder of XLAB and an advisor in RVO on developing and implementing knowledge management strategies.

Rolinde Oosterheert (Colleague)
Mrs. Oosterheert is a project leader for the food agenda based on the aim to be a better partner in RVO for policy. Mrs. Oosterheert has explored design methods as new interventions.

TU Delft

This graduation project is a part of the Strategic Product Design master track at the faculty of Industrial Design Engineering, TU/Delft. With human-centred and thing-centred design approaches, the faculty has formulated a scientific design methodology that can effectively address a variety of issues, from industry to the public sector. In this project, the designers address a social issue by covering not only the top-down view but also the bottom-up perspective.

Elisa Giaccardi (Chair)
Prof. Giaccardi is a full-time professor at TU/Delft and leads the Connected Everyday Lab. Prof. Giaccardi covers aspects from pioneering work in meta-design and social media to the role of the non-human in the Internet of Things.

Rebecca Price (Mentor)
Dr Price is a postdoctoral research fellow at TU/Delft and researches the macro impact of design society.

Youngsil Lee (Project owner)
Ms Lee is a SPD master student at TU/Delft and passionate about transforming scientific research into business, especially in the area of health and wellness.

Photograph by Rebecca Price (Kick-off Meeting)

1.4. Thesis structure

This paper consists of seven chapters. In the first chapter, we already detailed the problem, how we intend to solve the problem, and who we are. The following chapters discuss multidisciplinary literatures that are key elements in designing a framework. Thereafter, we verify the hypothetical framework with empirical methodologies. The verification gives rise to key insights, which are used to develop the general framework into a specific concept design for this Protein Transition case. Lastly, we draw a conclusion and provide recommendations after evaluating the final concept design.

More specifically, chapter 2 indicates what the Dutch government needs to formulate better policy, how service design can assist them, and what specific criteria are necessary to address problems in society. In conclusion, we determine an entry point, which is a critical element for individuals to make a transition. Furthermore, we endeavour to define a middle point that can connect top-down (system level) and bottom-up (individual level) perspectives.

Chapter 3 demonstrates how a thing-centric approach and a Panda-Tulip Framework (PTF) are utilized to prove the hypothesis. A thing-centred method is used to create a practical concept. In addition, PTF shows a strong possibility to scale the concept to the system level in chapter 7.

Chapter 4 illustrates empirical research, such as interviews and cooking sessions. This research brings valuable insights about why a kitchen is essential to begin, what the key elements for changes are, and how the elements can be distributed to the system level. Additionally, we also determined that cooking sessions play a crucial role in this Transition Design.

In chapter 5, we create a specific vision for our concept design and propose three critical factors for the concept. These factors are the criteria for the final concept design.

Chapter 6 first describes the roles of cooking sessions and the Kitchen-ing Codebook. Additionally, it demonstrates how the two factors are integrated into a system. Finally, all the elements become a final concept, and we explain the value of the concept.

Lastly, chapter 7 evaluates the final concept with potential stakeholders to understand opportunities and challenges. Thus, we perceive how it can be a sustainable business in the food market. Finally, we conclude this research by demonstrating how it can contribute, what the limitations are, and what might be necessary for further improvement.

2. Literature review

2.1. System thinking in service design

Recently, governments try to make changes in their governing system to keep pace with the more diverse and complex social system. In this chapter, it was explored that why, what, and how service design can help policymakers.

2.1.1. Service design as policy making

Previous researchers have validated that well designed service can produce disruptive innovations. Service design is likely to give rise to client-oriented, efficient, and competitive outcomes in private or public enterprises (Popovich & Briziu,1998; Aurich, Mannweiler & Schweitzer, 2010). Notably, today's public organisations are trying assume new roles. It compels them to apply service design that is productive in public expenditure. In addition, service design can reflect the needs of diverse citizens (Lee & Perry, 2002; Lenk, 2002).

A report from Service Design Network (2016) demonstrates how the Dutch government (see Figure 2) and other EU governments have been serious about service design recently. They emphasise the need for service design for public sectors in terms of the following(see Figure 3):

- **To do more with less: Increase the quality of services to meet the increasing demand and expectations of citizens in a time of scarce resources.** It is demanding to meet the sophisticated and higher demands of hyper-connected citizens.
- **To regain trust in public institutions: Opening government.** Citizen confidence

Figure 2. Presenting XLAB service design methods to the Dutch ministries

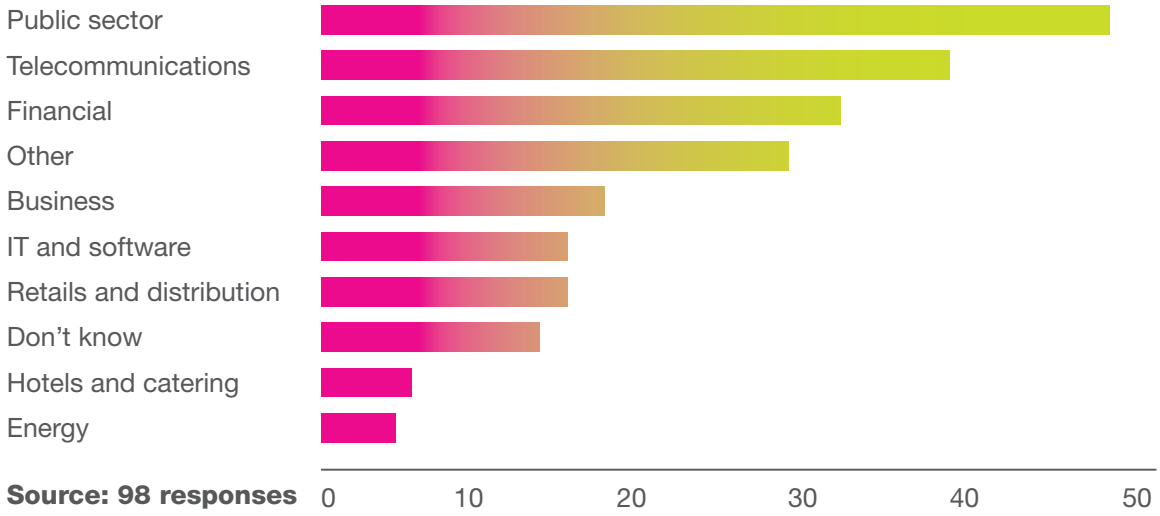


Figure 3. Service design client sectors, Scoping Study on Service Design: Art & Humanities Research Council (question 07), Design Council,ESRC, Final Report 2012

dropped from 37% to 29% between 2008 and 2013. It reflects a decrease in the quality of governance and the failure of public policies (ERCAS, 2015).

- **To deal with the complexity of public problems: Change the traditional policy approaches and embrace systems view.** There are more complicated challenges worldwide regarding social, economic, and environmental aspects. The critical problem is that the traditional policy approach cannot handle the systemic complexity.
- **Change of orientation: People at the centre of public problems and policy solutions.** It is clear that public sectors need to transform their perspective to a human-centric perspective. Thus, they can sympathise with citizens at the centre of social issues, not only ministers.
- **The practical approach to policy design: Experimentation for decision making.** Traditional policymaking has moved from a normative viewpoint based on rigid analysis of the present. On the other hand, today's problems require a long-term plan. Governments have to be equipped to see holistic elements over time and space by including creativity and empirical tests.
- **An alternative language for communication.** A visual language system is effective to translate and communicate across multiple disciplines. In addition, it is able to draw clear future scenarios and share expected experiences. It is not only for policymakers but also for ordinary users.

It is fundamental at this point to discuss what services are and who and how services can be designed successfully.

Firstly, many researchers have defined services by comparing them to products. Lynn Shostack (1982) was the first to create the concept of service design by presenting a methodology for designing a service. He claims that, unlike products, services cannot be possessed, so they can only be experienced, created or participated in.

Furthermore, Goldstein, Johnston, Duffy and

Rao (2002) insist that services are planned or designed with main components such as processes, people skills, and materials. In addition, Aurich et al. (2010) arranges the four characteristics of services that emerge in the design process. Those features are intangibility, heterogeneity, simultaneity of production and consumption, and perishability. Thus, service design can be summarised as creating a strategic alignment (Karwans & Markland, 2006) composed of intangible components such as skill, time, experience, and tangible elements such as people, things, and spaces.

Secondly, many private and public sectors hire professional designers who can address the ills of society with human-centred design methods and design thinking (Norman & Stappers, 2016). Briefly, many cases in different industries have shown that designers are well equipped to create efficient and sustainable services (Brown, 2008; Buchanan, 2015; Prendeville & Bocken, 2017). In this research, designers are not only professionals who are adequately educated at design school but also include anyone who has 'design mindfulness' (Peter, 2005).

Thirdly, Buchanan (2015), who is well known for extending the application of design into service and public sector design, refers to 'design thinking' and emphasises that this method of design practice is beneficial to the different kinds of organisations.

Figure 4 shows how design thinking covers problem-solving at different levels. Design thinking can be utilised from a symbol to a system in each phase or the entire process of the stages. In the order, it achieves invention, judgement, connection and development, Integration and evaluation through the design thinking approach. This research demonstrates that the 'invention' moment is for the creation of new ideas and the 'judgement' moment assesses what is desirable, feasible, and viable among the ideas created by the invention. In addition, 'connection and development' relates to central themes of design in the essential features of products, and 'Integration and evaluation' evaluates the value of innovation in the product to be produced or implemented. Again, we can see the potential of the design approach to change the public service to be competitive, mission-driven, result-oriented and customer-driven or enterprising.

Fields of Design Problems

Arts of Design Thinking	Communication Symbols	Construction Things	Interaction Action	Integration Thought
Inventing symbols	Symbols: Words & Images			
Judging Things		Pysical Objects		
Connecting Action			Activities, Services, Processes	
Integration Thought				Systems Organizations, Environments

Figure 4. Four order of design developed by Buchanan (2015)

2.1.2. From journeys to systems

This study focuses on a new service design approach, 'Transition Design.' This is an emerging design research field that was developed primarily at Carnegie Mellon University (CMU). They argue that Transition Design will be able to more efficiently solve problems relating to people, industries, and environmental factors. Table 1 enumerates the following disciplines in chronological order and illustrates how Transition Design is positioned differently from existing ones.

The concept of Transition Design shows possibilities for an innovative approach to social problem-solving. However, Transition Design still has a research-practice gap. To reduce the gap, researchers and practitioners are required to focus on implementation methods by engaging the community, including stakeholders of community-based interventions (Mallonee, Fowler & Istre, 2006). In this respect, this paper will be an invaluable resource by providing an evaluable method for government-based interventions to bridge the gap.

	Design for Service (Mature discipline)	**Design for Social Innovation (Developing discipline)**	**Transition Design (Emergent discipline)**
Design Area	Moderate change: existing business and dominant economic paradigm	Significant change: emerging and alternative economic models	Radical change: Long-term and envisioning future economic paradigm
Design Method	Observation, customer journey, blueprint, touchpoints (Prendeville & Bocken, 2017)	Co-create facilitation to leverage or amplify solutions: life cycle assessment and scenario analysis (Allwood et al.,2008), value mapping (Bocken et al.,2013)	'Cosmopolitan localism' (Manzini, 2009; Sachs, 1999) with methods that are possible to make vertical and horizontal movement temporally and spatially.
Target	Service provider & User	Multiple stockholders and the environment (human-centric)	Social, economic, political and natural systems (system-centric)

Table 1. Continuum of design approach derived from the version of CMU

2.2. Spatio-temporal scale of transition design

This chapter introduced 'Transition Design'. It defined the meaning of 'Transition' and determined the key features of transition that can be applied in a design method.

2.2.1. Key concepts

With regard to a definition of transition, CMU design school professors have framed it from cross-disciplinary theories and practices. Cameron Tonkinwise (2014) summarized the terms from diverse discourses:

- Ecosystems science, which describes the relationality that give ecosystems resilience, but which, beyond certain thresholds, can also result in cascading changes that wholly recompose the ecosystem.
- Sociotechnical innovation, which describes the technological infrastructure path dependencies that lock-in habitual everyday practices, but which can be transformed when new technologies and practices take hold in particular market niches at the same time that there are pressures – economic and/or political – on existing regimes.
- Life changes, which describes the (social) psychology that enable and accompany bodily changes that may be part of natural maturation, unforeseen ill health complications, or deliberate transformations.

From these perspectives, a transition occurs at a moment of tolerance breaking with macro effects. It can be said to be similar to the butterfly effect, which was coined by Edward Lorenz (2000) who often uses the metaphor to explain weather prediction. In other words, small, daily moments, cause larger random, unpredictable systemic changes.

Transition Design acknowledges that we are living in 'transitional times'. It takes, as its central premise, the need for societal transitions to more sustainable futures and argues that design has a key role to play in these transitions. It applies an understanding of the interconnectedness of social, economic, political and natural systems to address problems at all levels of spatio-temporal scale in ways that improve quality of life.

Transition Design advocates the reconception of entire lifestyles, with the aim of making them more place-based, convivial, and participatory while harmonising them with the natural environment. Transition Design focuses also on the need for 'cosmopolitan localism' (Manzini, 2009; Sachs, 1999), a lifestyle that is place-based and regional, yet global in its awareness and exchange of information and technology (Terry, Gideon, Cameron, & Peter, 2015).

In this Protein Transition study, the established concept of Transition Design by the CMU is summarised as a list of criteria. These criteria will be addressed from the beginning to the end of the entire design process to produce a desirable and viable design concept.

- Everyday life approach: self-organisation, participation, and interrelatedness are highly developed; each of the 'parts' of daily life contributes to the emergence of the wholes of everyday life (Kossoff, 2015).
- Spatio-temporal scale: cosmopolitan localism links towards globalism by establishing a place-based and holarchical foundation from the satisfaction of individual needs (Mander, 2012).
- Future vision: dynamic and grassroots-

based visions that are modifiable according to the changing situation (Cameron, 2014)
- Sustainability: economic, social, and environmental value - Triple bottom line (Elkington, 1994)

2.2.2. Change in everyday life

Transition Design is suitable for considering various hierarchical interests while simultaneously creating spatio-temporal dynamics. These changes can encompass unexpected variables and create more flexibility and possibility towards a complex future vision.

With regard to everyday life, Ouellette and Wood (1998) describe habitual behaviours as those performed on a daily or weekly basis in a stable, predictable supporting context. These involve working, eating, and sleeping behaviours. Their research proves that the following conditions must be met for successful daily change:

- Automatic repetition of past acts.
- Controlled, conscious reliance on behavioural intentions.
- Stable and constant contexts.

Repetition of past behaviour is the most critical factor in forming a future habit. It is habitual and likely to be nonvolitional and an unintentional response in a given setting (Wegner & Bargh, 1998). Behavioural intentions tend to be efficient and general. Moreover, the intentions need to be a continual motivation and can replace existing habits. A skill acquisition requires the cognitive processing of responses in a constant environment. These responses become automatic and can be performed in parallel with minimal effort (Schneider & Shiffrin, 1977; Shiffrin & Schneider, 1977). Additionally, Aarts, Paulussen and Schaalma (1997) suggest the need for short-term rewards for better implementing behavioural change (see Figure 5).

These theoretical concepts have developed as practice theory, which is a framework so that designers can conduct empirical experiments. Kuijer (2017) determined how precisely practice theory can be applied in design methods. She concludes the benefits of the use of the theory as follows:

- Analysing situated practices: Practice theory as a conceptual framework can be utilized for user research, interviews, ethnography, and so on. It can be a unique way to collect data from habitual and unarticulated practices.

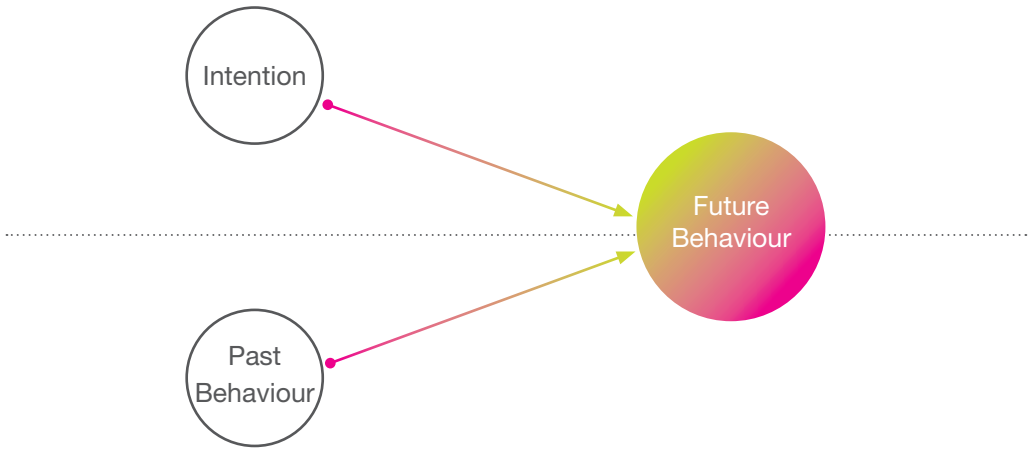


Figure 5. A model of a correlation between future behaviour and repetition of past behaviours and behavioural intentions

- Tracing practices in space and time: It enables designers to trace and compare practices in spatio-temporal scale. For example, we can see the history and future of the Dutch cooking and contemporary differences of cooking in the Netherlands, India, and Korea.
- Disrupting practices: Based on habitual practices, designers can rearrange elements that trigger a change in practice. Thus, they can solve problems.
- Reflecting on practices of design: By tracking explicit changes, we can review designed frames to determine whether designer interventions were valid.

These points are important to transform Transition Design perspective into practical cases. With the benefits, she shows an example of a designed framework through a practical case as illustrated in Figure 6. The framework illustrates how to change a target group's behaviour to reduce energy consumption in their home systematically.

From the figure, we could summarise the Kuijer's process as follows:

- Recommending new information (Quantify consumption indicators).
- Giving challengeable (similar practices) but achievable (historic career) motivations.
- Increasing opportunities for creating a desirable and new practice.
- Helping to form the best habit (best performance) by iterative triggers and feedback.

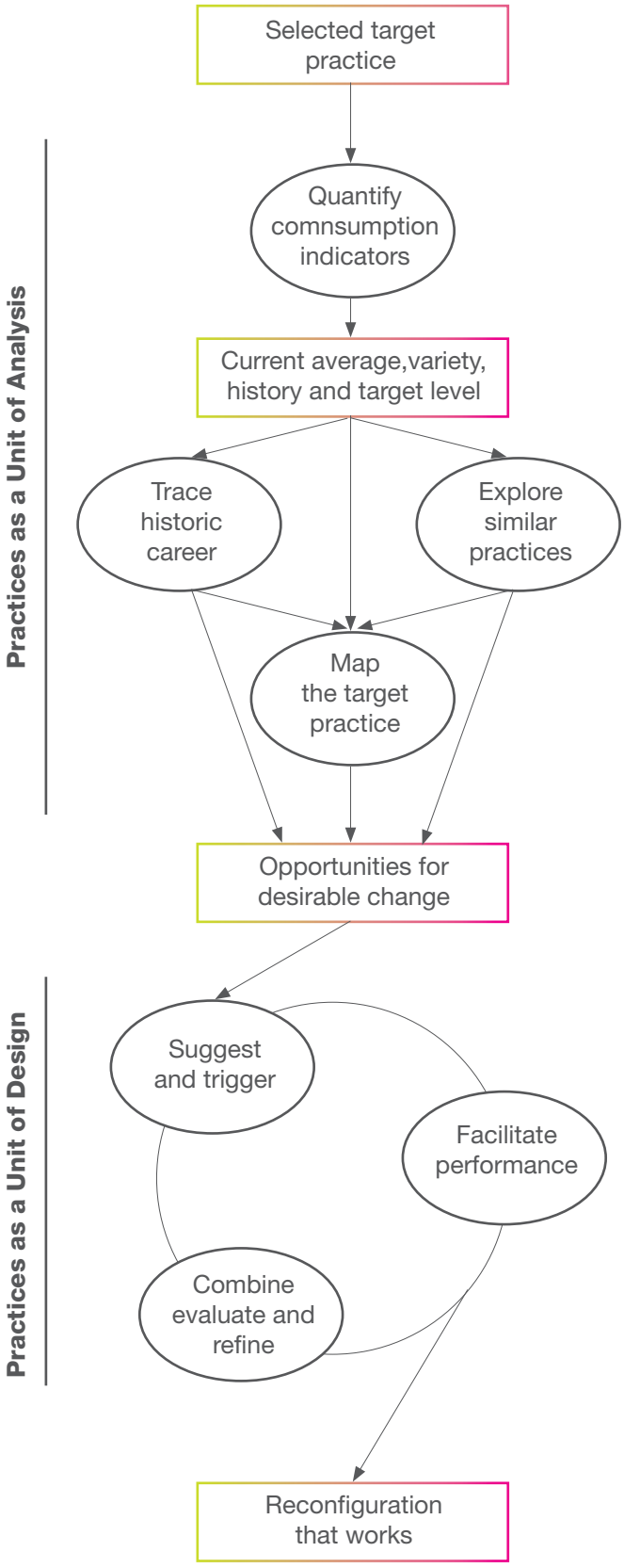


Figure 6. A practices-oriented approach to reducing domestic energy demand by Kuijer (2014)

2.2.3. Commons & "Commoning"

Next, we need to consider how to link the individual's daily changes to the extent of the system in a spatiotemporal scale. In this study, we define the linkage as 'commons' and refer to the phenomenon of horizontal and vertical organic diffusion through the linkage as 'amplify'. If there is a common axis, practices can travel as entities at different levels of the system. In this sense, a change of practice as an entity becomes a collective- influence on all individuals' everyday performance (Shove, Pantzar & Watson, 2012; Kuijer, 2017).

The general definition of 'commons' from Wikipedia is the tangible and intangible resource accessible to all members of a society individually and collectively. Dimeji (2015) notes that the commons have played a central role in the economic and societal world for a long time. Individuals, communities, and natural symbiotics have co-existed and formed livelihoods and cultural practices. The commons requires collaboration and participation of individuals to create 'commoning' practices for collective benefit. The 'commoning' challenges centralised and conventional economics while encouraging regional societies to maintain a balance. In fact, many economists viewed commoning as a major factor in the negative impacts of community (Lloyd, 1833; Hardin, 2009). They explain that individuals are likely to delete or spoil the common goods according to their own desires. However, Elinor Ostrom (2015) considers commoning as an opportunity, not just a problem, and reports many cases in which the government and individuals cooperate and successfully exact a significant impact (see Figure 7).

Figure 7. Farmers are sharing a land as commons

3. Methodology

3.1. A thing-centric approach to change in everyday life

Things perform their actions and promises by linking their roles and location to related context. Things are defined as non-humans, which involves texts, materials, objects, artefacts, and so on. The interesting point is that things compel people to carry out actions to receive a promise of a thing whenever people intend to use a thing. For example, there is a person who wants to drink a hot coffee. Hence, he thinks he will use a kettle. In fact, he needs to fill the kettle, wait a certain amount of time for the water to boil, and pour hot water into his cup while the kettle gives hot water as promised. Moreover, the objects are designed to perform a specific function. However, they are often utilised in the other ways, depending on the individual. Thus, things can represent a human being's daily practices including belief, culture, and education. If objects have their voice and deliver their neutral perspective about humans, it would be beneficial to understand the unconscious and habitual patterns of a human being (Shove, 2007; Caronia & Mortari, 2015; Giaccardi Speed, Cila & Caldwell, 2016).

Many scholars have conducted various studies using the thing-centred approach to observe changes in human behaviour. The previous cases have proved that it is possible to manipulate people's behaviour smoothly without strong coercion. Elimination and small changes (material, colour, location) of existing objects as well as interventions of new objects will affect human behaviour. Kuijer (2017) insists that a practice with a 'reconfiguration' of things gives rise to behaviour change. A human-being's habitual behaviours can be changed through constraints or possibilities. If we use

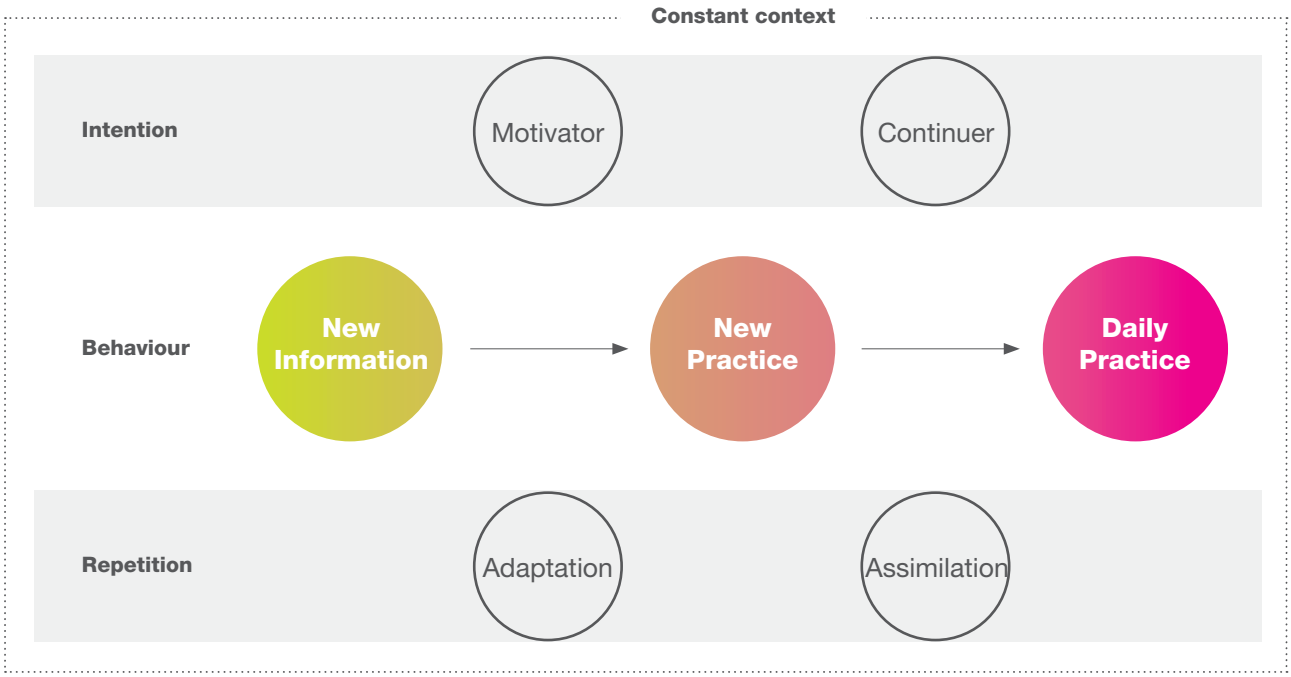


Figure 8. A designed new process for change in everyday life

a thing-centred approach to observe repetition of a human's past behaviours and behaviour intentions within a familiar environment, it will allow us to determine the elements that have a potential for transition in everyday life. Furthermore, we can explore the impact of Transition Design on the routine.

With a thing-centred perspective and the previous studies (see Chapter 2.2.2.), we designed the new process of daily change and divided it into three stages as shown in Figure 8.

The Protein Transition study has attempted to embody the two theories in the new frame. The new framework is subtly described as the process of a new behaviour. It demonstrates how motivators and continuers as things influence human behaviour to form new habits sequentially over time. In addition, we primarily use 'practice' to include repeating and developing for a particular purpose. Ultimately, we can track, disrupt, and reflect on everyday change for a future vision through this framework.

In the new process, information is acquired for a specific purpose. It leads to a new practice and becomes a daily practice by continuous and repetitive behaviour. During the process, it is first necessary to have a repetition of behaviour, which can be gradually transformed towards an intended direction. The conscious intention can be a motivator that compels people to start to change. In addition, a continuer keeps stimulating people and customising the behaviour change with their capability and the opportunity. With the triggers, the repetition of behaviour enables people to progress through adaptation and assimilation. All these transition strategies should be undertaken in a consistent and supporting environment.

3.2. The Panda-Tulip Framework (PTF) to amplify change

When we extend individual information to a system level, there are endless entangled relationships across all areas. For example, with regard to the food area, it is closely related to broad areas such as health, environment, and energy. This raises another challenge for policymakers to understand the whole picture efficiently. A systematic diagram or framework is an invaluable tool in these situations. The purpose of these tools is not to simplify the entire system, but rather to provide a flexible and selective integration through the effective use of the organizing principles of system diagrams (Jun, Kim & Lee, 2011).

Buchanan (2008) posited the four organizing principles of system diagrams as follows (see Figure 9):

1. Law that holds together individual components,
2. Rule that guides decision making,
3. Function that supports users' action possibility, and
4. Condition that facilitates participation in cultural ideals.

RVO's Xlab developed the Panda-Tulip Framework (PTF). This is a Multilevel Causal Loop Diagram that shows the cause and effect relationship between costs and benefits. Those elements drive behaviours of motivations and expectations. This diagram shows how to solve problems due to unintended conflicts between counter-parties. This understanding can help

policymakers draw up better contracts and agreements. Moreover, it can find better ways to co-produce values with other stakeholders. In this research, we focused on a thing-centric approach to design the concept. Then, the PTF was used to evaluate the scalability of our final concept to the system level. Figure 10 explains how the key factor (A0) can influence each counterpart as costs (C1, C2) and the costs give back risks (D1,D2) to A0. B1and B2 represents benefits, and these grow as rewards (E1, E2) and goodwill (F1, F2).

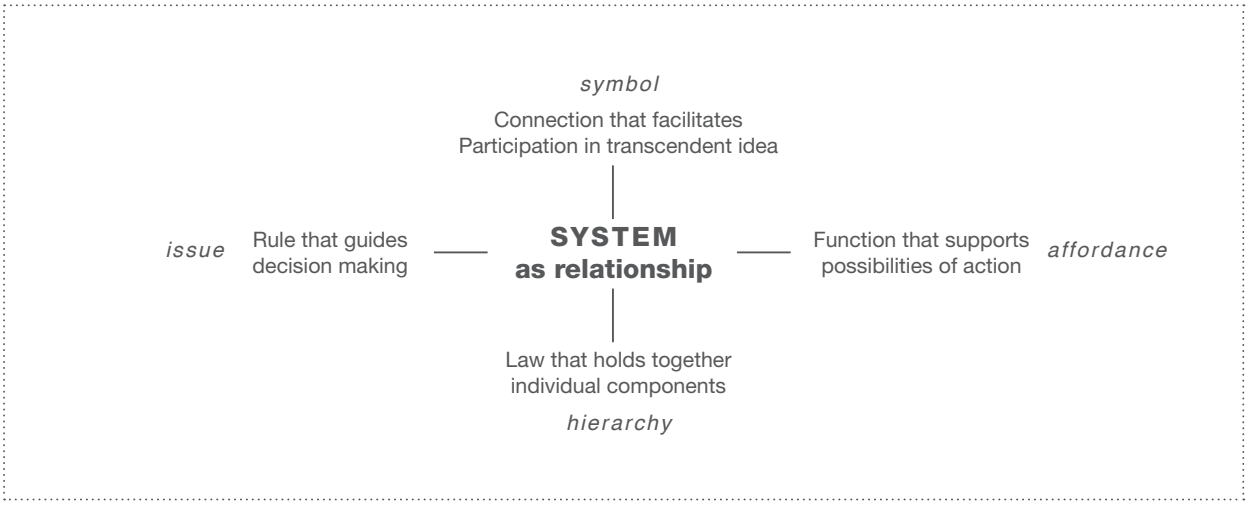


Figure 9. Organizing principles of system diagrams by Buchanan (2008)

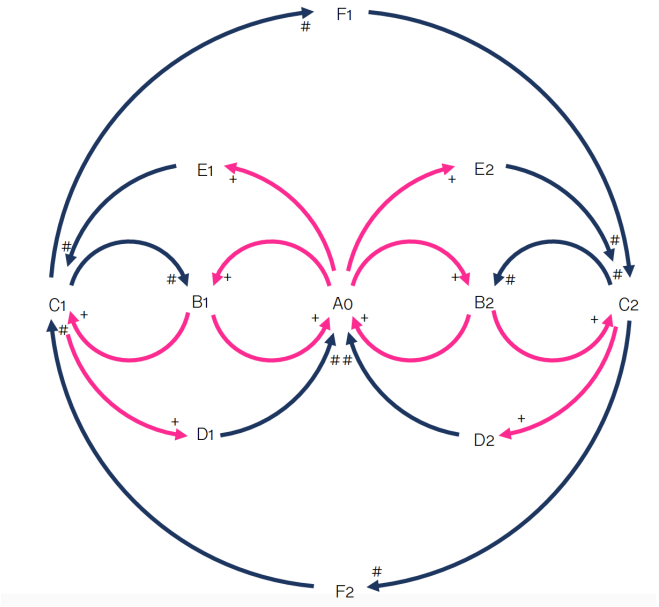


Figure 10. Panda-Tulip Framework by RVO's XLAB
(The picture shows the discussion about PTF on the right side)

4. Research phase

4.1. Data collection and analysis

To conduct empirical studies, we sought a thing or place that can meet the requirements discussed in the previous chapters. It should entail a place-based and holarchical feature. In addition, the thing should have access to observe individual eating habit. Furthermore, it should be possible to facilitate a thing centric design approach. After all, we determined that it is a 'kitchen'.

4.1.1. Thing ethnography in the kitchen

We have conducted several interviews to define the essential elements of the new process of new habit formation in a kitchen as shown in Figure11 and have named the process the 'Kitchen-ing Process'. The thing-centred approach helped us to understand the factors by the agency of things. In this respect, kitchen tools in the kitchen imply people's practices and values. The practices and values might include the process of storing ingredients in refrigerators or on shelves, preparing and cooking them, and handling leftovers. In this respect, 'kitchen-ing' refers to individuals' practices and values that emerge when they use their kitchen tools. During the interviews, we first ascertained personal preference, knowledge, and value through a thing-centred ethnography (Giaccardi, Cila, Speed & Caldwell, 2016). Then, we analysed findings relevant to motivator, continuer, adaptation, and assimilation of the Kitchen-ing Process.

Goal

Various interviews were conducted with key stakeholders related to the food industry. We observed how kitchen tools reflected routine practices and values, and predicted how these elements have potentials to be part of the process of new habit formation.

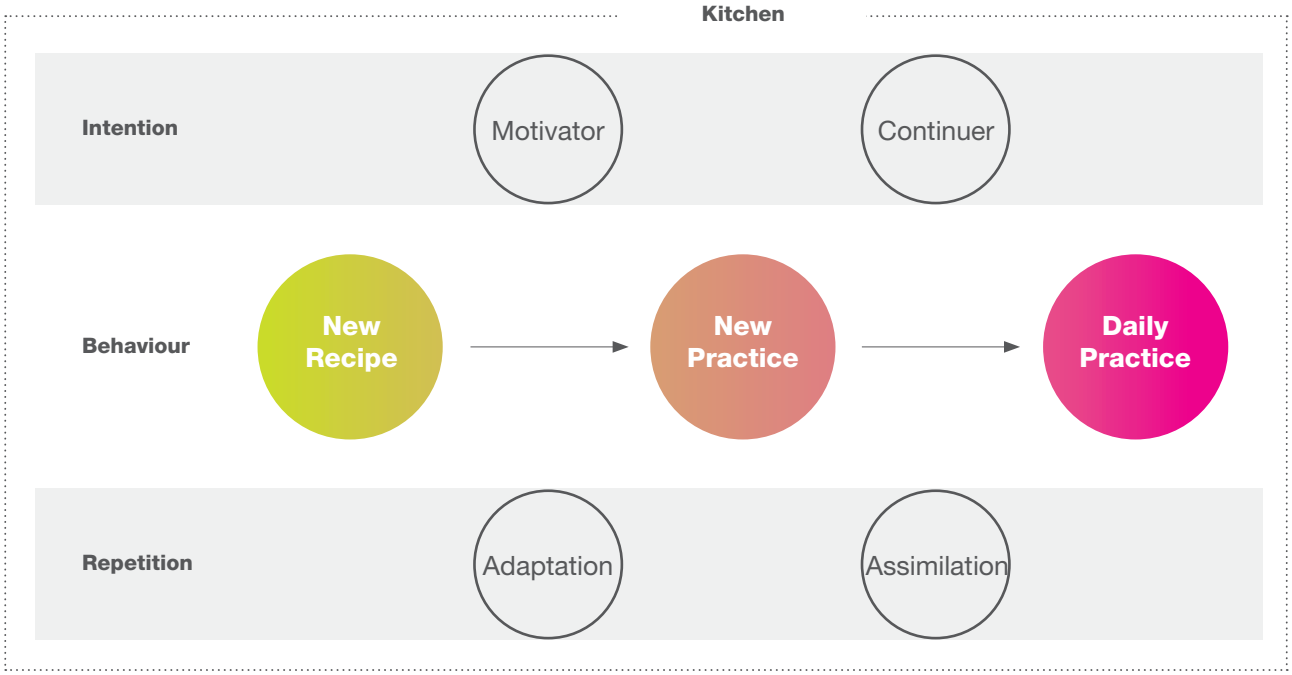


Figure 11. Kitchen-ing Process

Method

Participants

	Occupation	Initial	Nationality	Place of Interview	Living Status	Gender	Options
1	TU/Delft Student	T	American	Home	Single (roommates)	M	Different nationalities
2	TU/Delft Student	R	Dutch	Home	Single (roommates)	F	
3	TU/Delft Student	G	Korean	Home	Couple	F	
4	TU/Delft Professor	E	Italian	Home	Family (3)	F	
5	RVO	L	Dutch	Home	Family (4)	F	Different kinds of stakeholders in the food industry
6	Voedingscentrum	C	Dutch	Home	Couple	M	
7	Distribution	B	Dutch	Supermarket	Family (5)	M	
8	RVO Canteen	S	Dutch	Canteen	Couple	M	

Table 2. Participants of the interview

Table 2 shows eight participants participating in the same type of interview. After the interviews, they divided into two groups to analyze the interviews in depth. They all live in the Netherlands. The one group consists of the specialists who work in the food sector, and another group is composed of foreigners who have different national backgrounds.

Procedure

Thing-centred ethnography was used. Thing-centred ethnography encompasses two approaches. It is possible to see the agency of things through the first-person view (FPV) and a thing-driven lens, which observes a person's practices from the 'things' perspective. In Prof. Giaccardi's masterclass workshop (2017), using both methods was useful to better understand.

In this experiment, participants fitted a body camera for FPV and used a think-aloud technique for time efficiency. In other words, they explained – similar to famous chefs on TV shows – while cooking in their kitchens. Hence, we could know the intention of their behaviours at that moment. Moreover, the body camera was designed to be fixed to the chest, and the brand of the camera was Xiaomi Yi action.

Figure 12 demonstrates the entire process of the interview. First, I emailed a sensitizing booklet (see Appendix B) to the subjects. This allowed them to consciously recall the routines that they used to do (Stappers & Sanders, 2003). The questions included in the booklet are:

- Please describe your day yesterday. (to the timeline)
- What, where, when, and how did you eat during the day? (Breakfast, Lunch, Dinner, Snack)
- What does kitchen mean to you?

(Let us say that kitchen is 'a final place deciding what you eat'. Describe the meaning in words (five keywords))

- What are key objects in your kitchen for your daily cooking? Would you take photos of them with your cell phone?

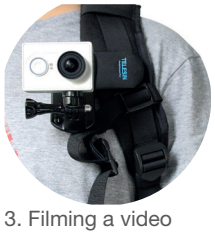
(Objects can be three areas, three appliances or utensils, three ingredients, and so on)

- If you could change anything in your kitchen, what would you want to change and why? (Everything can include ingredients, utensils, your skills, your practice, and value)
- Let us talk about your position in food industry. (Only for the four participants who work in food industry)

Second, interviews of the participants were conducted in their home kitchen during lunch or dinnertime. However, two of the eight participants had FPV conversations at their workplace (canteen, supermarket) and were asked about their home kitchen in the form of a questionnaire. Most of the conversations were filmed by allowing them to talk naturally. Probing questions were only asked if participants said something interesting. Lastly, the conversation was concluded by talking about the pre-written sensitizing booklet.

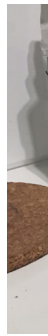
1. A booklet via email

2. Visiting home kitchens



3. Filming a video

4. wrap-up talk



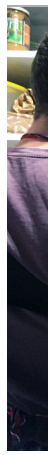


Figure 12. Entire process of the interview.

Figure 13. Home kitchen & working place interviews with diverse consumers

Data collection

First, some sensitizing booklets were handwritten forms while others were digital. To clarify, we talked with participants about the answers in their booklets during the last minute of each interview. Thus, we gathered the recorded voices and texts for each question. Thus, we compared the responses of the various participants on each question and analysed similarities (see Figure 14).

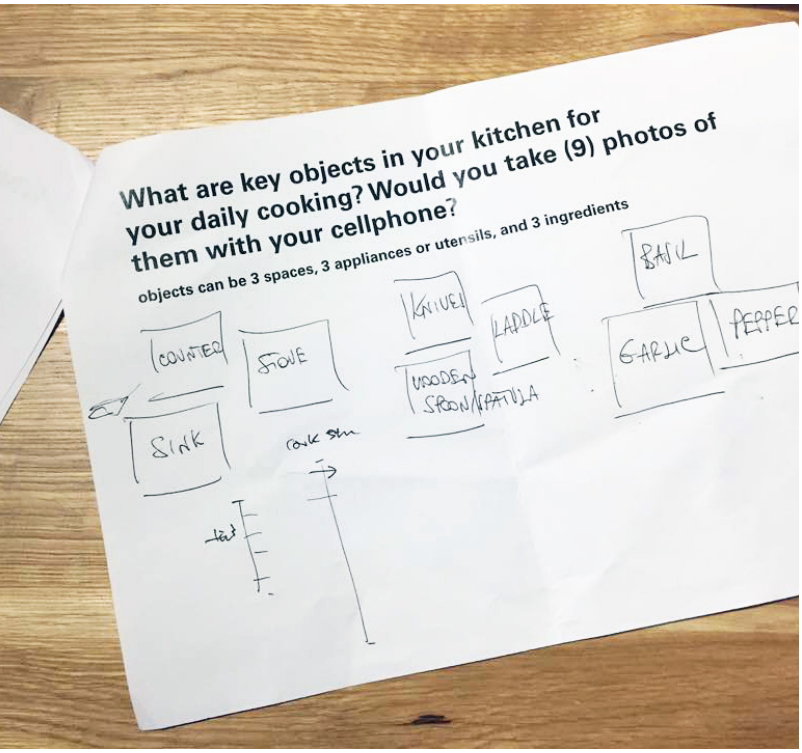


Figure 14. An example of the completed sensitizing booklet

Moreover, the film of the interviews was transcribed. Videos were useful for capturing participants' behaviour and thoughts. Thus, we could record unconscious and tacit practices they did not mention. Transcriptions mainly consisted of practices and values relating to kitchen tools. While collecting related data, kitchen tools encompassed not only non-human but also human elements. For instance, participant E as a mother had Tacos every Tuesday because her daughter loves Mexican food. In this case, her daughter is a thing triggering a habitual pattern. To codify the sequence of cooking processes, we applied the following three steps (see Appendix C):

1. Recording quotes and actions that show practices and values with the thing perspective
2. Dividing the quotes into Kitchening Tool, food/ingredient, practice/intention
3. Based on practice/intention, clustering them under motivation, continuer, adaptation, and assimilation.

Data analysis

1) Sensitizing booklets

What, where, when, and how did you eat during the day? (Breakfast, Lunch, Dinner, Snack)

This inquiry could help us observe the eight participants' daily eating pattern indirectly. Furthermore, quite common attributes were noted regarding meals for breakfast, lunch, and dinner and snack time. For breakfast, most ate a simple and similar food daily. They consumed mainly carbohydrates such as oats, bread, and muesli with yoghurt and a beverage such as juice, tea, and coffee. It was clear that people try to eat simple food that does not require cooking. On the other hand, one of the interviewees had a different menu than usual and ate the previous day's leftovers.

Each participant had a different meal for lunch according to their circumstances. Overall, five of the eight participants did not cook and ate their lunch at a canteen, a restaurant, and a delivery service. However, participant B did not eat a proper lunch because of his busy schedule. Furthermore, participant G prepared her lunch in the morning and went to a library. However, participant C completed the booklet on the weekend, unlike the others. Thus, he responded that he enjoyed cooking what his son enjoys. Each person had their work schedule during the daytime on weekdays and was likely to eat out. They relatively spent time on cooking for the family on the weekend.

With regard to dinner meals, six people cooked diverse food with more varied ingredients. Only one participant ate out while meeting her friend. Two single participants ate a comparatively simple dish such as spaghetti while others prepared more dishes for their families. All six of the eight participants who answered prepared quick and easy recipes during the week. Since most of them did grocery shopping on a weekly basis, their dinners were based on their plan and they improvised menus with leftovers at the last moment. The participant C who cooked during the weekend made an effort to prepare a lasagne with fresh vegetables in the oven. All participants showed their discipline for dinner by having special recipes and rules on their own.

"A sort of curry paste is in it and coconut milk. We call it dinner soup."

-Participant L (RVO)

"On Saturdays I always cook vegetarian."

-Participant C (Voedingscentrum)

What does kitchen mean to you?

The interviewees had a wide range of meanings regarding a kitchen. The implications were seen as functional and emotional aspects. The functional aspects were interpreted in equipment and the environment. Regarding equipment, a kitchen was described at different level concepts from specific pieces, such as oven and refrigerator, to a system representing one's health and lifestyle. Furthermore, a kitchen was depicted as a central place where people can eat and socialise with others. In this sense, participant C renovated his kitchen to make the cooking area face the living room and did handwashing instead of running a dishwasher. It allowed enough time and space to communicate with his family.

When examining the emotional aspects of a kitchen, participants had positive feelings about the process of making food. They explained that a kitchen is an inspiring place to show creativity, stimulate appetites, and feel cosiness. On the contrary, they also experienced negative emotions at the same time. A kitchen is another working place to feed themselves and their family, clean dishes, and empty rubbish. They indicated that they have a more positive experience on the weekend because they are willing to cook in a relaxed mood.

What are key objects in your kitchen for your daily cooking? Would you take photos of them with your cell phone?

Regarding this question, we provided examples of objects to help interviewees understand clearly. The examples were areas, appliances and utensils, and ingredients. They talked about many different kinds of things, but mostly about utensils. When we examine the answers regarding the utensils, all participants mentioned knives and chopping board. Moreover, there were cooking utensils, cookware, and tableware in that order. The interesting point was that some of them noted tools influenced by their cultural background(see Figure 15).

"Koreans need to eat rice, so I always use a rice cooker made in Korea."

-Participant G (TU/Delft Sttudent)

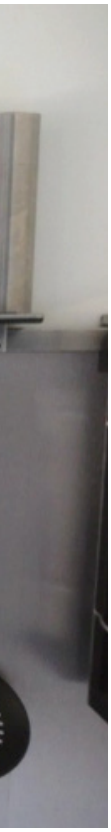
"Coffee is very important for me and our culture, and it is a social event to drink a cup of coffee with someone."

-Participant C (Voedingscentrum)

Ingredients included seasonings, vegetables, grains, and oils. Particularly, most of the participants referred to seasonings such as spices, herbs, and garlic. The difference in the kinds of seasonings they use also gave an indirect glimpse into their cultural influences.

Lastly, half of the interviewees talked about general areas in their kitchen such as a kitchen counter, a sink, a stove, and shelves and racks.

Figure 15. Kitchen tools of the participants (cooking utensils & seasonings, cookware, rice cooker)



If you could change everything in your kitchen, what would you want to change? and why?
When asked this question, a few main points emerged:

- **Space and time efficiency:** Most wanted to have spacious and efficient kitchens for better storage and preparation of tools and ingredients. Moreover, they preferred to use a dishwasher to save time and effort.
- **Central area for social interaction:** They also mentioned a kitchen island regarding the socialising aspect. They thought the island could be a central place to communicate with their family and friends while cooking.
- **Better quality and diversity of food:** All craved better food and wanted to enhance kitchen tools or their cooking skills. The tools they mentioned were ovens, refrigerators, coffee machine, and so on. Furthermore, one of them spoke about advanced equipment such as an Amazon Echo. Some were eager to improve their knowledge about cooking to experience more diverse food.

On the other hand, participant R spoke about sustainability as her discipline. She had a strong environmental concern and wanted to reduce plastic consumption. For example, she said she might buy eco-friendly packaged products and use more glass containers than plastic ones. Moreover, participant S, as a canteen manager, indicated desirable changes in business perspective. He wished for a better and efficient space to attract more customers. Moreover, he wanted a nice refrigerator to keep ingredients fresher and reduce food waste.

Let us talk about your position in the food industry and how to adds value to food.
This question was asked only to the interviewees who work in the food industry. They work for the Dutch government, the Dutch nutrition centre, the Plus supermarket, and the RVO canteen. As a result, two interesting points emerged

- **One cannot control the decision of customers as providers (individuals):** All indicated that they do not have the authority to lever consumers' choices. However, they believed they can support the consumers to make better choices by offering diverse options. For example, participant L said the government has tried to subsidise food entrepreneurs who can take the initiative in an improved way. Participant C, as a nutritionist, has provided educational guidelines to people so that they can eat healthier food. Participant B, as a CEO of a supermarket, has collaborated with local farmers to provide fresher and better products to consumers.

"I try to offer not only affordable but also good food to make them happy, but they can eat MacDonald's, too. These choices are their responsibility."

- Participant S (RVO Canteen)

- They can make small actions to change their circumstances as consumers: As consumers, they were passionate about healthy and sustainable food. Participant L often organised feasts to share food with her friends and neighbours. Whenever she cooks meals, she prepares various and balanced dishes to allow people to experience new tastes. Furthermore, participant C has put effort into cooking vegetarian food and saving energy by installing a solar panel. Participant B has chosen fresh and nutritious ingredients and not processed food for their children. Participant C has also tried to save energy and support the environment by recycling and supplying his own shopping bag.

1) Interview

As mentioned in the data collection section, 210 quotes were selected from the transcripts of the eight interviewees. Each quote was divided into kitchen tools, food and ingredients, and habitual practices and intentions (see Appendix D).

- **Kitchening tools:** Most included different kinds of kitchen utensils and appliances. On the other hand, human factors also played a role, such as their family, friends, guests, and customers (from canteen perspective).
- **Food and ingredients:** Data was from all levels of the food system. There were various ingredients, different kinds of meals, and sensory attributes of food, such as a flavour.
- **Habitual practices:** All practices from the entire process of cooking – grocery shopping, preparation and storing, cooking, eating, and cleaning.
- **Intentions**: There were internal and external aspects of behaviour intention. The internal elements were self-discipline, caring and affection, new experience, satisfaction, and cultural heritage. The external elements included efficiency, convenience, reliability, economic situation, regulation, better opportunity, and reminding.

When a habitual practice and intention was selected from each quote, it was clear that habitual practices are fundamental for adaptation and assimilation of various intentions. Furthermore, intentions can be sorted into motivation and continuer.

For example, participant G stated, "I don't like fried-rice that much. So, I can make fried rice for him but not for me." From the quote, we can divide the provided information into the following:

- **Kitchening tool:** Boyfriend (him)
- **Food and ingredient**: Fried rice
- **Habitual practice:** Frying
- **Intention:** Affection

Because her boyfriend likes fried rice, she relates the frying practice with affection. In this sense, the intention could be a continuer and the habitual practice could be assimilation.

Finally, we chose 168 quotes that have attributes of motivator, adaptation, continuer, and assimilation. The interviews were conducted to observe participant behaviours in their kitchen with which they were accustomed. Thus, it was more difficult to find elements of motivation/ adaptation than elements of continuer/ assimilation. We were able to gain insights from the small changes during the interviews or their memories of the moment when they started changing. For instance, participant T was cooking a new recipe for his friend during the interview. Moreover, participant L regarded us as guests and tried to prepare more food than usual. Through the process, motivator, adaptation, continuer, and assimilation were defined precisely.

- **Motivator:** Most of the motivators are unexpected external influences such as their friends and children, special gift, new experience, and knowledge. Interestingly, all examples resulted from people. For instance, participant L could have a special memory because of her birthday gift from her grandmother. If people have a positive experience from a motivator, they tend to keep the stimulus to adapt new practice. It becomes a continuer later.
- **Adaptation:** The practices are from past behaviours. They are basic behavioural patterns that remain in the past. Thus, the practices are hardly transformed to meet specific intentions.
- **Continuer:** The intentions are predictable and controllable. These are already embedded in daily life or are intentionally

remembered so that they are not forgotten. For example, there include regulation, heritage, convenience, and self-discipline.

- **Assimilation:** It is a process to make a new action become a habitual practice. The practice is likely to be tailored to a particular intention. For instance, participant C collects plastics separately in a specific area to recycle them.

4.1.2. Cooking sessions as both field and probe

Next, we organised a couple of cooking sessions. When we examine the 'Kitchen-ing Loop' as shown in Figure 16, a significant challenge emerges from the Kitchen-ing Process to make it a loop (see Chapter 4.1.1.). The step between daily practice and new recipes needs a driving force to create the cycle. The driving force is necessary to nudge people out of their comfort zone and have more opportunities to gain new knowledge continuously. This process is immediately followed by intentional motivators and heuristic adaptations to form a new practice. Therefore, we designed cooking sessions to observe the impact on the Kitchen-ing Loop. In this research, cooking sessions were proposed to enhance possibilities of dietary change by:

- Sharing new ingredients, new skills, and new value by collective group interaction.
- Using their own tools to retain similar contexts.

Cooking sessions can range from private gatherings to formal events. For example, some people cook with their family, friends, and neighbours. On the other hand, others who are interested in cooking tend to join social events. In addition, it can be part of an education programs for children in schools.

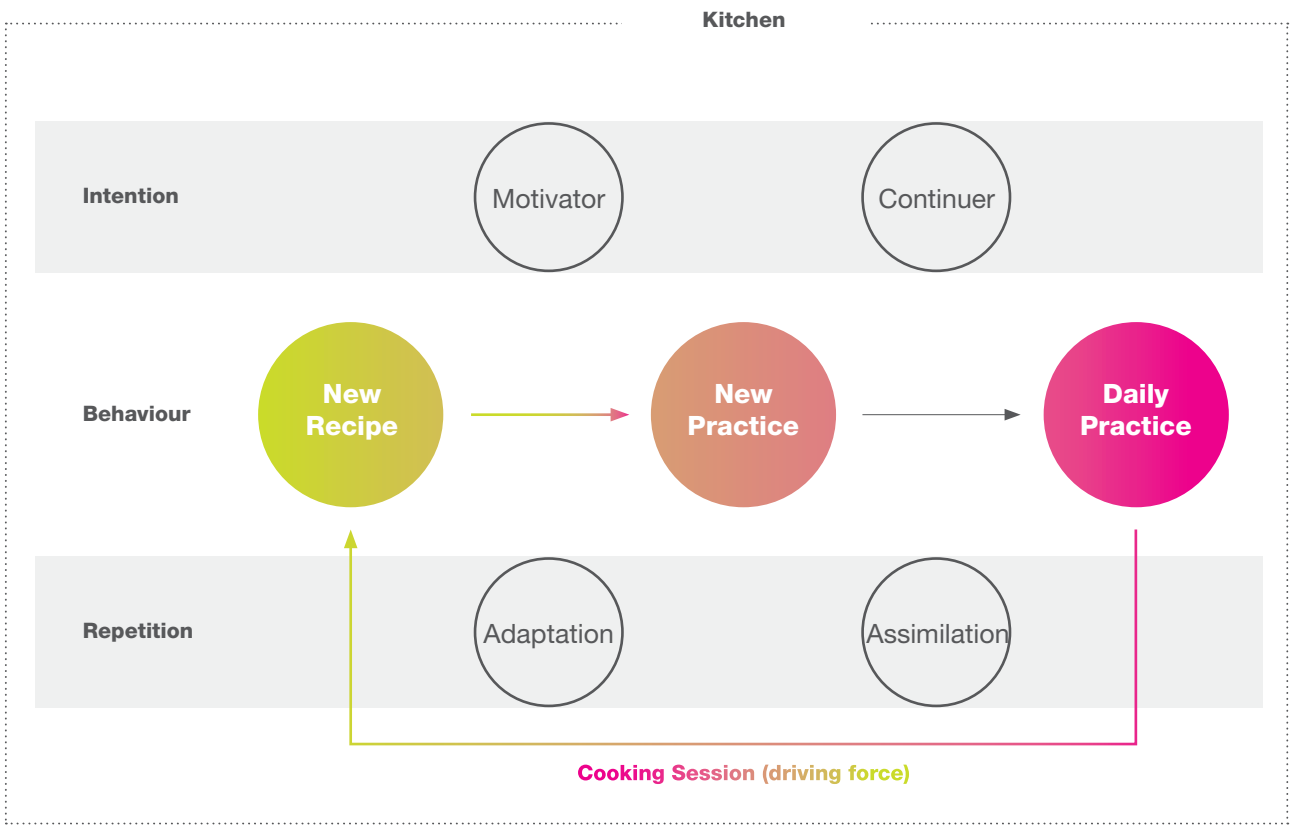


Figure 16. Kitchen-ing Loop with role of cooking session

Goal

Two cooking sessions were conducted in both private and public forms. We intended to determine the potential of cooking sessions to be a driving force for initiating change.

Method

Participants (see Figure 17 & 18)

Table 3 depicts participants of the two cooking sessions. The first session participants are design master students at TU/Delft. It created a comfortable atmosphere so that they could enjoy cooking each other as usual. However, the second session consisted of experts who have different specialties and interests. Additionally, the participants of the second session were, by comparison, foodies who like to explore new food.

Procedure (see Table 4)

1) First session

Participants were required to bring their own tools that they often use which represents their identities. For example, most Asian households have a rice cooker. They also were asked to bring their spices and seasonings, because these are significant to cook food. Furthermore, each participant had to think about 'green protein' ingredients for one main dish. We explained that the green protein includes ingredients that are good for your health and the environment. Thereafter, we listed the ingredients and purchased them from a supermarket.

The cooking session was processed at one participant's common kitchen where she usually shares with her flatmates. Thus, the kitchen

Session	Occupation	Initial	Nationality	Place of Interview	Gender	Options
First session	TU/Delft Student	T	American	R's common kitchen	M	Different backgrounds & classmates
		R	Dutch		F	
		G	Korean		F	
		M	Indian		M	
Second session	RVO	L	Dutch	RVO canteen kitchen	F	Different backgrounds & expertise
		S	Dutch		M	
		D	Dutch		F	
		A	Dutch		F	
		M	American		M	
	TU/Delft Supervisor	R	Australian		F	
	-	E	Australian		F	

Table 3. Participants' information of two cooking sessions

	First session	Second session
Member	Closed group (4 people)	Open group (8 people)
Preparation (A list of things)	- Kitchen utensils - Ingredients 1) Green protein (self-reference) 2) Spices and seasonings	- Kitchen utensils - Ingredients 1) Common ingredients 2) Random ingredient that participants did not mention: Veggie falafel, cashew nuts 3) Spices and seasonings
Place	Flat common kitchen	RVO office's canteen kitchen
Session Duration	2hr	3hr
Rule	-	- Being aware of colour stickers on ingredients 1) Green: sustainable 2) Yellow: processed 3) Red: non-sustainable - Giving up one ingredient or tools that they planned to use - Choosing one imaginary target they need to cook for 1) Low-status households 2) Patients in a hospital 3) Customers in a veggie restaurant
Result	- Indian curry - Hayashi rice - Moroccan style chickpea stew - Korean style sushi roll - Korean style tofu salad	- Moroccan style lentil salad - Chicken salad - Pomegranate salad - Green bean soup - Salmon steak - Couscous salad - Veggie falafel - Tofu salad

Table 4. Process of two cooking sessions

Figure 17. First cooking session with TU/Delft students

Figure 18. Second cooking session with RVO and TU/Delft Colleagues

was well equipped with appliances and kitchen utensils. Participants cooked for two hours in the following order:

1. Introducing tools they brought and recipes they want to prepare.
2. Choosing random ingredients and cooking together.
3. After one hour of cooking, they share and eat all 4-5 dishes.
4. Sharing self-reflection.
5. Cleaning the kitchen.

After the session, the students were required to provide feedback of whether there was any change in their thought or behaviour.

2) Second session

The second session was officially organized for a larger and diverse participants. The session took place in RVO office canteen. The group of the second session also needed to prepare their utensils. These members were not asked to think about 'green protein' ingredients when selecting ingredients. Additionally, unexpected ingredients were added to the list for them. The random ingredients included future alternative resources that EU governments predicted (Thijs, 2017). RVO's canteen was composed of more professional appliances and utensils such as large ovens, fryers, and a dishwasher.

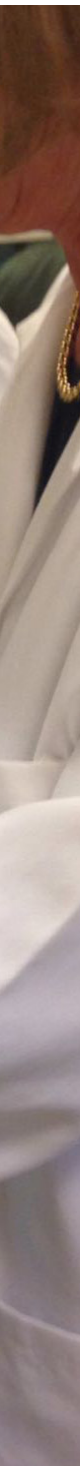
As organizers of this event, we were taught by the manager of the canteen how to use the facilities beforehand. With the large group, it took three hours to cook with the following steps:

1. Getting to know the RVO kitchen facility and RVO cooking event rules.
2. Choosing ingredients from the preparation room.
3. Introducing their ingredients and utensils.
4. Forming pairs to cook together.
5. Cooking at least one dish per team.
6. Eating and talking.
7. Cleaning the area.
8. Providing feedback through email.

In the second session, we established a rule to see how participants respond to the small challenges (see Figure19 & 20). First, prepared ingredients were allocated colour stickers. The 'green colour' represented more sustainable ingredients such as vegetables, grains, and fishes. The 'yellow colour' shows processed ingredients that consume extra energy and resources to preserve. Furthermore, the 'red colour' meant non-sustainable resources that not only negatively affect the environment but are also becoming scarce to support the growing population in future. Secondly, the participants were asked to give up one of their tools or planned ingredients. For instance, one participant tried to abandon a knife for a salad and a blender for making soup. The other participants replaced the main ingredient of a dish with another ingredient. Participant D attempted Moroccan style lentil salad by giving up the couscous. Lastly, they should consider three target groups. 'Low-status family' was an example of an alienated social group. 'Patients in a hospital' represented a special group requiring nutritious and specific meals. 'Customers in a veggie restaurant' embodied a segment that has strong self-preferences.

Figure 19. Attaching colour stickers on ingredients
Green: Natural ingredients
Yellow: Processed ingredients
Red: Meat & processed meat

Figure 20. A participant who is taking pomegranate seeds without a knife.



Data collection

Overall, we mainly analysed the introduction part and the discussion and feedback part of the entire process of each session. Hence, we want to determine what test subjects think about the experience of cooking sessions. It was efficient to transcribe articulated thoughts and reflections to gain insights (see Appendix E). Additionally, observations during the sessions helped to understand diverse influences on their attitudes. By analysing transcriptions, we could determine various driving forces from the dynamic circumstance.

Data analysis

When we examined the preparation phase of the two cooking sessions, we could see what tools and ingredients the members brought.

- **Their own tools:** All members of the first session brought cooking utensils such as a knife, a chopping board, and a spatula. They wanted to bring small utensils that are easy to carry. On the other hand, a Korean student brought a long chopstick and scissors. Interestingly, others were curious about those things. In addition, another student who is passionate about cooking brought his cookbook. The second session team also brought knives, chopping boards, and pans. Furthermore, they took more specifically functional utensils, such as a blender, a garlic press, and a coarse grater. They had probably already considered what they would cook in the session. In this session, highly functional tools were of interest to them.

- **Ingredients purchased:** vegetables featured in the first session because the participants were asked to cook with 'green ingredients'. Thus we purchased chickpeas, leeks, tomatoes, carrots, and so on. In the second session, the participants could select their own ingredients. Thus, many different kinds of ingredients were purchased: vegetables, fruits, dairy products, meat, fish, and so on.

To analyse the effect of the cooking sessions, we used observations during the sessions and participant feedback. Some insightful points emerged:

- **Motivation and Adaptation:** They inspired each other with their educational and cultural knowledge. Articulated knowledge was easily shared with each other through conversation and observation. That knowledge was interpreted to their recipes, utensils, and ingredients. However, their heuristic performances and expertise were difficult to share. During the session, all members focused on their cooking, and there was no time to try new practices from the others' recipes.

"I also really enjoyed the finger grater. I had never seen one before."

- Participant E (Second cooking session)

"I could see the different skills, background, routines, habits, tastes etc. that people bring with them. A lot of creativity on the spot also, by combining unexpected or unknown ingredients or by using other tools or ingredients than planned before."

- Participant L (Second cooking session)

"I focused on my cooking so I could not learn other people's cooking methods. If I could see their cooking process or discuss how to deal with utensils and ingredients with them, it would be better to remember recipes."

- Participant G (First cooking session)

- **Helping to get out of their comfort zone:** In the first session, most participants stuck to their knowledge and experience with tools, recipes, and ingredients while cooking. Moreover, they did not prefer to be in a team. It seemed that they wanted to share tasty meals with the best performance. It made them afraid to experiment. We ascertained that remaining within the comfort zone could be a hindrance to increasing dynamic interactions. To facilitate dynamic interactions, we established a rule to encourage participants to try a new experience in the second session. Before starting the session, we asked them to relinquish one ingredient or tool. In addition, they had to pair with another participant and cook together. As a result, they were more likely to manage with replaced ingredients than with tools. Making the pairs was effective although they selected a close colleague. In fact, teaming up with a peer helped encourage trying new things together.

"Cooperation is easy and feels natural."

- Participant S (Second cooking session)

"I held onto my cooking utensils that I know, no matter what ingredients I cook."

- Participant R (Second cooking session)

- **Providing environmental awareness with colour stickers:** This 'Protein Transition' project aims to create a better future, not only personally but also environmentally. There is a substantial gap between production and consumption in the food system. It has increased the ignorance of customers about 'true price' beyond consumer price. For example, pork is comparatively cheap in a supermarket. However, producing pork uses much environmental energy and resources at the production level. Moreover, the production process creates harmful pollutants to the environment. To help people know the true price, we tested with colour stickers to relay the message effectively. We realised it helped participants be aware of the true price.

"When adding ingredients, I was trying to consider green first, as red or yellow are colours that I subconsciously associate with stop/ danger."

- Participant R (Second cooking session)

- **Maintaining a stable context:** We explained why repetition of past practices is essential to keep learning new experiences. Thus, a stable context is a prerequisite to support the process (see Chapter 2.2). The first session team processed their cooking well in the familiar environment. As students, they lived in a similar condition and used similar tools, such as IKEA utensils. However, the second session members had a hard time by using the professional kitchen and giving up some of their tools. The professional kitchen was the RVO office canteen. Thus, they needed time to know how to use the different form of utensils and appliances. Moreover, some people could not use their utensils to cook because of the rule. It created a circumstantial instability. First, people could not perform their habitual practice in the cooking session. Second, they could not apply new action in their home kitchen, even if they learned something in the canteen.

"Great to see all of us working; at first it was a bit uncomfortable since it was a kitchen we were not used to, but we got the flow definitely."

- Participant L (Second cooking session)

After cooking, the participants including us enjoyed the meal together in both sessions. They felt happy about an accomplishment and sharing food with others. Perhaps, they knew about the project, and it led them to make more healthy and fresh food unconsciously. The dishes in the first session were similar by making the sauce and pouring it on rice. Only Korean participant made a sushi roll, and tofu salad and the others felt a big difference from Asian recipes. In the second session, more diverse meals featured, such as chicken salad, couscous salad, salmon steak, veggie falafel with a sauce and green bean soup. The interesting point was that one of the participants got interested veggie falafel and created a delicious meal which people liked. The falafel was an ingredient which was not on the participants' shopping list.

Even though we did not track their daily life, if there was a change in their routine, we could see that cooking sessions have much potential for change. The following findings emerged from their feedback:

- **People tried simple recipes or ingredients**: Participants shared information regarding where a specific ingredient could be acquired. After the first session, participant R visited a Turkish supermarket to purchase the same ingredient. Moreover, the recipe for tofu salad, which needs only soy sauce, sesame oil, chilli powder, and raw tofu, was shared through email. Thus, participant S attempted to prepare it. Some foodies who are enthusiastic about cooking tailored a recipe spontaneously.

"I will remember your dressing with the tofu. I never make tofu since I do not know what to do with it, and it appeared to be so simple but delicious."

-Participant L (Second cooking session)

"I will try to replicate M's sauce. The green accompaniment was so nice I'd like to try it with a little bit of roast garlic."

- Participant E (Second cooking session)

- **Most of the excitement and motivation faded within a few days**: They returned to their original eating patterns because of no reminders or recorded information. They struggled to be motivated and remember what they saw. Moreover, there was no practice or learning process regarding new recipes. It is true that only observing and watching each other does not help people to apply new actions further.

Overall, it was seen that cooking sessions have a high possibility to be a driving force, which makes people deviate from their routine and mingle with others to gain unusual experiences. If people in a session are from different cultural and professional backgrounds, it will amplify dynamic and exciting interactions.

"I was surprised by the ease with which we could make a well-balanced dinner by combining meals from so many different (national) kitchens."

- Participant S (Second cooking session)

"It is hard to believe that it is the first time in my life that I have ever tried it."

- Participant E (Second cooking session)

From our experiments, several points emerged that would improve further sessions:

- Cooking sessions need a new theme with an instruction to help people to experience new recipes systematically. It will enable people to move from their comfort zone and learn new things systematically. We already mentioned that apprenticeship

and mentoring are sufficient to acquire heuristic technique. Moreover, it would be good to encourage them to join cooking sessions with their family or friends to be comfortable. If there is too great a difference from what they used to, they will hesitate because of uncertainty and vulnerability.

- It would be important to maintain a balance between a stable context and new motivations. Based on the Kitchen-ing Loop, cooking sessions can be designed to provide motivation from new people and recipes and create a similar condition for adaptation with a setting of kitchen and the tools people brought.
- A simple device with colour coding can be useful to enhance people's environmental awareness.
- To maintain momentum towards a new habit, it is necessary to create a system that encourages people to repeat new practices in their kitchen. It should accumulate personal data, suggest customised exercise, and stimulate with feedback. Eventually, they will have more possibilities to transform new practices into daily practices.

4.2. Key insights

This project is about the transition of food consumption for a sustainable future. Based on the analysis of literature and methodologies, we finally designed an empirical system diagram for Protein Transition.

It was essential to first find commons and commoning for spatiotemporal scale (see Chapter 2.2.3.). Commons over the whole food area could be attributed to 'kitchen' and practices in the kitchen could be newly defined as 'kitchen-ing' as illustrated in Figure 21.

Next, we applied the thing-centred approach developed by Prof. Giaccardi to find explicit elements that might cause a change of habitual practices in everyday life. Those things were named 'kitchen tools'.

Finally, we could scale this data of factors to spread to all different levels of the system. By codifying vast amounts of information in a disciplined architecture, anyone will be able to use them efficiently (see Figure 22).

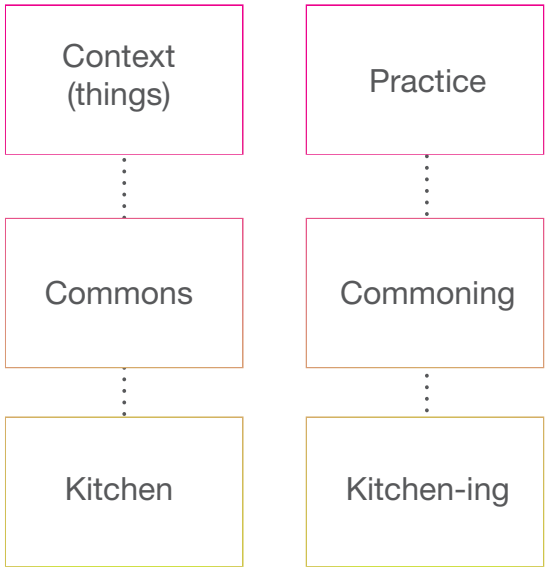


Figure 21. Correlation of new terminology with existing concept. (1-2-3 steps)

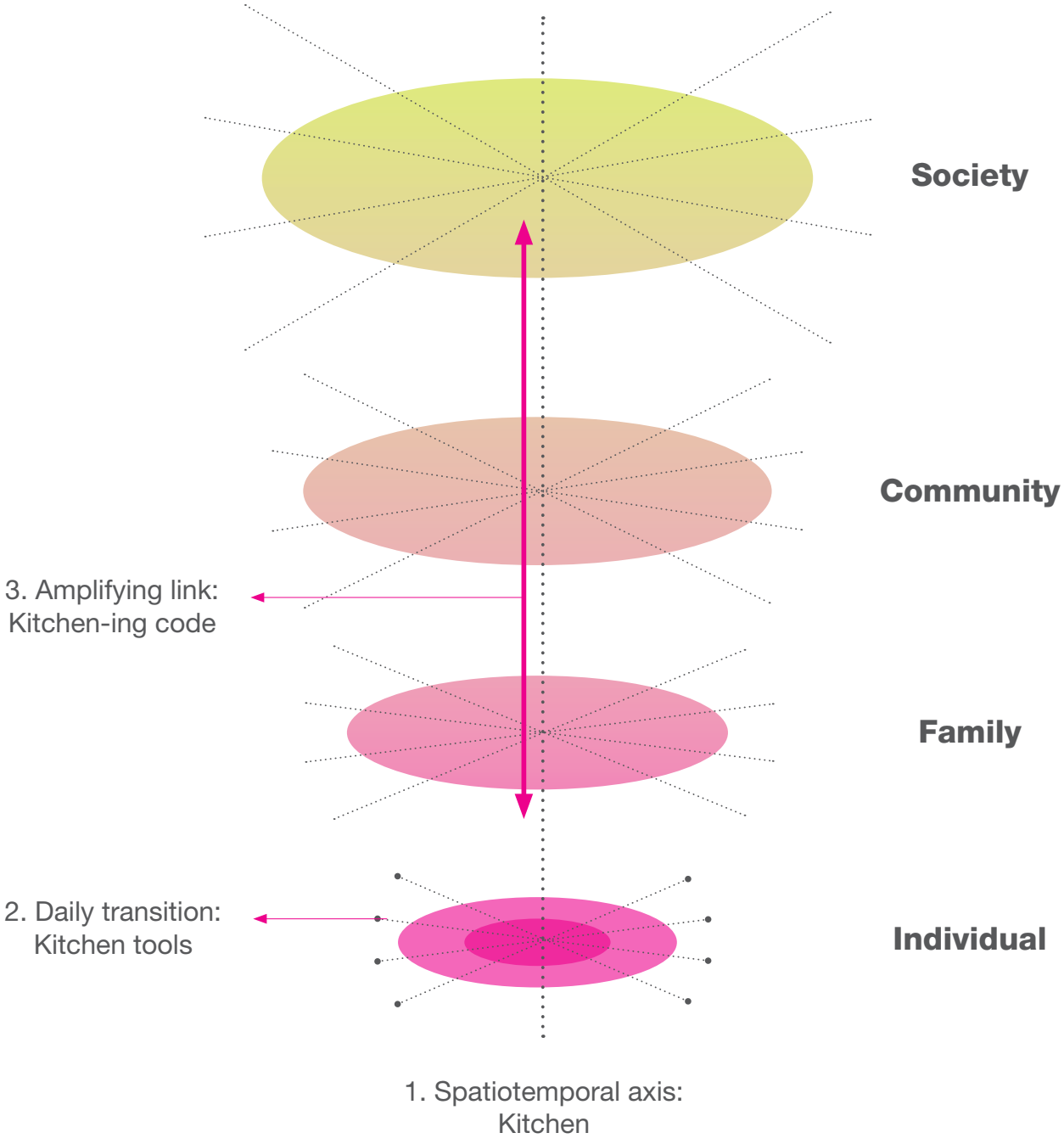


Figure 22. System diagram of Kitchen Concept for Protein Transition

4.2.1. Kitchen as spatio-temporal axis

Kitchens have changed functionally and semantically. The more technology has advanced, the more kitchens have been separated from the public place to become part of the individual's space. However, the function of 'commons' is still alive. In ancient times, after hunting, tribes would gather at a public area to eat and communicate by cooking together with fire. Nowadays, the kitchen is privatised and differentiated into various forms for home kitchens, restaurants, and hospitals. There are many different kinds of kitchens in which to eat, share, and serve food for yourself, family, and others. Even though kitchens are segmented for specific groups, there are common purposes: Profit (finance), People, Planet. These objectives create a common experience in cooking processes as described in Figure 23.

It demonstrates that kitchens play an essential role in the practice of 'commoning' (see Chapter 2.2.3). For example, people shared a kitchen with their parents and developed their eating habits and cooking skills. Additionally, they may have spent time with their grandparents and learned family history and tradition. In addition, they sometimes have the opportunity to cook with diverse friends from different nationalities. Thus, they can learn cultural differences. After starting a family, people are integrated and form independent cultures in their families. In fact, kitchens are a controllable environment for individuals. For example, people can immediately make their own decision to reduce food waste or packaging. They directly influence their own kitchens. Thus, the kitchen and the kitchen-ing have value for being the commons and commoning.

Based on previous interviews (see Chapter 4.1.1), this study clarified the meaning of 'kitchen' as follows:

- **There are various foods from many different kitchens that people can experience in everyday life.** In fact, the kitchens are the final step in determining what food people eat. Those can be a home kitchen, a restaurant, a canteen, or a delivery service. The kitchens are selected depending on time (breakfast/lunch/dinner and week/weekend) and occasions (being busy, doing business, socialising).
- **A kitchen contains at least one of the following elements:** storage, cooking area, or tables. We determined that a kitchen plays a vital role as a hub to store, prepare and cook, and interact with others. From a things perspective, storage includes cabinets, racks, and a refrigerator for ingredients and tools. In addition, the cooking area is for cooking practices with kitchen appliances and utensils. Tables create an atmosphere in which to talk with family, friends, and guests.
- **A place to do certain actions to change their circumstance:** eating better food, saving resource and energy, and recycling, In fact, a kitchen is the unique space that enables people to consume external energy and resources and create something with internal resources in their everyday life.

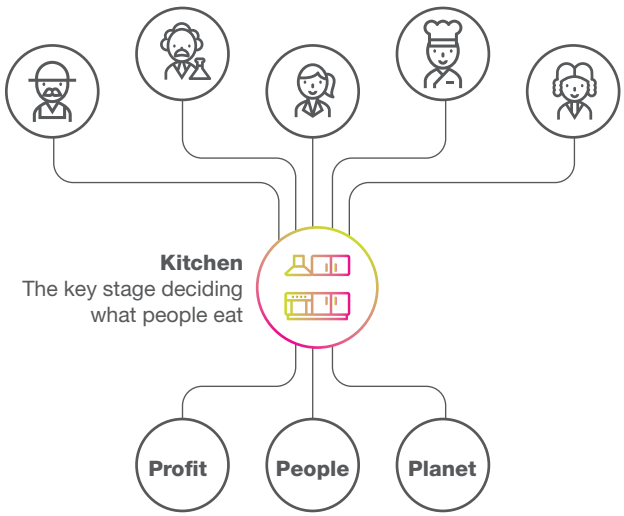


Figure 23. Kitchen Concept

4.2.2. Kitchen tools for daily transition

If we seek the agentic things in the kitchen context, kitchen tools would be not only non-human things – utensils, appliances, ingredients – but also human things, such as family, friends, guests, and customers. This research refers to them as kitchen tools, which mainly reflects personal practices and values in the kitchen (see Chapter 4.1.). These determine the scope of human activities by giving motivations to acquire skills and techniques. The intention can be of themselves (self-discipline, caring and affection, and satisfaction) or the environment (efficiency, convenience, reliability, economic situation, and regulation). The skills can be learned through apprenticeship and mentoring. For instance, there is a pan that a student usually uses, as shown in Figure 24.

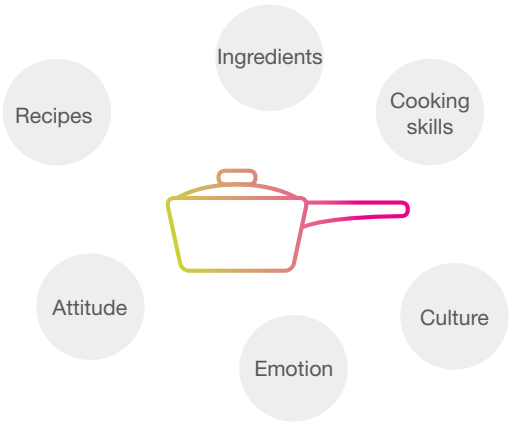


Figure 24. A agentic thing showing practices and values

The pan reminds him of usual ingredients, such as zucchini, mushroom, and onion. His frying skill might have been acquired in the past by observing how his mother cooks. This practice has subtly changed by leaning on new recipes he wants to try. Moreover, in addition to these associations, the tool also represents complex emotions and an attitude, such as being in a hurry, trying to make something quickly, and feeling guilty because of unhealthy food.

4.2.3. Codification to amplify changes

Daniel Chandler (2002) explains that code is a dynamic system of rules changing over time, historically and socio-culturally. Additionally, codification is a process to establish conventions. Precisely, it is mainly recognised that processing knowledge to information is achieved by codification, such as word, image, and sound. For example, language is one of the fundamental codes of the human societal system. Human-beings have been creating texts of visible and invisible social context to communicate experiences.

Knowledge codification can be a disruptive process to convert knowledge into information in the aspect of economics. The codification process requires an initial significant investment. The fixed cost enables the users, such as producers, mediators, and consumers, to use the extensive information at significantly low costs (Cowan & Foray 1997). This is the specific benefit of codification for amplifying changes.

> In a general sense, codification reduces the costs and improves the reliability of information storage and recall. Provided the media remain readable, and the language is not forgotten, in principle the knowledge can be stored and retrieved indefinitely. Many aspects of knowledge acquisition—transport and transfer, reproduction, storage, and even access and search—are all functions the costs of which fall dramatically with codification.
>
> (Cowan & Foray,1997, p.2)

Moreover, it leads the speeding-up of knowledge creation, innovation, and economic growth (Cohendet & Edward Steinmueller, 2000). To apply the nature of knowledge codification in this research, we examine the process of knowledge codification further. Cowan and Foray (1997) insist that the process consists of a three-step phase of creation:

1. Creation of models
2. Creation of language
3. Creation of messages

The phase of modelling knowledge means knowledge creation. An irreversible and partial transformation from tacit knowledge to codified knowledge occurs in this step. In the process of transforming, unarticulated and intuitive knowledge is divided and captured to create specific and determinative knowledge. Next, the Infrastructural development comprises language creation. Diverse languages are created depending on the types of expertise. After developing languages, explicit messages can be generated. Finally, knowledge is reconstructed as information. By doing so, a clique community can read and share the codified knowledge. In this sense, we realised that the Cowan and Foray process of knowledge codification was already used in our research (see Chapter 4.1). For instance, there is a process inherent in cooking a recipe. The consecutive practices during cooking can be subdivided into ingredients, tools, monotonous practices, and intentions. With the codified components, the combination of them becomes a written recipe. By doing so, the recipe enables people to repeat and share the information at different levels of the food system.

4.3. Additional findings

Moreover, a cooking session is practical for several reasons. It helps people to discover new things, learn an educational message, co-practice through trial and error, and socialise with others. Unlike existing services, which depend on online application, it can give rise to real actions for a change beyond awareness. The existing services often use notifications for automatic suggestions. The problem is that people hardly follow the recommendations if they do not put in significant attention and effort (see Figure 25).

To create practice repetition, it is important to check whether the context of the private kitchen can embody the cooking session. The context depends on kitchen tools and personal preference. For example, a woman learned how to cook a roast chicken in a cooking session. If she does not have an oven, it would be difficult for her to practice the recipe. A similarity between the two settings increases the possibility of dietary changes.

Lastly, it is necessary to create a system that can measure a degree of change and encourage people to repeat new practices in their kitchen. By tracking and analysing personal data, the system is able to suggest customised activities. Thus, people can maintain momentum toward a new habit.

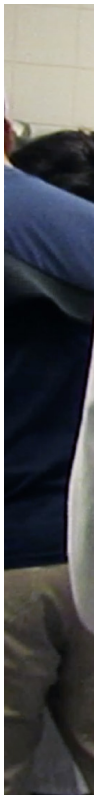


Figure 25. Dynamic interaction during the cooking sessions

5. Vision and proposition

5.1. Vision

After the research phase, we set out the following vision to further the concept design.

"I want to seek a possibility of change in consumer values and practices from kitchens by helping them to reconfigure familiar things effortlessly."

This study focuses on the individual kitchen for the improved future of food consumption. 'Kitchens' are the most common and desirable environment to create new habitual practices. Particularly, 'kitchen tools' are crucial to determining possibility for change by tracking routines. The changes might happen relatively 'effortlessly' because of familiar context and tailored motive (see Chapter 4.2.).

To achieve this vision, we designed 'Kitchen-ing Loop', 'and 'Kitchen-ing Codebook' and evaluated them to determine feasibility and viability.

5.2 Kitchen-ing Loop

We developed the process of eating habit formation as a continuous and iterative loop, the Kitchen-ing Loop (see Figure 26). Based on the key insights in the previous chapter, this circle has been developed as a framework for knowledge codification in parallel with a process of a habit formation. In this sense, 'motivator' and 'continuer' have a close relationship with 'codified knowledge'. These terms include the following features: explicit, articulable, and shareable.

On the other hand, 'adaptation' and 'assimilation' are close to tacit knowledge. Thus, they are ambiguous and inarticulable. Their main feature is a transmission in the form of experience instead of information. This loop is desirable for acquisitions of both codified and tacit knowledge. Kitchen-ing Loop proceeds with optimised cooking sessions and a supporting service platform.

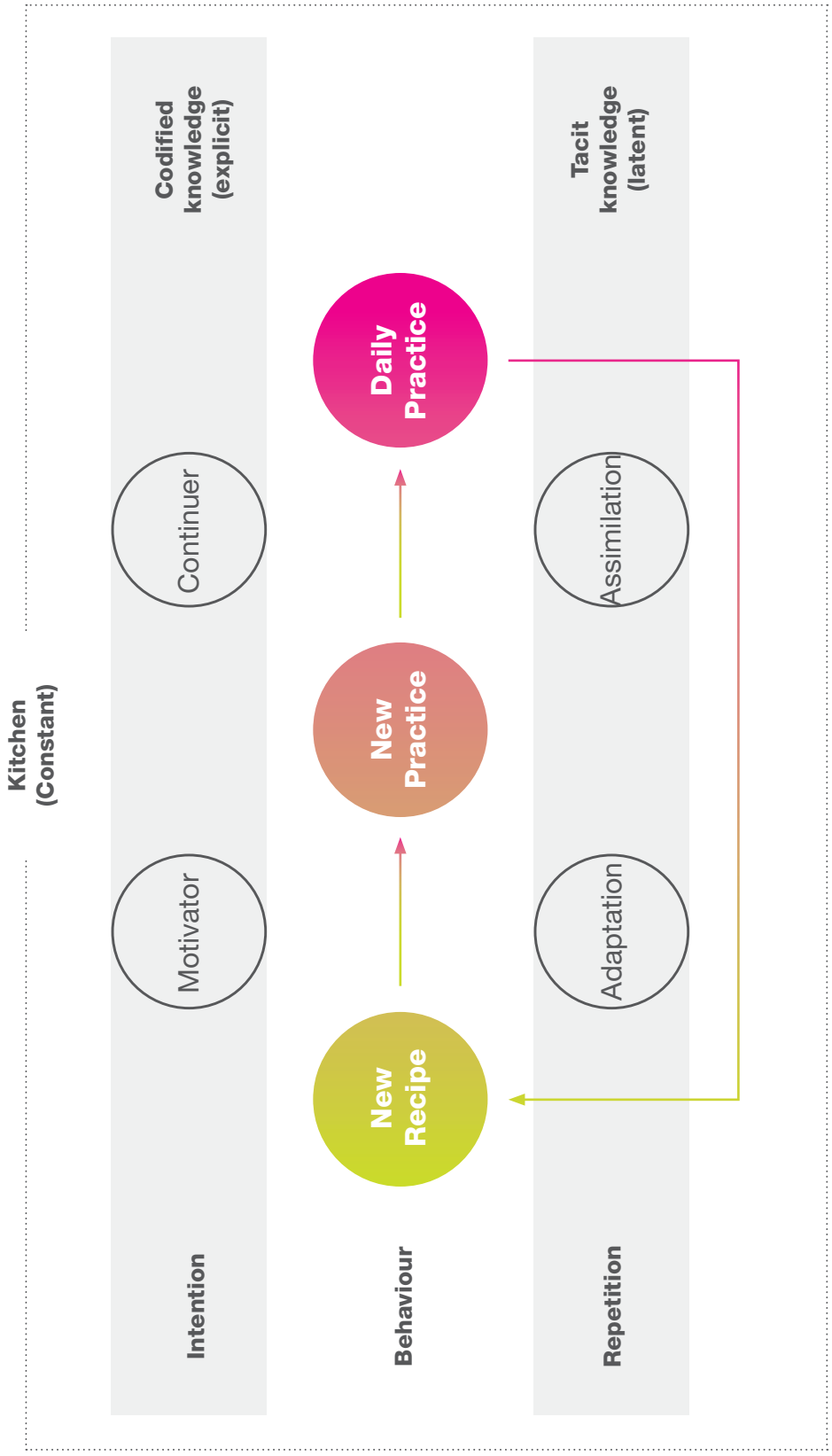


Figure 26. Kitchen-ing Loop

5.3. Cooking Session

Nowadays, all knowledge and information is linked to (personal) devices such as computers, mobile phones, etc. on an Internet of Things basis. This makes information easily accessible at any place at any time. But also, it enables the service providers to acquire vast amounts of detailed usage data that was not possible before. Many companies have developed technologies that can recommend new information based on this data. Our behaviour and preferences greatly dictate the recommendations we receive from services such as YouTube, Spotify, Facebook, and Netflix.

Thanks the previous examples, people are now accustomed to automatic recommendation systems to explore new TV series, music and also food recipes. This works great for passively consuming information as a user, but more is required to drive action and behavioral change in the kitchen. This is largely because of the discrepancy between the available kitchen appliances, tools and skills of the viewer and the creator of the recipe. No service has yet bridged this gap.

For example, many people can watch Jamie Oliver's cooking show on how to prepare lobster, without ever having it done themselves. a. Only a few will follow through and give it an attempt. The unfamiliarity with ingredients and tools are too large to overcome without the right motivation or guidance. Not everyone has pan big enough to boil a whole lobster in or knows where to buy a live lobster. And killing a lobster with a chef's knife can be very different in real life from watching it on video.

Still, we strive to help people change their behaviour by stepping out of their comfort zone. Thus, we need to add cooking sessions as part of our concept. First, because behavioural change is effective through learning and experience. Cooking sessions will enlighten people regarding new recipes by teaching them the necessary skills through smell, taste, hearing, and touch.

Second, the cooking session recipes can be cooked at home. Accessibility is a key factor, so the limitations of the users' kitchen and skills will be taken into account.

Data-based recommendation systems can have a disadvantage. It is likely to make people trapped in their own comfort zone. For example, If a person likes rock music, and only listens to rock music every day, the recommendation system will keep recommending him other rock music. And not a different genre.

However, cooking sessions in this research will recommend new ingredients and skills. It's recommendation system is not optimized to predict the users' favorite recipes, but to predict the recipes that are most likely to succeed in creating behavioral change. For this it will combine personal data and preferences with all the available general data. Thus, it creates an achievable challenge for individuals and helps them to expand their food experience.

5.4. Kitchen-ing Codebook

Ultimately, this project aims to design an open platform that enables economic agents to intervene and a myriad users to communicate essential information. As mentioned, there are two kinds of knowledge: codified knowledge and tacit knowledge. Here Cowan, David, and Foray (2000) classified the types of knowledge in more detail, as shown in Figure 27. The vertical axis means the range of codification: codified, partially codified, and uncodified. On the other hand, the horizontal axis means the range of manifestness of knowledge: Manifest, Alluded to, and Latent. We focus on the Manifest column regarding economic benefit and efficiency. The researchers insist Alluded to and Latent columns are likely to be very costly and inefficient to maintain tacitness of knowledge.

In the Manifest column, the codified-manifest case is likely to generate codes. These codes create contents and draw upon the pre-existing contents of 'Codebook'. The codebook is a metaphorical term to show two aspects:

- Dictionary aspect: large storage to stabilise codes.
- Document aspect: the rapid creation of codes in a certain structure.

Although tacit knowledge cannot readily be codified, the uncodified-manifest case can be codifiable. This case requires experience-oriented communication such as apprenticeship and expertise within a guild-like association. Thus, some uncodified knowledge might be added to the Codebook (Cowan et al., 2000; Cohendet & Edward Steinmueller, 2000).

In conclusion, criteria are required for this project to design 'Kitchen-ing Loop','cooking sessions' and 'Kitchen-ing Codebook'.

- Defining roles of cooking sessions and Kitchen-ing Codebook to clarify Kitchen-ing Loop (Modelling).
- Designing cooking sessions and Kitchen-ing Codebook to support the Kitchen-ing Loop (Implementing).
- Creating a business model by involving benefit and cost of stakeholders (Sustaining).

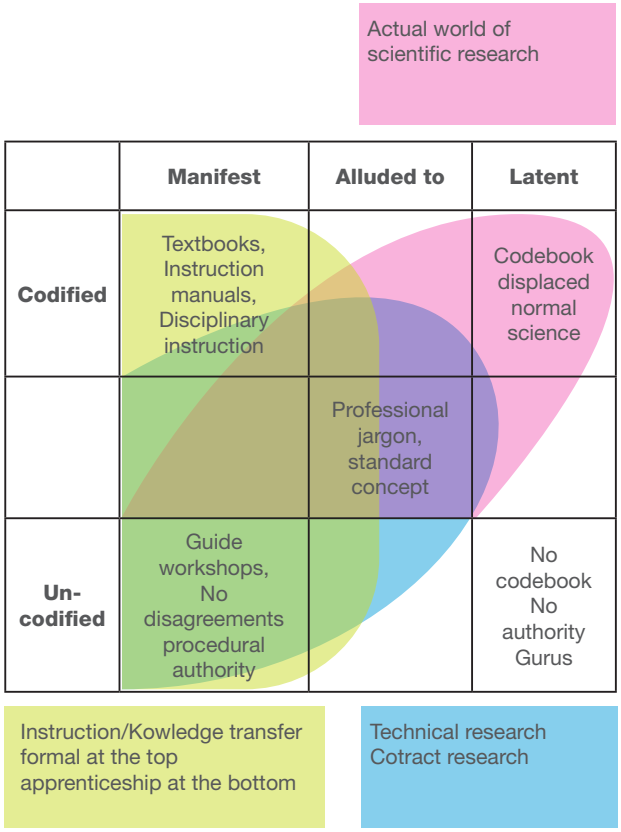


Figure 27. Classification of knowledge and knowledge generation on two axes by Cowan et al.(2000)

6. Concept Design

6.1. Roles of cooking sessions and Kitchen-ing Codebook

From the research phase, we could determine the criteria to create desirable cooking sessions and the Kitchen-ing Codebook (see Figure 28). Firstly, the role of cooking sessions is to help individuals move from their comfort zone to an optimal performance zone. White (2009) demonstrates some requirements for this movement. It is essential to offer a clear goal and a solid methodology (guideline). It should encourage building confidence and include monitoring their performance.
Secondly, the Kitchen-ing Codebook needs to govern new practices to fit in their daily lives. It must facilitate collecting individual-level data, suggest desirable cooking sessions for changes, and optimise the challengeable changes to increase feasibility. Finally, The changes become part of their everyday life.

Unlike existing services, cooking sessions and the Kitchen-ing Codebook will create more chances to trigger actions for a change beyond awareness. The existing services offer notifications to trigger users. The problem is that people hardly follow the recipes. These require people to put a lot of attention and effort. For example, many TV shows of famous chefs often introduce unfamiliar recipes which are difficult to cook every day.

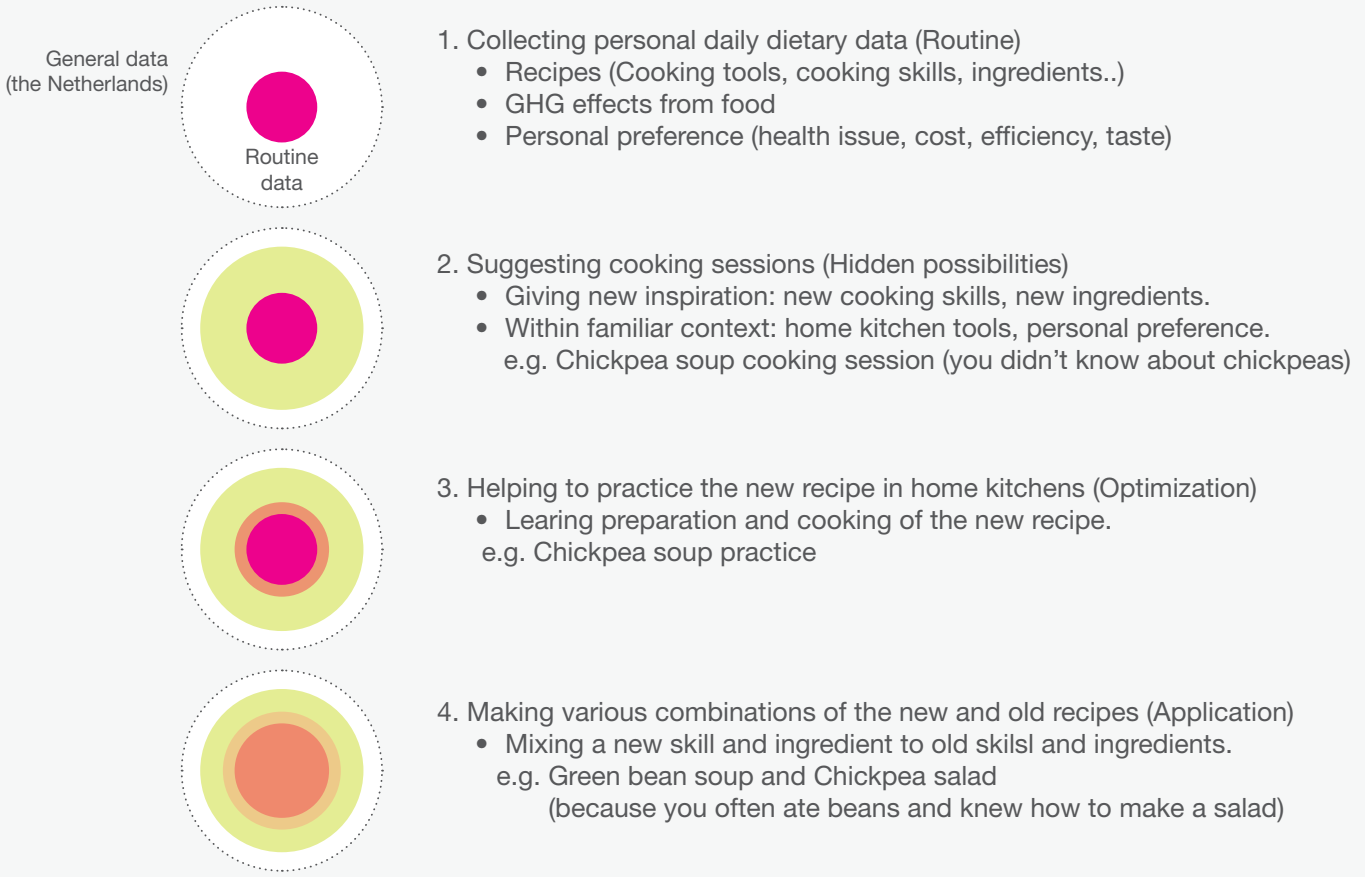


Figure 28. Dietary change with cooking sessions and Kitchen-ing Codebook

6.1.1. Cooking sessions

- The integral system (cooking sessions and Kitchen-ing Codebook) links the hidden opportunities to cooking sessions that will be held within 4-5 days. Users can transform the opportunities in the sharing mode. For instance, a mother wants to join a cooking session with her daughter. It is possible to determine overlapping opportunities.
- Then, it provides detailed information about the cooking sessions. For instance, the rate of dietary change, the location, date and time, the organiser, neighbours who join the class, the recipe, and so on. The cooking sessions will take place in the nearby district such as restaurants, supermarkets and schools.
- Users will be motivated through hands-on experience. They will smell, taste and touch. The guided practice encourage them to acquire new skills. In addition, they share unexpected knowledge and skills with others. These activities can be shared with their family and friends.

6.1.2. Kitchen-ing Codebook

- The integral system first looks into Users' kitchens and recognizes their kitchen tools. Interestingly, each kitchen tool represents a possibility of what users can cook. In this sense, it automatically calculates what kind of food people can make with their tools. Personal preference such as health, taste, costs, and efficiency are also taken into account; these can be set by the user. The system then uses an algorithm to find out hidden opportunities that have the highest chance of making an eating habit change as shown in Figure 29.
- Each opportunity is estimated as 'change %.' The % is an integrated unit that shows how much of preparing a certain meal is new (Skill, Ingredients, Green effect) compared to your routine (tools, preference) . For example, there are two options, Asian noodles and salmon steak. For an average Dutch person, cooking Asian noodles might have an increased rate of change. Because to make the Asian noodles, the person needs to have Asian sauces, a frying skill for noodles, and a wok. With the rate of change, The integral service sets personal objectives and provides direct feedback. It becomes a momentum to encourage people to try more new recipes.
- After a cooking session, the automatic recommender service helps you to keep practicing by giving an optimized suggestion. For instance, it recommends the closest supermarket for new ingredients, selects necessary tools you have and shows the new recipe. Furthermore, the algorithm calculates additional recipes that combine the newly acquired recipes and skills with old recipes that were already known.

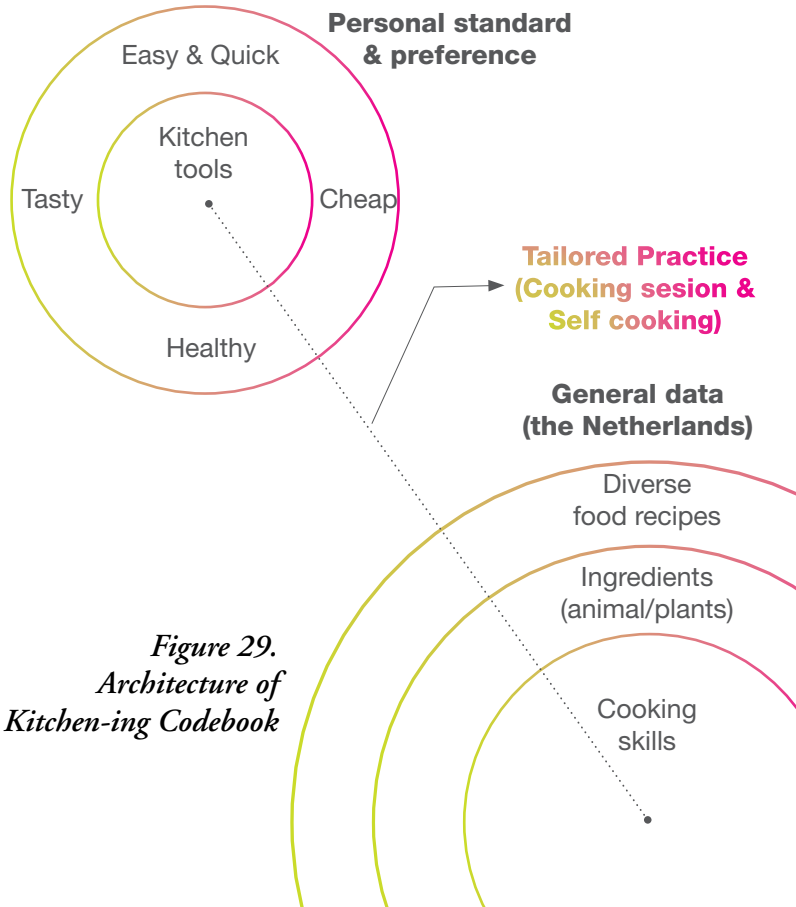


Figure 29. Architecture of Kitchen-ing Codebook

6.2. An open platform

The key concept is an open data platform for smart cooking. The open platform system is able to embody the two essential elements (cooking sessions and Kitchen-ing Codebook) of the Kitchen-ing Loop.

The term of open platforms stemmed from platform-mediated networks. Eisenmann, Parker and Van Alstyne, (2009) demonstrates that platform-mediated networks entail four distinct roles (see Figure 30) :

- Demand-side platform users, usually called 'end users.'
- Supply-side platform users, who offer complements to the end users.
- Platform providers, who serve as users' primary point of contact with the platform. They supply its components and create its rules.
- Platform sponsors, who exercise property rights and are responsible for determining who may participate in a platform-mediated network and for developing its technology. They design the components and rules.

In general, each of these roles may be open or closed on a given platform. The term 'an open platform' cannot exactly refer to our concept. However, we named our concept as an open platform, meaning that the demand and supply roles are open. Hence, all users can be both consumers and suppliers.

A platform can be governed by single or multiple firms who are in charge of provider or sponsor role. For our concept, a licensing model, a single company sponsor and multiple providers, is appropriate. First, licensees may have unique capabilities to create platform varieties fitting users' diverse needs. Second, a sponsor can utilize partners' marketing to promote platform adoption. Lastly, Customers can force the sponsor to reduce vulnerability to hold up and supply interruptions while insisting upon a second source of supply (Eisenmann et al., 2009)

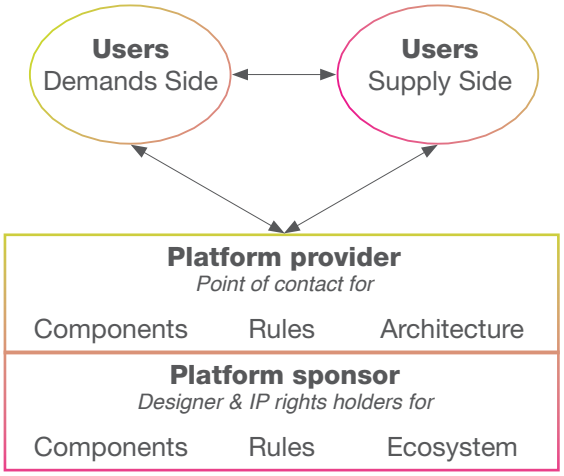


Figure 30. Elements of a Platform-Mediated Network by Eisenmann et al., 2009

6.2.1. Values for individuals, public sectors, industries

Based on a licensing model, we determined four key roles who need to be in our platform.
Demand-side platform users: Individuals who use our service
Supply-side platform users: Food industry, suppliers and partners.
Platform providers: A board of directors including public and scientific sectors, profit and nonprofit entrepreneurs.
Platform sponsors: An IT company monitored by the board of directors

The public sector can have more authority to make a rule. Then, the public and alliance like- private sectors collaborate to generate right components. For example, they can push green protein products in the platform. It will

help to improve personal health and expand the food market with new products. On the given platform, both users will use the updated components and give responses with two-sided networks.

6.2.2. Data collection and recommender system

Image Recognition

Data about kitchen utensils and food can be collected and analysed in the form of images. The technology of computer vision is instrumental for this. Computer vision tasks include methods for acquiring, processing, analyzing and understanding digital images, and extraction of high-dimensional data from the real world in order to produce numerical or symbolic information, e.g., in the forms of decisions (Klette, 2014).

For the new concept app, this technology can be used for identifying the food items and kitchen tools from an image. That is, the user can take the image of a pan from his or her kitchen, and the technology should be able to recognize that it's a pan, and send this information to the central database for further action. Similarly, images of food items can also be analysed.

To implement this, various APIs (Application Programming Interfaces) exist in the market, and depending on the organization's resources, new APIs can also be developed. These tools have the benefit that they get better (i.e., more accurate) as more and more images are loaded and processed. Some of the popular APIs are Clarifai as well as Amazon Rekognition. The accuracy of these systems can be up to 94% (Simon & Barbara, 2017), with more images contributing to better accuracy. There are already apps like Fodo and Calorie Mama which analyse food images to identify them and their ingredients.
Google Cloud API can also give great results with images. We took two examples of images to test this API (see Figure 31).

neonbrand-335257-unsplash.jpg

Cup	90%
Cup	86%
Coffee Cup	86%
Still Life Photography	59%
Drink	54%
Drinkware	52%

roberta-sorge-125549-unsplash.jpg

Strawberry	98%
Strawberries	97%
Fruit	94%
Natural Foods	83%
Produce	72%
Food	71%
Still Life Photography	70%
Superfood	65%

Figure 31. Results of Google's image analysis with a tool and food
- Cup, 90% accuracy
- Strawberry, 98% accuracy

Recommender systems

Based on a person's existing choices, new food recipes can be recommended. Recommender Systems are software tools and techniques providing suggestions for items to be of use to a user (Ricci, Rokach & Shapira, 2011). The popular e-commerce site Amazon used recommender systems to personalize it's online store for each user (Liu & Shih, 2005). Similarly, other internet sites like YouTube, Netflix, Tripadvisor, and IMDb use recommender systems (Ricci et al., 2011).

With this new app, we can implement recommender systems to understand the food choices of the user and find what else might fit their preferences and needs, based on their current food choices and preferences.

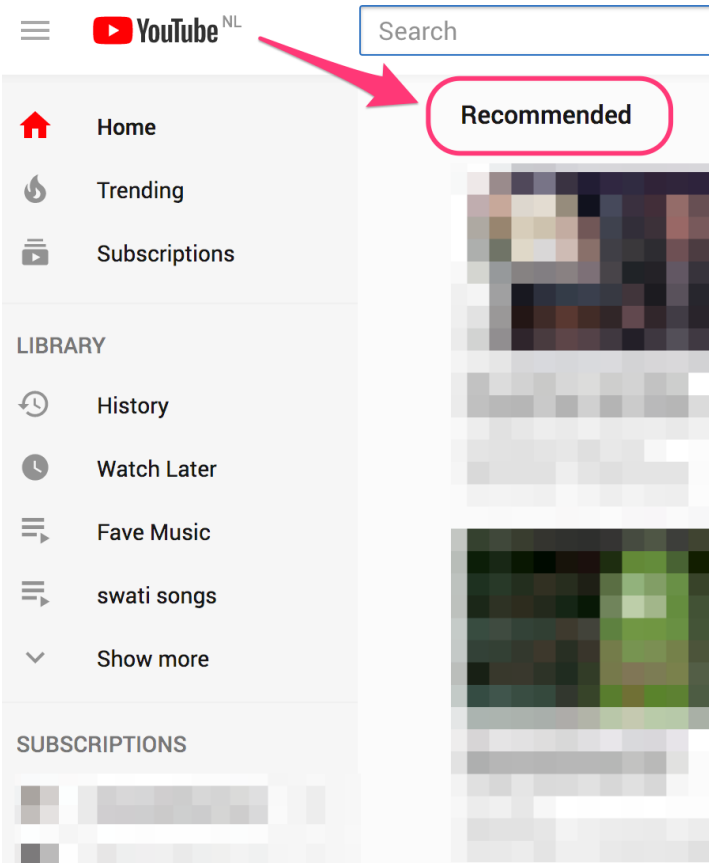


Figure 32. Youtube home page showing recommended videos based on a viewer's past viewing behavior

6.3. Final concept: Eat.Q

This chapter described how the concept can be communicated in the current market. First, a differentiated value of this concept was determined for the current market. Then, a positioning matrix was used to explain the value. We also defined initial target groups and explained how it can add value to them through a user scenario

6.3.1. Eat.Q

Brand

'Eat.Q' is named for the final concept. This name was chosen because it entails the follow meanings:

- Smart choice
- Meaning of cooking and eating
- An individual indicator showing a rate of change (%)

It can be compared with IQ and EQ. These indicators were made to try a scoring individual intelligence and emotion. The name 'Eat.Q' can be described as a indicator for scoring individual eating behaviour likewise. However, IQ and EQ usually focus on demonstrating current personal condition.This indicator can determine expected future conditions and stimulate users to improve their Eat.Q.

When considering the logo, the key point was to communicate 'sustainability'. Thus the green colour part of the logo speaks for sustainability. Ultimately, Eat.Q is expected to consist of a mobile service and a physical item embedding

Internet of Thing (IoT) technology. When Eat.Q becomes in the implementation stage, simplifying the logo as 'Q' in the green colour circle will be useful. The symbolized logo can be appropriate as an app icon. In the next stage, we considered that the item might be designed as a dial shape. In this sense, the physical item can be communicated easily because the 'Q' symbol looks like a dial.

Representative & symbol logos

Eat.Q

Mobile application

Eat.Q dial

Current status:
17% change (achievement)
Now, eating more animal-based diet

Cooking sessions & home cooking for a new recipes

Value Proposition

Format from Crossing the Chasm (Moore, 2002)

1. For (target customers)
2. Who are dissatisfied with (the current market alternative)
3. Our product is a (new product category)
4. That provides (key problem-solving capability).
5. Unlike (the product alternative),
6. Our product (describe the key product features).

"**For people** *who want to eat healthier, tastier, and smarter*
And are not satisfied with *current methods of changing food habits*
Eat. Q is an integrated service
That provides *ways to integrate healthy eating habits into daily life*
Unlike *other services which fail to create permanent change*
Eat Q helps people gain better eating habits effortlessly."

Problem:
People want to eat healthy, but they give in to temptation. They try various solutions to change their behavior, but nothing really sticks. They feel worse and sometimes blame themselves.Current food apps do not offer a strong path to long lasting behavior change.

Solution:
What if there was a service which could actually change their behavior for better eating habits? Eat. Q is here. It considers their resources in the kitchen, their food preferences, as well as their context and uses technology to suggest solutions - so they can adopt healthy eating habits effortlessly.

Figure 33. Positioning of Eat.Q in food recipe service market

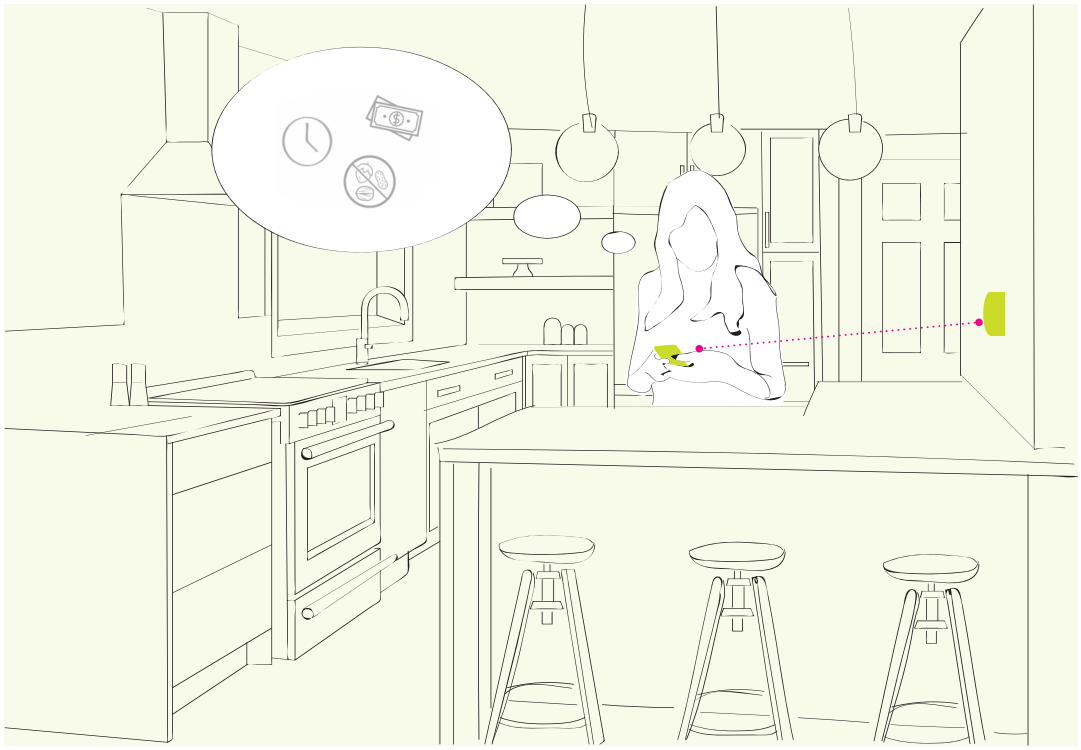
6.3.2. Target

Eat.Q is suited for everyone that buys and prepares his or her own food. The application can vary from parents who want to feed their children a balanced diet to students who love to get a new experience via dishes from other cultures. Another example can be patients who have specific dietary needs.

Like other apps, Eat.Q will be introduced through online channels such as App Store and the Play Store. Furthermore, the app will be promoted via social media such as Facebook and Instagram. In addition, this service is giving optimized recipes for everyone. Thus, this service can collaborate with schools, hospitals, gym and NGO organization.

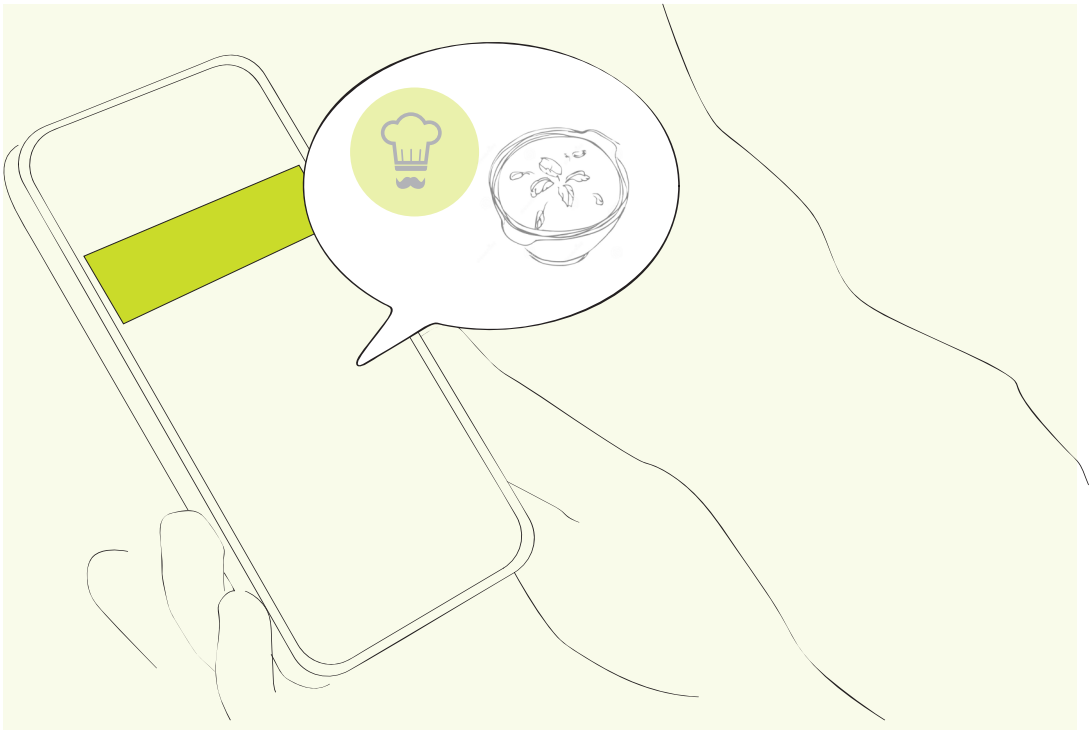
6.3.3. User scenario

To give a clear picture of this concept, we developed a user scenario of a young family user. The story is about Susan (mother) and Sophia (daughter).

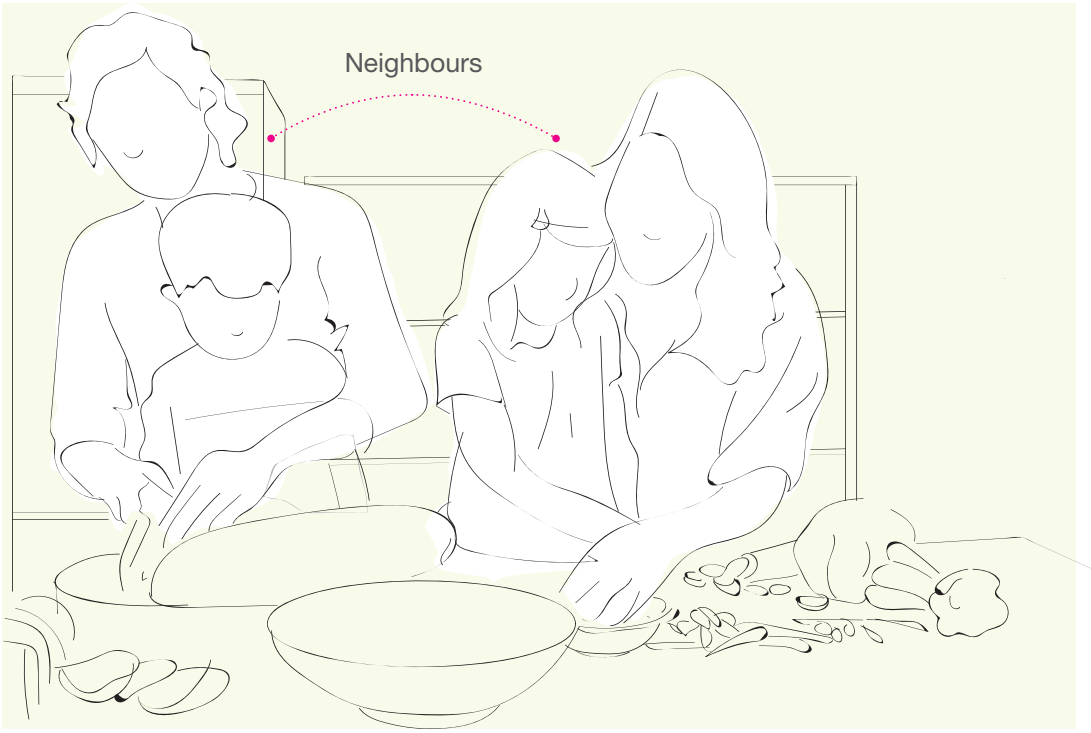


Susan decided to use Eat.Q for her family. So, she first followed the instruction of this app to set her preference. She also considered some options for her daughter who is allergic to peanuts.

After that, Eat.Q guided her to use image recognition option to check her kitchen context (kitchen tools).



They love to cook chickpeas and lentil to make a salad at home. Eat.Q realized they never tried quinoa before and recommended some cooking sessions which will be held on this weekend. They decided to go a cooking session for 'lentil soup mixing with chickpeas and quinoa'.



The cooking session is organized by the famous chef's restaurant in their district. She finds that her neighbours will join too.

Susan and Sophia will practice the new recipe at home. Maybe Susan will try to make another soup with ingredients that she usually uses.

In next step, Eat.Q will recommend integrated recipes such as quinoa salad. Because she often makes a salad and now she can combine the new ingredient, quinoa, in her old recipes.

6.4. Implementation and stakeholders

Since the app is based on an open platform, the success of Eat.Q depends on how to leverage different interests of key stakeholders (see Chapter 6.2). This chapter describes who should be involved to make this business sustainable. This stakeholder map was for the Netherland case. Figure 34 illustrates benefits and costs from each side.

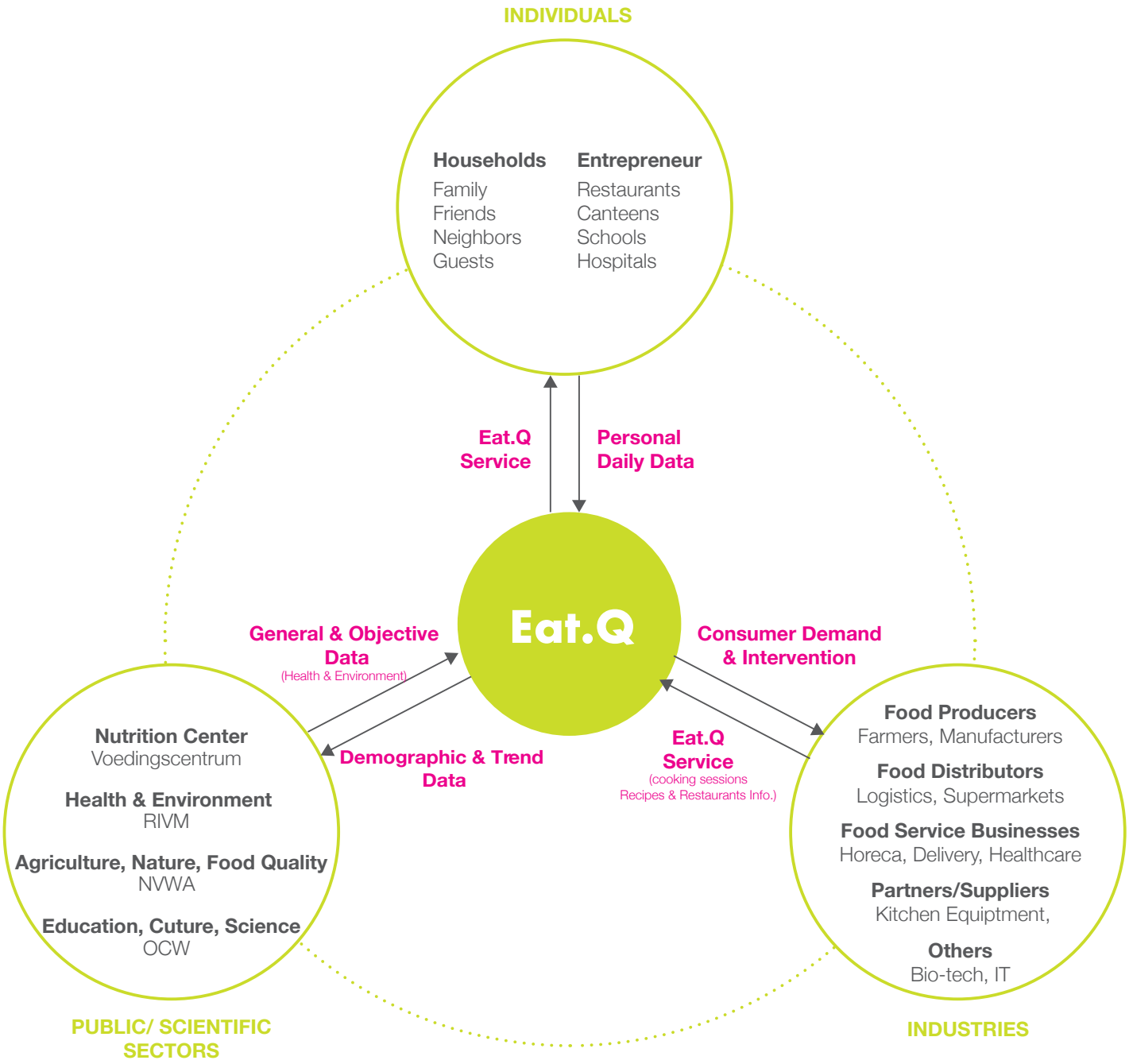


Figure 34. Stakeholder map of Eat.Q

Figure 35. Discussion about Eat.Q stakeholders with RVO colleagues

7. Discussion

7.1. Evaluation

During the project, we conducted several empirical tests and developed a final concept based on our vision and proposition (see Chapter 5). Ultimately, we thought of a concept as an open platform. Well known open platforms are Google and Facebook. These existing systems have verified that everyone can be both a provider and a consumer at the same time.

Users form massive networks on these platforms. Together they generate value by creating and consuming content and providing large amounts of user data. Other stakeholders in these platforms are greatly interested in this data, mainly for commercial purposes. To formulate a successful platform, it is significant to involve proper stakeholders to substantialize this idea. This chapter 7 demonstrates that how the evaluation was carried out through stakeholders' interview.

7.1.1 Stakeholder feedback

Goal

We conducted six interviews with different stakeholders. All are Dutch and work in the public, scientific or food industry sector. We focused on the potential initiators for implementing the Eat.Q service. Through the interviews, we determined what the strengths and weaknesses of this service are from their perspectives. While also analyzing how it can be made more desirable, viable and feasible.

Method

Participants (see Table 5)

	Initial	Company/ Expertise	Sector
1	D	RVO (Topsector Creative Industries)	Public/ scientific sectors
2	F	RVO (Agricultural information & Blockchain)	
3	N	National Institute for Public Health and Environment (Environmental impact, food consumption of the Netherlands)	
4	L		
5	C	The Netherlands Nutrition Center Foundation (Knowledge specialist of sustainable food)	
6	B	Plus Supermarket (Owner of PLUS Rozenburg supermarket)	Industry sectors
7	M	Restaurant (Chef, an experience at Michelin-starred restaurants)	
8	S	Farmer & RVO (Organic meat producer)	

Table 5. Participants of evaluation interview

Procedure

We emailed the participants a summary about the Eat.Q concept and the expected questions beforehand (see Appendix F, G). During the interviews, we explained the concept in detail together with a diagram which shows different interests between diverse stakeholders (see Figure 34). After that, we asked the following questions:

- How do you think about the concept? (opportunities/challenges)
- When you see the stakeholder map, where do you think you (your company) are located?
- What can be the benefit/cost from your side?
- If we make it more feasible, viable and desirable, what elements should be changed/added/removed? You can create a new stakeholder map in the empty one.
- If Eat.Q becomes a real business, who do you think is the best player for running the business?

For the fourth question, we prepared an empty paper and post-its. Participants were asked to choose to either draw a new map or put the post-it on the original map (see Appendix H). We met the six participants in their office while using facetime for two. All conversations were voice recorded.

7.1.2. Key insights

When we explained the concept, participants understood it well. They also imagined the implementation of the idea and were curious about how this concept can be materialized. For example, they wanted to know more about how to make a profit out of the Eat.Q service and how much data collecting tech and recommender system have already been developed. Those questions were useful points to improve the conceptual idea. Moreover, participants pointed out some critical insights about each question.

How do you think about the concept? (opportunities/challenges)

Eat.Q starts examining their familiar context and tries to find hidden opportunities to suggest new recipes. Participants said that this is the core competency of the concept. By giving personalized suggestion, users can explore new ingredients in an easy way. Thus, it provides the highest chance of changing their eating habit.

Stepping out of the comfort zone

Participants gave some specific examples how it can help them to get out of their comfort zone and to try new things. They said everyone has a willingness to improve their meal, but it is hard to find the right recipes considering their circumstances. One participant insisted many cookbooks show high standard and fancy recipes which are hard to cook every day. They believed the Eat.Q service can easily motivate them to cook by adding value in their life as follows:

- It is efficient because users don't need to buy special tools and unfamiliar ingredients which might be used only once.
- Everything will happen within their living area. They can buy ingredients from a supermarket nearby and can join a cooking session in their neighbourhood.
- Diverse and balanced food will prevent users from getting sick.
- Diverse food experience will help children to form a proper eating habit.
- Low income and low educated people can have more possibilities to eat healthier.

Importance of cooking sessions

Most agreed on the importance of the cooking sessions despite the fact that people are likely to stay in their comfort zone. One participants who is a professional cook noted that people have to be in the kitchen to learn how to cook for various reasons:

- Users can be fully motivated by smelling,

tasting, touching and they then realise it is not hard to prepare.
- Users can learn about hidden costs and efforts beyond a consumer price. For example, people realise that a price of a hamburger should not be too cheap when they try to make the burger by themselves.
- The young generation will experience various things in the kitchen.

Collective impact in society
Participants expected that Eat.Q might make a social impact regarding healthcare, food waste, children education, and so on. Their consensus was that:

- It will guide people to eat more plant-based diets. Most recipes from plants are relatively easy to cook. Eat.Q will recommend unfamiliar and replaceable vegetables.
- If people follow a more balanced diet , they will become healthier and have a smaller chance of needing healthcare.
- It gives an opportunity to teach people how to cook different parts of a cow as well as steak. Farmers can use all parts of the cow without wasting.
- In the Netherlands, the primary education starts including a nutrition class. Eat.Q would help them to keep experiencing nutritious food.

On the other hands, the participants referred to some points that might be a challenge to implement Eat.Q.

A cooking session is not for everyone
While the interviewees understood the impact of cooking sessions, they expressed concern about a group of people who do not like cooking or who do not want to hang out with strangers. Most insisted that consideration is needed about how to encourage these kinds of people to prepare diverse meals. For instance, Eat.Q can enhance an online service for a cooking guide, offer unique value to motivate them to try. In addition, they demonstrated that Eat.Q can create a great transition by including specific cooking sessions, for the group who might have a high likelihood of unhealthy eating habits.

Information risk management
First of all, the participants urged that Eat.Q must make sure of Information privacy. Personal daily diet can reveal individual health. In fact, existing service platforms have a protection system based on national security policy to keep users from misuse of information. For example, public and private sectors can see demographic data without access to individual data.

Furthermore, the interviewees were concerned of information quality from the business sector. The participants who work in public/ scientific side addressed a difficulty in controlling information transparency of business side. Food companies are reluctant to share their product information. Moreover, consumers have a lack of trust in the industrial production. The Dutch government has generated food labels such as E numbers. However, many consumers do not trust the label. In addition, Eat.Q needs to include all big corporates and small and medium-sized enterprises (SMEs) without any monopoly for providing product information.

Unique value proposition to increase potential users
All participants, as a Dutch national, described what Dutch people are. They said many Dutch people are not interested in cooking and do not want to spend time doing it. Furthermore, their generation grew up with the idea that food should be cheap. They proposed to enhance our selling point and lead more potential users to be engaged.

Technological embodiment
We shortly explained the key technologies of Eat.Q such as image recognition and

recommender system. Most interviewees were curious about technologies regarding collection and analysis of individual input because the quality of personal data is crucial to offer useful feedback to individuals. They were concern about that how much new technologies can collect accurate date while making sure of an easy and quick way to use. Participant N notes that it would be demanding to report a meal regarding nutrient value. For example, a small amount of some ingredients can play a significant role in our health. Eat.Q might miss these essential ingredients depending on an accuracy of the image recognition technology.

Different stakeholders involvement

Participants recognized the interest gap between the government and the food industry. Interviewees in the public sector said that they are also confronted with this problem while endeavouring to make a better intervention. On the other hand, the industry side group asserted it is not difficult to create profit under rules and regulations

When you see the stakeholder map, where do you think you (your company) are located?

All participants indicated they are on the individual side. Furthermore, half of them pointed the public or industry sector in which they work. Interviewees who work in RVO mentioned they are also in the industry field because they provide financial support for many SMEs. In addition, the M participant indicated that he is a chef, but also involved the scientific sector. He has studied critical features of ingredients that can be harmful to human-being such as intolerance and allergy.

What can be benefit/cost from your side?

Public side

By collecting data on everyday life from individuals, the government first can observe their habits. They can perceive a latent tendency regarding food preferences and cooking skills. Then, they can provide better services to improve social welfare. In addition, Eat.Q enables the government to enhance a holistic view. It will help them to cooperate with different experts related to agriculture, health, and the environment.

On the other hand, the public sector can also attempt new policies , for example based on blockchain technology or the promotion of green protein. Then, they can determine whether these policies are effective from direct feedback by the Eat.Q system.

Industry side

The participant S, an organic meat producer, indicated that Eat.Q enables users to be aware of unfamiliar pieces of meat they can eat from a cow. Thus, it is possible to reduce unwanted waste. In this sense, farmers will grow different plants and animals. Furthermore, it will alleviate a competition to sell similar products. Cooking sessions at a farm will assist to deliver a story beyond local products and revitalize local economies.

The owner of a Plus supermarket insisted that with Eat.Q, he doesn't need to spend extra money to fit consumer demands. Distributors and producers can try a new product on the app and gain quick responses.

The participant M, as a chef, noted that restaurants might make more profit by increasing a portion of vegetables in a dish. Eat.Q will produce a possibility of a connection between local farmers and restaurants. It helps chefs to find fresh and tasty ingredients. In addition, cooking sessions will be beneficial to introduce their delicious food to consumers.

Participants rarely mentioned the costs aspect from their side. Participant F has expertise in

agricultural information regulation. He said that it is essential to reinforce information security systems to protect the privacy of users and compel companies to provide credible information.

If we make it more feasible, viable and desirable, what elements should be changed/added/removed? You can create a new stakeholder map in the empty paper.

All participants consented the triangular structure of the stakeholder map. Regarding specific stakeholders in each sector, there were some different opinions.

The participants in the public sector indicated that Eat.Q must give less authority to the industry sector. In fact, food companies are likely to manipulate information to make a profit. Furthermore, the platform needs to involve all kinds of food producers and distributors such as local farmers and e-commerce business. They also mentioned that IT and energy industries also would take a significant role as much as the food business.

The industry side said it is crucial to involve the public sector, who can keep a balance between public goods and business profits. In addition, it is suggested that behavioural psychologists can be in the scientific area. Most wanted to see a specific money flow that can create a sustainable business model.

If Eat.Q becomes a real business, who do you think is the best player for running the business?

The participants demonstrated that Eat.Q can be executed by diverse entrepreneurs such as an IT expert, a startup and a famous chef. However, it should not belong to one company entirely. Having checks and balances of a board of directors is necessary. The board of directors might include other businesses, nonprofit organizations, and government agencies.

Interestingly, most participants asserted that small and local entrepreneurs should initiate this business. These businessmen tend to be passionate to make better food production and services. Then, it is recommended to start the Eat.Q service in a small city or village. There is expected to be easier to collaborate with different stakeholders such as farmers, bakery shops and restaurants.

To sum up, the evaluation with the stakeholders verified that the Eat.Q concept has a potential value to be a business. All participants recognized the benefit of the service for individuals and societies. In fact, they also challenged some critical issues. However, there was a strong prejudgement about the other sectors. For instance, public/scientific expressed a negative perception about producers and chefs. They insisted most producers and distributors do not follow consumer needs and make the cheapest food. In addition, they assumed that chefs might hesitate to share their recipes. It can be true, but they need to recognize a change in the food industry. My interviewees in the food business answered differently.

"Why not? If consumers want something they need, I will always look for what customers ask. Then, profit is naturally created."

- Owner of PLUS Rozenburg supermarket

"Our business model is very good. We set our own price. People know what they eat, and they know what happens with it like organic food is good for the environment."

- Organic meat producer

"I can show our kitchen and give my recipes.... sharing is good for everyone, right? I love to teach and

show how to cook”

- Chef, an experience at Michelin-starred restaurants

Eat.Q is a conceptual design. It is possible to be ideal and challengeable. However, the most important is that every participant validated the powerful value of Eat.Q.

“I hope this concept really works; it is good to make them aware of how to eat better and healthier. I’ve been a chef for 25 years in Holland. I believe the Dutch people need to change their eating habit. Nobody knows how to cook.”

- Chef, an experience at Michelin-starred restaurants

7.2. Conclusion

The goal of this research was about how to make a transition in food consumption. To achieve the goal, the research questions were defined. Thus, we have sought the answers theoretically and empirically. This chapter demonstrated how this study has addressed the research questions.

How to design a transition in everyday life?

To answer this research question, first ‘transition’ and ‘everyday life’ was defined. It helped to explore the Transition Design approach and practice theory in Chapter 2. From these theories, we could determine ‘kitchen’ as a starting point to build our new method and design the ‘Kitchen-ing Loop’. This proposed method was verified through empirical experiments in Chapter 4. During the experiments, a new insight about ‘cooking sessions’ emerged. It demonstrated how it is possible to transfer tacit knowledge (uncodified knowledge).

In Chapter 6, cooking sessions, as part of a concept, determined the way to maintain a constant context among different kitchens. Finally, Eat.Q was designed to combine physical (cooking session) and digital (Kitchen-ing Codebook) functions. The concept suggested the users can perform a new experience in their everyday life.

How to amplify a transition to all system levels?

First of all, the research explores ‘how to amplify’. In Chapter 4.2, it was discovered that kitchens are a commonplace that everyone

has to prepare food. The common feature of the kitchen became a point which connects all individuals to create a system. It was seen that new knowledge and skills can move through this connection. We introduced some cases showing the effect of knowledge codification (see Chapter 4.3.2). This approach helped us to validate that kitchen elements can be codified and shareable. Furthermore, the imaginary storage for the codes was named 'Kitchen-ing Codebook'. It was determined to be a key part of the concept, 'open platform' in Chapter 6. It confirmed an opportunity of being 'cosmopolitan localism'. Eat.Q can create satisfaction of individuals' needs as well as better government intervention.

Moreover, the RVO helped me to answer 'all system level' in the research question. In Chapter 3.2, it was mentioned that they have developed 'PTF' as a system framework. Through the PTF diagram, they explored the 'Protein Transition' case. They determined the key factors that influence the system dynamics as costs and benefits of different parties (consumer, government, food industry):

- The percentage of 'early adopters' that opt for vegetable.
- The product quality of vegetable available in the food industry (see Figure 36).
- The product quantity of vegetable available in the food industry.
- The diversity of vegetable available in the food industry.

Furthermore, the RVO, as a part of the government, determined the two entry points to start the transition:

- Knowledge among consumers about alternatives to animal protein (bottom-up).
- An unambiguous, consistent message from the government to consumers about the desired transition (top-down).

From the RVO perspective, Eat.Q has a strong potential to carry out governmental interventions through the four key factors of the PTF diagram. The steps of the interventions will be:

1. Determining a central factor.
2. Define a goal of interventions such as 'increasing awareness about green protein.'
3. Deciding arrows of benefits and costs.
4. Design specific intervention to increase or reduce of the arrows.

We all agreed that Eat.Q can make an entry point to take action in the fourth step. They insisted that this tool will be useful to make an interaction between suppliers and consumers. In addition, government and food industry can collect individual data and government can especially convey targeted messages.

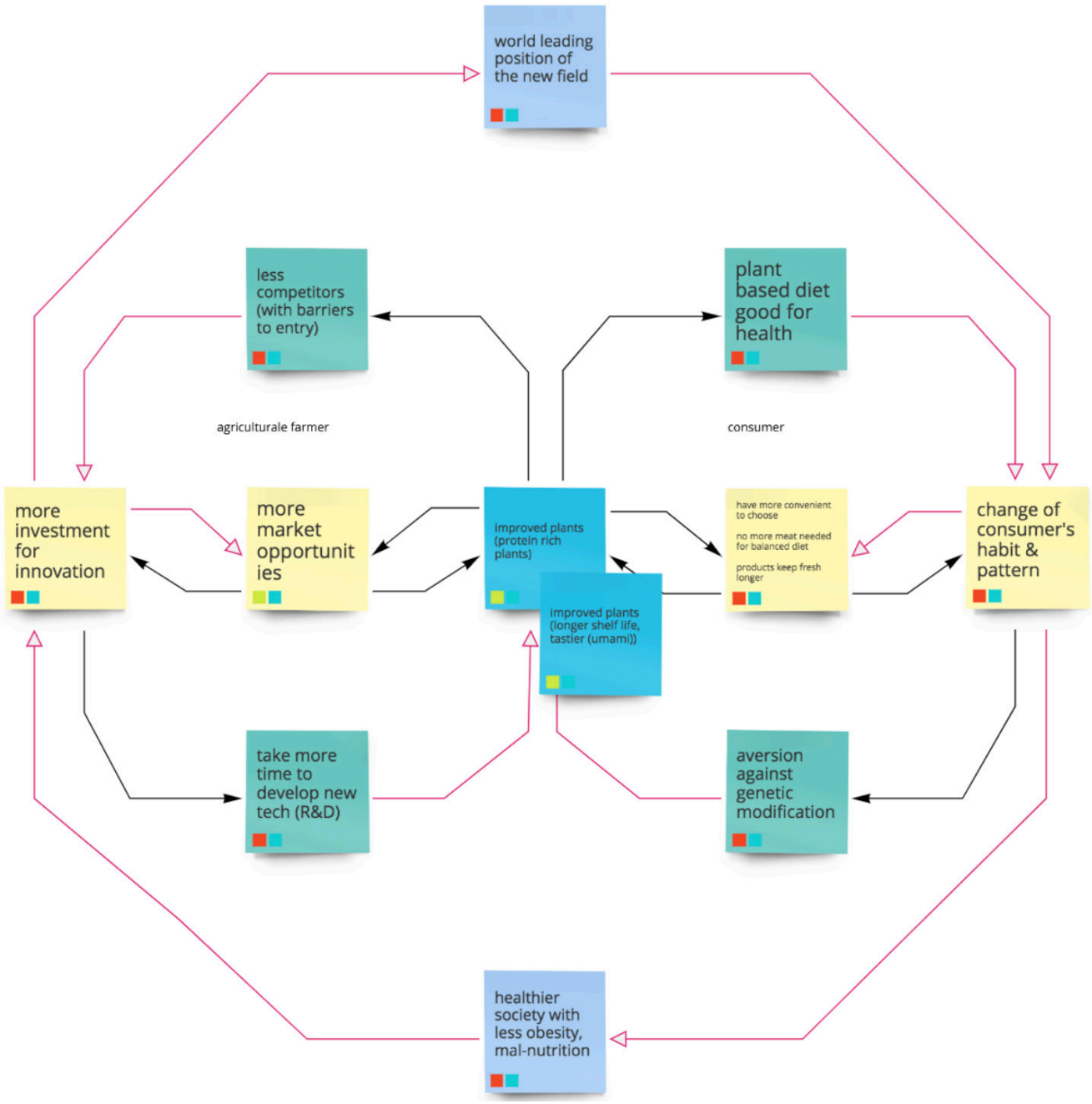


Figure 36. An example of PTF diagram about 'product quality of vegetable'

7.3. Recommendation

Eat.Q collaborating with different system diagrams for policy makers

To fully confirm the second research, collaborations with other system approach tools need to be explored further. In the previous chapter, we demonstrated a potential synergy between Eat.Q and the PTF model. It proved the possibility with a case in food policy. However, it can be used with more various policies across different countries. Eat.Q can be a more powerful tool not only to provide an individual service but also to bring a social impact.

Discussion with diverse experts for a sustainable business model

In the evaluation phase, we conducted interviews with civil servants, distributors and entrepreneurs. From the interviews, it was seen that including the right stakeholders is imperative to create a successful service. It would be valuable to discuss with more various experts who work in IT, food and kitchen equipment companies.

Development of an open platform

Information risk management (see Chapter 7.2) emerged as a critical challenge. In the implementation phase, it will be an inevitable issue. When a platform is designed for the initial step, it will need enough discussion between public and private sectors. Rules on the platform should be established precisely. The access authority of this system should be allocated differently depending on each role and not entirely belong to one side. We also need to consider who can be appropriate as a platform sponsor (see Chapter 6.2).

End-user tests for the concept implementation

This research was focused on establishing the designed framework, 'Kitchen-ing Loop'. In the next phase, Eat.Q should be tested to complete a detailed design of the service. Although an app wireframe was developed (see Appendix I), It should be visualized to check user experience on mobile devices. InVision is a tool that can be utilized to test a prototype of this app.

Also, it is necessary to test the effectiveness of push notifications. Giving relevant notification at the right time and place will have a significant influence on people's behavioural change. For example, it is critical to notify users on time when they feel comfortable to join a cooking session. The notification function can also help the users to go a grocery store before cooking at home.

In addition, there was controversy about the cooking sessions during the concept evaluation. The interviewees insisted that many people don't like to hang out with other. For those people, Augmented reality (AR) and virtual reality (VR) can be a great alternative solution to help them to gain experience. Thus, it is suggested to find a possibility of embodying the technologies to engage more users.

Designing an item as a continuer in kitchens

In the next phase, it can be considered to design an item of Eat.Q that can be in a kitchen and take a continuer role (see Chapter 4.1.1). Nowadays, kitchens become a smart place with advanced technology such IoT. An IoT environment will enable the item to collect all the data of a kitchen context automatically. For example, it would gather ingredients in the refrigerator, energy consumption level and

kitchen tools. Moreover, the item can be a smart speaker that recognizes your voice and takes an intelligent assistant role (see Appendix J).

8. References

Aarts, H., Paulussen, T., & Schaalma, H. (1997). Physical exercise habit: on the conceptualization and formation of habitual health behaviours. Health education research, 12(3), 363-374.

Allwood, J. M., Laursen, S. E., Russell, S. N., de Rodríguez, C. M., & Bocken, N. M. P. (2008). An approach to scenario analysis of the sustainability of an industrial sector applied to clothing and textiles in the UK. Journal of Cleaner production, 16(12), 1234-1246.

Aurich, J. C., Mannweiler, C., & Schweitzer, E. (2010). How to design and offer services successfully. CIRP Journal of Manufacturing Science and Technology, 2(3), 136-143.

Bocken, N., Short, S., Rana, P., & Evans, S. (2013). A value mapping tool for sustainable business modelling. Corporate Governance, 13(5), 482-497.

Brown, T. (2008). Design thinking. Harvard Business Review, 86(6), 84-92.

Buchanan, R. (2015). Worlds in the making: design, management, and the reform of organizational culture. She Ji: The Journal of Design, Economics, and Innovation, 1(1), 5-21.

Buchanan, R. (2008, spring semester). Design, Management, and Organizational Change. Class Lecture. Carnegie Mellon School of Design.

Cameron, T. (2014, August 7). Design's (Dis) Orders and Transition Design. Retrieved from https://medium.com/@camerontw/designs-dis-orderstransition-Design-cd53c3ad7d35

Caronia, L., & Mortari, L. (2015). The agency of things: how spaces and artefacts organize the moral order of an intensive care unit. Social Semiotics, 25(4), 401-422.

CBI. (2015, November).CBI Product Factsheet: Superfoods in Europe. Retrieved from https://www.cbi.eu/sites/default/files/market_information/researches/product-factsheet-europe-superfoods-2015_0.pdf

Chandler, D. (2002). Semiotics: the basics. Routledge.

Cohendet, P., & Edward Steinmueller, W. (2000). The codification of knowledge: a conceptual and empirical exploration. Industrial and corporate change, 9(2), 195-209.

Cowan, R., David, P. A., & Foray, D. (2000). The explicit economics of knowledge codification and tacitness. Industrial and corporate change, 9(2), 211-253

Cowan, R., & Foray, D. (1997). The economics of codification and the diffusion of knowledge. Industrial and corporate change, 6(3), 595-622.

Dimeji, O. (2015, November 11). What is Design's Role in Amplifying the Commons? Retrieved from http://transitiondesign.net/2015/11/amplifying-commons/

Giaccardi, E. (2017, November 22). Designing and innovating in the connected everyday. Retrieved from https://www.4tu.nl/du/en/events/2017-11-22-idemc7-thing-centered-design/

Giaccardi, E., Cila, N., Speed, C., & Caldwell, M. (2016, June). Thing ethnography: Doing design research with non-humans. In Proceedings of the 2016 ACM Conference on Designing Interactive Systems (pp. 377-387). ACM

Giaccardi, E., Speed, C., Cila, N., & Caldwell, M. (2016). Things as co-ethnographers: Implications of a thing perspective for design and anthropology. Design Anthropological Futures, 235.

Eisenmann, T. R., Parker, G., & Van Alstyne, M. (2009). Opening platforms: how, when and why?. Platforms, markets and innovation, 131-162.

Elkington, J. (2002). The triple bottom line.

ERCAS. (2015). Public Integrity and Trust in Europe. Retrieved from http://www.eupan.eu/files/repository/20160202135959_2016-01-21_-_Public_integrity_and_trust_in_Europe_-_final.pdf

Goldstein, S. M., Johnston, R., Duffy, J., & Rao, J. (2002). The service concept: the missing link in service design research?. Journal of Operations management, 20(2), 121-134.

Green Protein Alliance (2015). Green Protein Growth Plan: samen naar 50:50 in 2025.

Hardin, G. (2009). The tragedy of the commons. Journal of Natural Resources Policy Research, 1(3), 243-253.

Heinrich-Böll-Stiftung, Chemnitz, C., & Becheva, S. (2014). Meat atlas: Facts and figures about the animals we eat. Heinrich Böll Foundation.

Jun, S., Kim, M., & Lee, J. (2011). The system diagrams: Shifting perspectives. Design Issues, 27(2), 72-89.

Karwan, K. R., & Markland, R. E. (2006). Integrating service design principles and information technology to improve delivery and productivity in public sector operations: The case of the South Carolina DMV. Journal of operations management, 24(4), 347-362

Klette, R. (2014). Concise computer vision. Springer, London.

Kossoff, G. (2015). Holism and the reconstitution of everyday life: a framework for transition to a sustainable society. Design Philosophy Papers, 13(1), 25-38.

Kuijer, L. (2014). Implications of Social Practice Theory for Sustainable Design.

Kuijer, L. (2017). Practices-oriented design. Design for Behaviour Change.

Lee, G., & Perry, J. L. (2002). Are computers boosting productivity? A test of the paradox in state governments. Journal of Public Administration Research and Theory, 12(1), 77-102.

Lenk, K. (2002). Electronic Service Delivery–A driver of public sector modernisation. Information polity, 7(2, 3), 87-96.

Liu, D. R., & Shih, Y. Y. (2005). Integrating AHP and data mining for product recommendation based on customer lifetime value. Information & Management, 42(3), 387-400.

Lloyd, W. F. (1833). Two lectures on the checks to population.

Lorenz, E. (2000). The butterfly effect. In The chaos avant-garde: Memories of the early days of chaos theory (pp. 91-94).

Lynn Shostack, G. (1982). How to design a service. European Journal of Marketing, 16(1), 49-63.

Mallonee, S., Fowler, C., & Istre, G. R. (2006). Bridging the gap between research and practice: a continuing challenge. Injury prevention, 12(6), 357-359.

Mander, J. (2013). The capitalism papers: Fatal flaws of an obsolete System. Counterpoint.

Manzini, E. (2005). A cosmopolitan localism: Prospects for a sustainable local development and the possible role of design. Dis-Indaco,

Politecnico di Milano, 1, 2005.

Moore, G. A. (2002). Crossing the chasm.

Norman, D. A., & Stappers, P. J. (2016). DesignX: complex sociotechnical systems. She Ji: The Journal of Design, Economics, and Innovation, 1(2), 83-106.

Ostrom, E. (2015). Governing the commons. Cambridge university press.

Ouellette, J. A., & Wood, W. (1998). Habit and intention in everyday life: The multiple processes by which past behavior predicts future behavior. Psychological bulletin, 124(1), 54.

Peter, T. J. (2005). Tom Peters essentials. DK.

Popovich, M. G., & Brizius, J. A. (1998). Creating high-performance government organizations: a practical guide for public managers. Jossey-Bass Inc Pub.

Prendeville, S., & Bocken, N. (2017). Sustainable Business Models through Service Design. Procedia Manufacturing, 8, 292-299.

Ricci, F., Rokach, L., & Shapira, B. (2011). Introduction to recommender systems handbook. In Recommender systems handbook (pp. 1-35). springer US.

Robinson, T. P., & Pozzi, F. (2011). Mapping supply and demand for animal-source foods to 2030. Animal Production and Health Working Paper, 2.

Sachs, W. (2015). Planet dialectics: Explorations in environment and development. Zed Books Ltd..

Schneider, W., & Shiffrin, R. M. (1977). Controlled and automatic human information processing: I. Detection, search, and attention. Psychological review, 84(1), 1.

Service Design Network. (2016, October). Service Design Impact Report: Public Sector. Retrieved from https://www.service-design-network.org/books-and-reports/impact-report-public-sector

Shiffrin, R. M., & Schneider, W. (1977). Controlled and automatic human information processing: II. Perceptual learning, automatic attending and a general theory. Psychological review, 84(2), 127.

Shove, E. (2007). The design of everyday life. Berg.

Shove, E., Pantzar, M., & Watson, M. (2012). The Dynamics of Social Practice: Everyday Life and How it Changes. London: Sage.

Simon, M., & Barbara K. S. (2017, June 27). NutriNet: A Deep Learning Food and Drink Image Recognition System for Dietary Assessment. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5537777/

Terry, I., Gideon, K., Cameron, T., & Peter, S. (2015). Transition Design 2015. Retrieved from https://design.cmu.edu/sites/default/files/Transition_Design_Monograph_final.pdf

Thijs, G. (2017, November 24). The protein shift: will Europeans change their diet? Retrieved from https://www.ing.nl/media/ING_EBZ_-the-protein-shift-will-Europeans-change-their-diet_tcm162-136110.pdf

Wegner, D. M., & Bargh, J. A. (1998). Control and automaticity in social life.

White, A. (2009). From comfort zone to performance management. White & MacLean Publishing.

“HABIT IS THUS THE ENORMOUS FLYWHEEL OF SOCIETY, ITS MOST PRECIOUS CONSERVATIVE AGENT. IT ALONE IS WHAT KEEPS US ALL WITHIN THE BOUND OF ORDINANCE, AND SAVES THE CHILDREN OF FORTUNE FROM THE ENVIOUS UPRISINGS OF THE POOR”

- WILLIAM JAMES, 1890, P. 121

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