Serious gaming to support professionalisation of energy cooperatives in The Netherlands

Jasmijn Goudsmit

Student number	5100259 (TU Delft) & 3749657 (Leiden University)
Supervisors	Udo Pesch (Chair) & Geertje Bekebrede
Date	21/08/2024
MSc	Industrial Ecology

TU Delft

Universiteit Leiden

Preface

The journey for writing this thesis started with an interest in local citizen initiatives. I was inspired by energy cooperatives, to which I was introduced during my master of Industrial Ecology. They bring citizens together towards creating social or environmental improvements, often without paid work, because it is simply the right thing to do. Still, as I have experienced, many people of all ages do not know what an energy cooperative is. Though energy cooperatives themselves are very optimistic about what they achieve, they don't reach the participation of citizens they could. Their informal nature gets in the way of achieving their goals: it appears that many lack professionalism. This spurred a drive in me to see if there could be a way to support these organisations through my thesis. Furthermore, I have an interest in serious gaming. The special quality of serious gaming as an educational tool is that it can enable players to see topics they work on every day in a completely new light, as games allow players to step into a new reality. Also, they entice players to think more strategically about various topics. So, when the challenge of professionalisation of energy cooperatives – which involves strategic thinking of board members - came forward, the topic of energy cooperatives and serious gaming coincided.

Just like almost any master student will say, it has not been easy to write this thesis. There is little scientific literature available on energy cooperatives in the Dutch context, let alone specific to the topic of professionalisation. Because of this, there was a need to organise interviews and engage with people from the field how professionalisation was perceived and what struggles were involved in this. Each professional and every board members involved in was an inherently idealistic person, which has been a great source of inspiration for me.

With that experience in mind, I would first like to thank all students, professionals and deservedly proud citizens involved in this study, who, despite time constraints, were eager to speak with me. I would specifically like to thank the workshop participants who were so supportive of my game and willingly connect me to many cooperatives in Zuid-Holland for inspiration and further testing.

Also, I would like to thank my supervisors, Udo Pesch and Geertje Bekebrede, for their consistent support throughout my thesis and encouragement during doubtful periods. Finally, I would like to thank my family and friends for their support. Their advice has been pivotal in my times of hardship.

Jasmijn Goudsmit

Delft, August 2024

Executive summary

Energy cooperatives are non-profit civil society organisations that promote renewables and lower energy use and can help achieve 2030 EU climate goals by translating governmental policies to local contexts, mobilizing public backing, and increasing social or environmental impacts. However, energy cooperatives often face various challenges that hinder their success, including barriers in professionalisation. Within literature, it appears that professionalisation has to be addressed to improve the impact of energy cooperatives on the EU climate goals, as it would allow them to engage in more (complex) projects towards the energy transition.

However, professionalisation remains a vaguely defined concept in the energy cooperative literature, and the question remains how to interpret it. Five perspectives exist in literature: professionalisation of individuals, organisational structures and processes, activities, jobs and professionalisation as a by-product of the external environment. Yet, only the first three perspectives are recognized by interviewees from the cooperative field, and combined match the description of 'organisational capacity' of cooperatives. Also identified in the interviews are professionalisation from the perspective of cooperatives' relationships with other stakeholders or that of the energy cooperative movement as a whole. Still, interviews show that the topic of professionalisation mostly relates to organisational capacity of individual cooperatives and that the other perspectives show some inconsistencies or do not cover the benefits that professionalisation of the individual cooperative offers. Therefore professionalisation of a cooperative is defined as 'the process in which a cooperative builds organisational capacity'. Organisational capacity consists of leadership capacity, adaptive capacity, management capacity and technical capacity. Especially leadership capacity appears to require special attention for young cooperatives.

Furthermore, another question that arises with professionalisation is that, given the extent it can be a barrier for energy cooperatives to professionalise, if there is not an alternative route with lower complexity. It is argued that professionalisation is mainly needed to allow cooperatives to expand project portfolio and complexity while assuring long-term sustainability of the organisation. Options for collaboration as a substitute for professionalisation typically do not cover issues in leadership capacity and focus more on managerial and technical capacity. Other alternatives are stagnation, exit or merging – yet these carry significant barriers that can harm the community and its involvement and undo impact done.

Further analysis has been conducted to understand the success factors and barriers that need to be addressed for professionalisation to occur. A set of 'professionalisation pathways' help cooperative boards understand what developmental pathways cooperatives typically take and how these relate to barriers and success factors for professionalisation. The pathways include an innovator pathway (aimed at supporting small innovations), broad local pathway (which includes both social and renewable production goals on a local basis) and finally a local energy efficiency and savings pathway (aimed at providing energy savings and efficiency on a very local basis). The latter involves a lower level of professionalisation due to lower costs, though it becomes apparent that they must still engage in energy production to financially afford their efforts. A plurality of success factors for professionalisation are identified, yet barriers need to be addressed first or success factors may not be fully realized. Barriers identified include low awareness of the importance and lack of marketing at cooperatives, the development of clear plans with the municipality about who does what, limited time available for essential self-assessments and a dependence on subsidies. Lastly, it appears that strategic thinking as part of leadership capacity is an essential first step towards a professional organisation yet lacking in cooperative boards, and therefore needs to be prioritised.

However, one thought that inevitably follows here is how one might address insufficient strategic thinking of board members. There are a variety of options, yet the format of a serious game could stimulate long-term strategic thinking. As a result, the cooperative game called ‘EcoCoop: road to 2035’ was created. After a draft was made, the game was optimized through testing with students. The resulting game ‘EcoCoop: road to 2035’ was expected to support strategic thinking, as it enticed players to think further ahead as a team: players are required in-game to invest in organisational capacity in order to execute projects and vice versa and prepare for upcoming technologies, all in order to meet goals specified for in approximately 10 years.

Whether the game can actually increase strategic thinking in board members was evaluated through 4 tests with energy cooperative board members using the Triadic Game Philosophy, which includes the dimensions of reality, meaning and play. The game did receive very positive remarks in regards to realism, showing that the concept of professionalisation and the reality of cooperatives has been properly understood. The results indicate that the game might help cooperatives think strategically towards long-term goals, however, the study points to the need to increase playability to motivate deeper strategic thinking.

To conclude, energy cooperative professionalisation, as the process of building organizational capacity, points to the importance and lack of strategic thinking. The serious game 'EcoCoop: road to 2035' could enhance strategic thinking, yet further refinement of this tool is necessary to fully realize its potential in improving the effectiveness of energy cooperatives.

Table of contents

1 Introduction

For the energy transition towards a 55% reduction in the EU's greenhouse gas emissions in 2030 and a climate neutral EU in 2050, the European Commission has determined that civil society should play an important role (European Commission, 2022a; European Commission, n.d.a). Part of civil society – which comprises the activities of non-state institutions and organisations – are energy cooperatives, which can be defined as 'decentralized non-governmental initiatives of local communities and citizens to promote the production and consumption of renewable energy' (Oteman et al., 2014, p.2; Anheier, 2013). It must be added that an important omission from this older definition is the increasingly important role of energy efficiency and savings projects in energy cooperative portfolios (De Graaf et al., 2023). In the legal cooperative form, the assets of a cooperative are owned and controlled collectively, and profits are returned to the members and community. In the Netherlands, the Dutch Climate Agreement contains a segment on local participation stating that fifty percent of energy-related projects are to be created by local stakeholders (Zuilhof et al., 2022). This is where energy cooperatives could play a significant role.

Specifically energy cooperatives can contribute to improving the public acceptance of renewable energy projects and motivate citizens to invest in it (European Commission, n.d.b). Wagemans et al. (2019) also defines additional key governance roles of local renewable energy cooperatives for the energy transition: mobilising the public, translating government policy to the level of citizens for implementation, communicating citizens opinions to the government, using a personal and local approach to create context-specific energy solutions and finally integrating a variety of sustainability benefits into the energy transition, beyond just energy generation. In this way, energy cooperatives in The Netherlands accelerate the transition and when successful could act as an example for cooperative movements in other countries as well, which is ever important in the increasing efforts needed to counteract increasing global temperatures (Energy Transitions Commission, 2022).

According to HIER, a Dutch NGO concerned with engaging citizens in the energy transition, current growth in the number of cooperatives is plateauing and most existing energy cooperatives are arriving at a state where they are still quite small yet stabilised, with many wanting to expand to increase their environmental impact (De Graaf et al., 2023). The current state of energy cooperatives is also confirmed by literature (Maqbool et al., 2023; Kooij et al., 2018; Emmen, 2020). Yet, energy cooperatives in the Netherlands often run into complex issues that inhibit their success (De Graaf et al., 2023; Kooij et al., 2018; Warbroek et al., 2019). These issues include e.g. poor relations with municipalities, low involvement and support from the community and low net capacity (De Graaf et al., 2023; Proka et al., 2018b; Warbroek et al., 2019). The definition for energy cooperative 'success' varies, as will become apparent in Section 2.3, but one is the survival of the cooperative, which involves execution of projects (Warbroek et al., 2019).

The objective of this thesis is explorative literature research and interview research to better understand how energy cooperatives can achieve success and the development of a tool to help cooperatives accomplish their goals. As the research is exploratory in nature, the following research question is formulated throughout the course of this thesis.

How can a physical serious game effectively support young energy cooperatives in The Netherlands with professionalisation, thereby maintaining and/or increasing their contribution to the EU's 2030 or 2050 climate goals?

A research gap and focus are determined in Chapter 2, resulting in the central challenge of professionalisation to combat low professionalism, which sets the foundation for the research question. To answer the research question, firstly the relation between professionalisation and professionalism is studied and a definition of professionalisation is provided so as to both combat the presently vague and illusive aspects of the term **(S1)**. Then, to determine if there is not a way for cooperatives to avoid professionalisation, it is investigated why cooperatives might engage in professionalisation in the first place and what other options exist **(S2)**. If it can be determined that professionalisation of cooperatives is still relevant, it then becomes important to understand what success factors and barriers lie therein and how they are connected to different types of developmental pathways. A specific barrier – strategic thinking among board members – has been identified for further focus **(S3)**. The solution of a serious game is addressed, and a game is designed to enforce strategic thinking **(S4)**. Lastly, this game is evaluated to assess its possible effectiveness **(S5)**. The sub-questions are written below.

S1: How do professionalism and professionalisation relate and how can professionalisation for energy cooperatives in The Netherlands be defined?
S2: Why do cooperatives professionalise and are there no alternative approaches that might achieve similar outcomes with less complexity?
S3: What are the success factors and barriers for professionalisation for different types of developmental pathways?
S4: How might an engaging physical serious game support young energy cooperatives in strategic thinking, a barrier of professionalisation?
S5: Does the serious game support cooperative board members in strategic thinking, a barrier of professionalisation?

The first sub-question is answered in Section 3.2, the second sub-question in Section 3.3, the third in Section 3.4 and 3.5 and the fourth sub-question in Chapter 4. The last research question is addressed in Chapter 5. In Chapter 6 the results of the thesis are discussed and conclusions are shown in Chapter 7.

This thesis aims to add to the body of knowledge within the field of Industrial Ecology, understood here as 'the study of the flows of material and energy resources in industrial and consumer activities, of the effects of these flows on the environment, and of the influences of economic, political, and social factors on the use of these resources' (Dictionary of Energy, 2015, p. 307), as this study investigates the effect of professionalisation, a challenge for the success of energy cooperatives, which typically aim to reduce the use of finite energy resources for both industrial and consumer activities. In fact, consumer and industrial activities are linked: in cooperatives, consumers become producers.

2 Literature review

In this chapter, the historical context from which cooperatives have emerged is discussed and a research gap is identified. Furthermore, the focus of this study is further specified in Sections 2.2 and 2.3. This chapter sets the foundation for the first sub-question.

2.1 Background on energy cooperatives and research gap identification

2.1.1 History of energy cooperatives and structure

After the1970s oil crisis, there was a strong dependence on fossil fuel imports and concerns emerged about the environment, which resulted in a focus on energy saving and renewables Proka et al., 2018b). Later, in the late 1980s, the first bottom-up renewable energy cooperatives began to emerge in the Netherlands (Proka et al., 2018b). Energy cooperatives also started as a response to a rising social market perspective in The Netherlands, where a community engages in the governance and organisation of the market. Another factor for the emergence of energy cooperatives was the liberalisation of the Dutch energy market, resulting in the diversification of energy suppliers. Furthering the development of energy cooperatives was the modernisation of the Electricity Law from 1998 in 2010 to a new institutional framework that was more supportive of energy cooperatives (De Bakker et al., 2020; Kooij et al., 2018). Ever since, there has been significant growth in the number of cooperatives, with currently about 705 cooperatives active in the country. A plateau has been reached now that approximately 86% of municipalities have an energy cooperative active in them (HIER, n.d.).

2.1.2 Overview of existing research and research gap

In the introduction, it has been established that this thesis focuses on understanding how cooperatives can achieve success. Yet, there is already quite a lot of research available into barriers, success factors and threats for initiatives. For instance, Warbroek et al. (2019) investigate the relation between different social and institutional factors and energy initiative success. They find that factors relating to the initiative themselves, to interaction with the local community and to governance setting and linkage play a significant role in all initiatives. In addition, Germes et al (2021) find that cooperatives often lack clear goals and poorly monitor whether these goals are obtained. They further argue that there are a variety of barriers (such as lack representation of community members) and success factors (a strong steering group) for cooperative success.

In a similar vein, De Graaf et al. (2023) conclude with a categorisation of issues for energy cooperative development and list of solutions for these that need further attention, such as supports for professionalisation of hybrid organisations. Maqbool et al. (2023) also conclude that an entrepreneurial mind-set, mixed with repeated reflection on the starting values and goals, collaboration and a focus beyond the local community can support the cooperative's survival. Boon & Dieperink (2014) state that organisational factors play a key role for energy cooperative success.

Other studies focused on success factors or barriers also compare different countries or zoom out to the EU or the global level. For instance, Meister et al. (2020) concludes that municipal support is an essential factor for overcoming the specific cooperatives' barriers after analysis of cooperatives in Germany and Switzerland. Kooij et al. (2018) stresses the importance of institutional support to grow following insights of cooperatives in Denmark, Sweden and The Netherlands. Huybrechts & Mertens (2014) conclude that barriers to entry of the market (e.g.

limited access to capital, few locations) and cognitive barriers are hindering diffusion of cooperatives throughout North-West Europe.

However, it appears that most studies do not focus on overcoming specific factors or barriers except for a few. Issues with the local government have been addressed by Emmen (2020), which finalizes their thesis with a process design to improve communication between municipalities and local energy initiatives as based on three main barriers between energy cooperatives and municipalities. Heuninckx et al. (2023) investigates issues relating to the collection of data by energy communities on the consumption of energy and production, so that reliable cooperation models can be made, and conclude that there are many overlooked issues that could be easily mitigated when considered beforehand. But still, it becomes clear that if we are to accurately understand how energy cooperatives can succeed, there needs to be more specific attention to the crucial success factors and barriers.

Warbroek et al. (2019) support this finding as they believe that there might be value in more in-depth study into one or more of the factors addressed in their research – which include e.g. project champions, community involvement and linkage to government, and a variety of other factors. Many of the factors in Warbroek et al. (2019) and other sources have not been specifically addressed in research.
Firstly, it is needed to better understand what the specific factors are that affect cooperative success as based on Warbroek et al. (2019) and other sources and how these factors relate in order to define which factor requires special attention.

Furthermore, many studies suggest improved datasets (e.g. including more cooperatives and factors) to refine their results as another crucial research gap within the field. For example, Germes et al. (2021) suggest assessing the impacts of local energy initiatives on the long term with measurable indicators. De Bakker et al. (2021) propose investigating the endurability and logic of different business models for energy cooperatives. Heuninckx et al. (2023) suggest an in-depth exploration of how to overcome barriers in data collection by energy cooperatives. Camargo et al. (2023) recommend the creation of a dataset of energy cooperatives and communities to improve the analysis made by the researchers on the effect of environmental conditions on the existence of these. Finally, Warbroek et al. (2019) suggest expanding their analysis on governance factors for cooperative success to more countries.
Due to the timeframe, financial and geographical limitations of this thesis, this thesis will focus on an in-depth dive into a success factor or barrier instead of improved data-sets.

The next section tries to identify a factor of focus. Each country has their own issues when it comes to cooperative development and so for adequate research data within the scope of this thesis a limited geographical area has to be chosen. It is specified that the area of focus will be cooperatives in The Netherlands (Kooij et al., 2018).

2.2 Identification of the factor of focus: professionalisation

2.2.1 Overview of barriers from literature

To specify the factor of focus for cooperative success, Appendix 1 summarises an overview found in literature. Sources were used for the list of factors are at least five years old; at the moment of initiation of this study this means sources that are from 2018 or older, to ensure factors are relevant. Keywords for the literature study are 'energy community', 'energy cooperative' combined with 'barriers', 'challenges' and/or 'growth' or 'success' and 'The Netherlands', ensuring that all sources used at least partly described barriers experienced by Dutch cooperatives. Table 1 includes a list of these factors.

The difficulty in the creation of a list is that the studies vary in their description of factors. However, within the table an attempt has been made. One factor in particular is difficult to grasp. In Warbroek et al. (2019), 'human capital' is described as follows: 'Expertise is often called for that goes beyond what a volunteer organization, such as many LLCEIs, can provide or support. As such, it is expected that the extent to which LLCEIs have human capital (understood as knowledge and experience in relevant industry, self-employment, or leadership) contributes to their success' (Warbroek et al., 2019). De Graaf et al. (2023) talks about lacking professional knowledge and skills of the volunteers – matching the description of human capital. Proka et al. (2018a) mentions the importance of professional staff. So, human capital and professionalism seem to be closely related concepts and are captured together under 'low professionalism' in Table 1.

Yet, De Graaf et al. (2023) also mentions challenges with 'professionalisation'. Though the report does not explain the term, it seems to relate to organisational growth and would require paid work. Zuilhof et al. (2022) also hints that professionalisation is a step of organisational growth but also means becoming more trustworthy towards the municipality. De Bakker et al. (2020) state that a professional organisation is business-like, which seems to involve professional 'skills', notably about marketing and financial management.
Especially the first and last interpretation would suggest that professionalism and professionalisation are highly related. The concepts themselves would furthermore suggest that high professionalism is achieved through professionalisation. Both seem to be related to the capacities of individuals within the organisation – which most likely would mean (board or active) members. Proka et al. (2018b) talks about professionalisation as a step towards the capacity to complete more and more complex projects, giving insight in why cooperatives might engage in professionalisation.

For now, professionalism is interpreted as the expertise and behaviours of (board)members. Professionalisation is interpreted as the process to achieve professionalism, and specifically, it is understood as the process to improve the expertise and behaviours of (board)members. This is meant to grow the project complexity and portfolio of the cooperative and create trust with the municipality. Still, professionalism and professionalisation will need to be further defined, as these definitions are based on vague references in energy cooperative literature.

The factors have been grouped into the categories 'organisational', 'state', 'market' and 'external operations factors' to keep a clear overview of type of issues that are currently at play. Organisational level factors encompass issues related to the structure and operations of energy cooperatives. State level issues relate to problems between cooperatives and governmental

actors and issues regarding regulations or subsidies. Market level problems discuss interaction with market actors, e.g. energy companies and problems that arise from the market domain.

Two grey literature articles that were included are a bottleneck inventory for scaling-up of initiatives by HIER (De Graaf et al., 2023) and a report on the relation between government and cooperatives by the Participatiecoalitie (Zuilhof et al., 2022). These were included because the discuss very specific barriers for energy cooperatives in The Netherlands and have been able to reach a large variety of cooperatives in their investigation.

Table 1: List of factors that affect energy cooperative success

Factor type	Factor	Source
Organisational level	Lack of project champions (over time)	Warbroek et al. (2019), De Graaf et al. (2023)
	Low involvement and support from community	Warbroek et al. (2019), Proka et al. (2018b)
	Low professionalism (relating to expertise and behaviour of (board) members)	Warbroek et al. (2019), Proka et al. (2018a), De Graaf et al. (2023), Zuilhof et al. (2022), Proka et al. (2018b), De Bakker et al. (2020)
	Lack of representation of different citizens	Germes et al. (2021)
	Difficulty reaching the 'early majority'/new societal groups	De Graaf et al. (2022); Germes et al. (2021)
	Energy seen as 'non-issue' among citizens	Proka et al. (2018b), Jansma et al. (2023)
	Moral dilemma between hybridisation (working closely with commercial actors or becoming business-like) and core values	De Bakker et al. (2020), Kooij et al. (2018)
	Poor framing of cooperatives	Lagendijk et al (2021)
State level	Poor linkage to local government, little financial and knowledge support from local government	Warbroek et al. (2019), Germes et al. (2021), Proka et al. (2018b), Zuilhof et al. (2022)
	Upcoming mergers	Warbroek et al. (2019)
	Environmental ignorance of local government	Warbroek et al. (2019)
	Lack of governance capacity for local government	Warbroek et al. (2019), Zuilhof et al. (2022), Vringer et al. (2021)
	Delays because of slow bureaucratic processes	De Graaf et al. (2023), Zuilhof et al. (2022)
	Vagueness regarding regulations or subsidies	De Graaf et al. (2023)
	Unfriendly regulatory landscape (especially for smaller cooperatives)	De Graaf et al. (2023), De Bakker et al. (2020), Kooij et al. (2018), Proka et al. (2018-a)
	Conservatism of government officials	De Bakker et al. (2020)
	Uncertainty through dependence on government support	Zuilhof et al. (2022)

Factor type	Factor	Source
State level	Dislike for wind energy among local governments	De Graaf et al. (2023)
	Low support of local government for larger projects	Warbroek et al. (2019)
	Costs for insurance of solar panels due to strict regulations	De Graaf et al. (2023)
Market level	Scarcity of new intermediary market players & strong network	Reis et al. (2021), Proka et al. (2018a)
	Deficiency in installers, materials and price volatility	De Graaf et al. (2023)
	Failing competition with commercial actors for land	De Graaf et al. (2023)
External operational factors	Low net capacity and other infrastructure or grid issues	De Graaf et al. (2023), Proka et al. (2018b)
	Specific climate conditions	Camargo & Coosemans (2023)

It appears that low professionalism is a challenge that has been mentioned by several papers – the table shows that it (or the need for professionalisation) has been discussed in 6 papers, and it has been for some years – from 2018 onwards - showing that this problem has not received enough attention or that it is difficult to tackle.
Other sources concluded that institutional problems are the main barriers for cooperative success. Warbroek et al. (2019) state that the project champions are determinant for the success of cooperatives but also signify the importance of human capital (as captured in professionalism in Table 1). Perhaps, the relations between factors can give further insight into centrality of factors.

2.2.2 Relations between factors for cooperative success

In Figure 1, a map is created to show how different factors might be related as supported by the literature review of factors in Appendix 1 and logic to determine a factor of focus for this research. The 'deficiency of installers, materials and price volatility', 'specific climate conditions' and 'low net capacity' could not directly be related to other factors. Low professionalism seems to be connected to a large number of barriers. The logic for these links is described below.

Professionalism is related to poor linkage to the local government, as local governments often do not trust energy cooperatives to be professional enough to collaborate on the energy transition, and low government capacity is also related to a poor link (De Graaf et al., 2023; Warbroek et al., 2019; Zuilhof et al., 2022).

At the same time, (local) government support affects professionalism: if there is not a safe space for the niche to develop their capacities – such as a more professional organisation - e.g. through lack of governance capacity and unfriendly regulatory landscape, it is difficult for cooperatives to break out of it, compete with traditional market players e.g. for land - and overtake the regime. Cooperatives might not have the expertise in related legal processes or carry behaviours that improve negotiation if they are not yet professional.

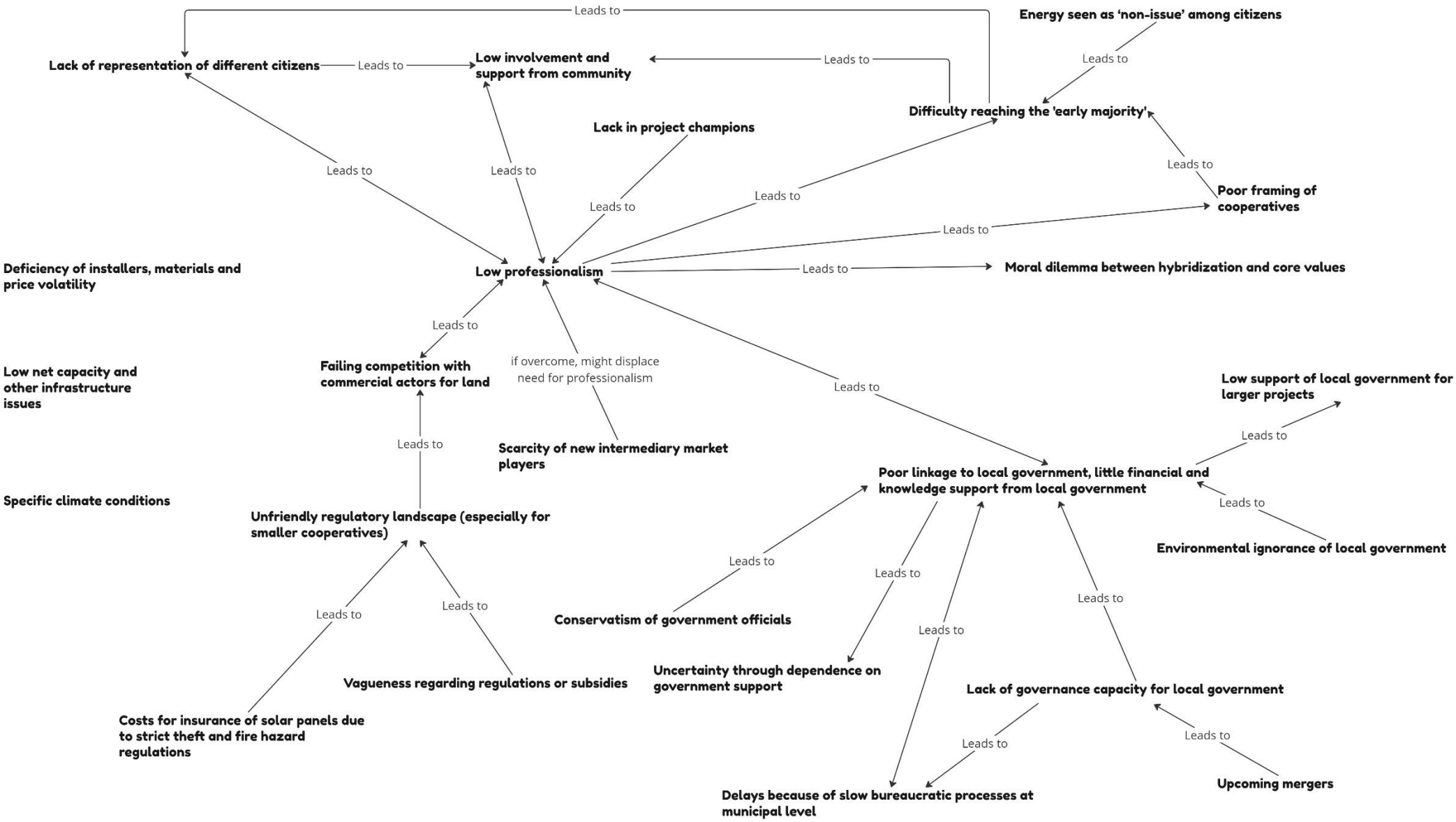


Figure 1: Map of possible connections between barriers that affect energy cooperative success

Also a moral dilemma might emerge due to low professionalism, causing a clash between the needed change in behaviours and related growth – which might be more 'business-like - with the values that cooperatives cherish, such as its informal community focus (Wagemans et al., 2019). Low involvement and support from the community might prevent cooperatives from benefiting from local professionals – similarly for a lack of representation of different citizens and project champions that might carry useful expertise or behaviours. At the same time, low professionalism might result in poor communicational expertise or behaviour which results in poor framing of cooperatives and reaching new societal groups.

Still, professionalisation might not be needed if there are more/improved intermediary players to take care of this – this will have to be further investigated (see Chapter 3.3) – but firstly the term professionalisation and its relation to professionalism appear to be rather vague and would have to be further specified.

2.2.3 Professionalism and professionalisation

Professionalisation is chosen as the focus of this research as low professionalism is connected to many other barriers and has been consistently mentioned by several different studies on energy cooperatives since 2015. Professionalisation need special attention considering it is very poorly defined in literature - the studies used in Section 2.2. do not offer a clear definition in the context of cooperatives, and how the term relates to professionalism is not entire clear (Bauwens et al., 2019; Proka et al., 2018b; Heylen et al., 2020; Battilana & Dorado, 2010). A definition for professionalisation sets the foundation to understanding how to tackle this challenge.
The linkage with the local government is also an important factor and closely related to this, but has also been addressed by Emmen (2020) in their thesis, and therefore the scientific relevance of professionalisation might be higher.

2.3 Defining success for energy cooperatives

2.3.1 Varying views on success for energy cooperatives

When focusing on barriers for success, i.e. professionalism, it is crucial to understand what is meant by success. A cooperative might define success by the electric output of energy cooperatives. Proka et al. (2018b) would argue for this, emphasising the need for energy cooperatives to set a specific vision for energy cooperatives in which they conclude that different types of cooperatives should produce each year until 2025. Still, this neglects that energy cooperatives are also aimed at demand reduction, such as is the case with Beauvent, or that they aim for social goals, as is the case with Bronsgroen (Bauwens et al., 2019)

On the other hand, as aforementioned, Warbroek et al. (2019), acknowledges that community energy collectives aim to not only pursue renewable energy and demand reduction goals but also pursue local socio-economic community-building goals important for the welfare of a local community. The study states that success can be measured by their ability to exist over time, for which the realisation of new projects that support the financial operations is often essential. This matches Hagget et al. (2013) who state that the success of a cooperative can be measured by the completion of renewable energy projects. However, this definition sounds quite bleak, as it would suggest that cooperatives are merely trying to survive.

Luckily, Germes et al. (2021) offer another perspective. They explore how most energy initiative motives and objectives are firstly related to the environment, then financial and social factors. Though the goals of the initiatives are often vague and poorly evaluated, the initiators themselves state that a local energy initiative is successful when it can realise energy projects (meaning mostly the generation of renewable energy) and involve local citizens. With this definition, the question arises what is considered involvement of local citizens. Citizens can be part of the cooperative team itself but might also be members that buy energy or invest in new panels, or just receive their newspaper (De Graaf et al., 2023). Germes et al. (2021) also argue that a project can be called successful if it fulfils the needs of the community. While this definition of success might still sound vague, it would allow cooperatives to fill in themselves what the needs of the community are.

2.3.2 Conclusion on success for energy cooperatives

Professionalisation appears to support the execution of more and more complex projects, which according to literature could support cooperative success. Yet, what is deemed success for energy cooperatives might not be straightforward. From these sources, it becomes apparent that there is not a consensus on how to define cooperative success, and it ultimately depends on the type of initiative. For some cooperatives mere survival might be enough. For some, it might be the execution of renewable energy projects or generation of renewable energy, reduction of energy use or local social goals. Therefore, success is taken as a broad concept for this research.

3 Professionalisation of energy cooperatives

In this chapter, firstly, the difference between professionalism and professionalisation is investigated so as to define professionalisation and clarify any uncertainties – particularly as it relates to success. Next, it is determined if professionalisation is integral to energy cooperatives, or if the barrier of low professionalism can be overcome in different ways. When the need for professionalisation is specified, a professionalisation framework is created to organise the findings. The study continues into understanding the success factors and barriers of professionalisation for different developmental pathways and a barrier that needs immediate attention is specified.

3.1 Method

This chapter covers research questions S1 to S3, which it mostly inductive, exploratory research. This is because there is little literature data on what professionalisation entails for energy cooperatives.

Firstly, S1 is, as aforementioned, 'How can professionalisation for energy cooperatives in The Netherlands be defined?' In order to tackle this question, a short literature review was performed, however, it showed that there were few sources available in the field of cooperatives. Search terms were 'professionalisation OR professionalism of energy cooperatives', 'definition professionalisation OR professionalism' and 'definition professionalisation OR professionalism energy cooperatives'. Also 'difference professionalism and professionalisation' was used as a search term.

From there, interviews with umbrella organisations and other organisations that work with energy cooperatives on a daily basis were conducted and provided further insights. These organisations have experience with a large variety of energy cooperatives and many aim to help cooperatives elevate their levels of professionalisation. Through a google search, organisations were found and contacted through e-mail.

The interviewees had varying experiences in the field. The organisations involved in this interview are EnergieSamen (both national and provincial level, specially South Holland), Energie van Rotterdam, SamenOM and HIER. The organisations are not mentioned in the interview summaries to protect the privacy of the interviewees - if there was specific information mentioned about the organisations, this is described in Appendix 2.2, without reference to an interviewee. The interviewees were either board members or employees at their respective organisation. The questions used for these interviews are described in Appendix 2.1. The questions were used to answer S1 but also for S2 and S3.

Most interviewees had personal experience being part of a cooperative, 3 interviewees as a board member, one interviewee was also active in an energy initiative. Another interviewee also had experience being active in an association of owners. Because many of the interviewees had personal experience next to professional experience, they could give multiple perspectives on questions. Summaries of the interviews can be found in Appendix 2.2 and 2.3. The interviews have been recorded with audios and are saved on a protected drive. The privacy of the interviewees is protected by precautions as accepted by the ethics committee of the TU Delft. Through informed consent forms, all the interviewees accepted participation. As little personal data as possible is collected and names have been reduced to letters of the first name, such as 'T.'. Interview data and data about the interviewee's organisations have been separated. Names

of organisations mentioned by the interviewees have been removed as well as they did not consent to participation.

Secondly, for S2: 'Why do cooperatives professionalise and are there no alternative approaches that might achieve similar outcomes with less complexity?', the model by Cook (2018) and the study by Herbes et al. (2017) are applied in an attempt to find a variety of directions cooperatives might take when they arrive at a point where they are not sure whether to professionalise. The interview results and further scientific literature provide substance to these directions.

Thirdly, for S3: 'What are the success factors and barriers for professionalisation for different developmental pathways?' firstly, success examples from literature have been investigated to identify different pathways and matching professionalisation success factors and barriers. All sources had been derived from the search for the literature review in Appendix 1 (see Section 2.2 for the method) and through searches with the terms 'Professionalisation of energy cooperatives' or 'Professionalisation of energy cooperatives in The Netherlands' in Google Scholar. Furthermore, the research terms 'Success example(s)' combined with 'energy cooperative' or 'energy initiative' or 'energy community' were used in Google Scholar and TU Delft Library to find further success examples, though no new sources that explained a cooperative in detail were found. Next, the aforementioned interviews were used to find further success examples and success factors and barriers for professionalisation.

The results of the literature and interview research were wide-reaching. Therefore, it was deemed useful to organise the findings into a framework. Frameworks were investigated by searching google scholar and the TU Delft library with the terms 'organisational life cycle theory' or 'organisational model' or 'organisational theory' combined with nothing or 'energy cooperative' or 'cooperative' and also 'framework for professionalisation' and 'framework for professionalisation energy cooperatives'.

3.2 Defining professionalisation for energy cooperatives

3.2.1 Interpreting professionalism and professionalisation according to literature

Professionalism may be defined as 'particular kind of occupational identity position produced in conditions of late capitalist modernity' (Ganesh & McAllum. 2011, p. 153) which is quite vague or as 'the construction of specific discursive work norms such as impersonality, fairness, or promptness that split public and private codes of conduct' (Ganesh & McAllum. 2011, p. 153) which provides some more guidance. This does match the draft interpretation of professionalism as 'the expertise and behaviours of (board)members' in Section 2.2 in terms of behaviour, yet not in expertise. Still, expertise might be needed to arrive at specific work norms.

It appears that professionalism receives special attention in the field of medicine, whereas there were no papers defining the topic in the field of energy cooperatives. In the context of medicine professionals, Bossers et al. (1999) divides professionalism into multiple fields. It includes expertise in the category 'self' (including e.g. current knowledge and self-evaluation) and 'skills/practice' (including e.g. skills application, knowledge of discipline). Also, their paper suggests that there are a lot of aspects to professionalisation – next to behavioural aspects, there are also professional 'professional parameters' (including sub-categories of legal issues

and ethics & morality') and 'responsibilities' (involving profession, self, community, and employer and client). The concept of professionalism might cover a broader range of aspects relating to individuals than expected from Section 2.2, though legal aspects and responsibility might play a larger role in health.

Meanwhile, Ganesh & McAllum (2011) agree that professionalisation and professionalism are very poorly defined and complex terms and though connected are different in the sense that professionalism is aimed at practice and identity – matching the interpretations of the previous paragraphs - while professionalisation focuses on structure and process. As such, it can be argued that professionalisation provides the structural framework that supports the development of professionalism of individuals.

Ganesh & McAllum (2011) conclude that, considering the importance of volunteering in civil society organisations, professionalisation and professionalism are encompassing 'techniques and procedures for directing human behaviour' (Foucault, 1997, p. 73) that 'govern volunteers at a distance by encouraging them to adopt prescriptive practices drawn from the for-profit world.' (Ganesh & McAllum, 2011, p.155). This would suggest that professionalism and professionalisation are highly interconnected subjects.

The definition by Ganesh & McAllum (2011) captures 'behaviours' from the draft interpretation from Section 2.2. in 'techniques and procedures' and also includes aspects of change in organisational structures which were also recognized. Heylen et al. (2020) explicitly includes 'expertise' and involves 'behaviours' of individuals as well yet also mentions aspects of change in organisational structures. They argue that, for example, during professionalisation, civil society organisations might hire professional staff and adopt different organisational structures to develop expertise. Or the organisation might make choices on how members, volunteers and staff are deployed, or specific units might be created within the organisation for specific tasks.

Still, there appears to be more to professionalisation than expertise and behaviours of individuals and organisational structure change. In the literature search for this chapter, especially professionalisation of sports organisations came forward. Insights may be drawn from these, because sports organisations are similar to energy cooperatives in that they are often volunteer-based and member-based (Doherty et al., 2013). Ruoranen et al. (2016) recognizes in sports literature three types of professionalisation: of individuals (relating to more paid employees and larger expectations of employees), of activities (creating goals and measures towards these goals and evaluation whether goals are reached) and professionalisation of processes and structures (which comes down to division of tasks and task units, centralisation and creation of hierarchy). This would suggest that professionalisation is not just limited to that of individuals and organisational structures, but that the professionalisation of activities should also be added.

Meanwhile, Dowling et al. (2014) argue that professionalisation of sports management can be classified into organisational, systemic, and occupational professionalisation. Organisational professionalisation comes down to "processes of change experienced as a result of the influx of full-time, managerial business-like professionals into what have been traditionally volunteer-run organisations" (Dowling et al., 2014, p. 523). This seems to be about both the professionalism of the individuals within the organisation and related organisational change. Systemic professionalisation is caused by an external force, instead of an internal one. Lastly, occupational professionalisation refers the process by which certain occupations evolve into

recognized professions. This would be about professionalism of jobs. This matches Black (1970) which states that professionalisation 'refers to the assimilation of the standards and values prevalent in a certain profession' (Black, 1970, p.865). This would add another 2 perspectives on professionalisation: that of occupations and professionalisation as a by-product of an environmental change.

Insights from literature

To conclude, professionalism is interpreted in literature as 'the construction of specific discursive work norms such as impersonality, fairness, or promptness that split public and private codes of conduct' (Ganesh & McAllum, 2011). Yet, this does not capture expertise of (board) members, only behaviours from the draft-interpretation of professionalisation as the expertise and behaviours of (board)members. An interpretation from medicine does include the expertise of the individual, yet also many other aspects, which shows there is more to professionalism than originally thought.

While professionalism and professionalisation are highly connected, it can also be said the professionalisation forms the framework for professionalism. Yet, it is found that professionalism of individuals is only one perspective on professionalisation.

The review has shown that many different perspectives exist on professionalisation – of individuals, organisational structures and processes, jobs, of activities or as a by-product of an environmental change. These perspectives do not clarify what professionalisation in the context of cooperatives might precisely entail: most of these perspectives did not come forward in Section 2.2 – perhaps only that of organisational structures and processes and individuals.

Due to the discovery that professionalisation seems to go way beyond professionalism of individuals, the interconnectedness of professionalisation and professionalism, and the finding that professionalisation is a pre-requisite for professionalism, it is justified to focus on professionalisation and not professionalism in this thesis. Interview interpretations can give more insight into what is meant by professionalisation in the context of cooperatives.

3.2.2 Interview interpretations of professionalisation

Results

Three interviewees (M., T. and S&E) stated that they do not wish to confine themselves to a certain definition to professionalisation or thought it was difficult because there are so many different aspects to professionalisation. All interviewees described aspects of professionalisation rather than give a specific definition, which will become apparent in the following paragraphs.

M. mentioned that cooperatives should first generate a clear strategy if they want to become professional. Furthermore, cooperatives need to define what company activities are – for which people need to be paid - and what volunteer activities are, and they should ensure that they are financially healthy, have a healthy business case, healthy business plans, a fixed income or clear income streams, etc. Administration also needs to be in order. Employees and volunteers and their time need to be treated respectfully. This includes aspects of professionalisation of organisational structures and processes as well as activities.

J. said that professionalisation can be defined as an organisation with more paid work, but that is not their personal definition – they believe that volunteer organisations can also professionalise without much paid work. Professionalisation then comes down to developing the organisation in a way that work is well-portioned. This includes aspects of professionalisation of organisational structures and processes as well as individuals.

S&E believed that if they had to define it, professionalisation would be about cooperatives becoming more independent - the independent realisation of projects and customer service, for example, without government subsidies. This definition would be more about the position of the cooperative within the energy sector than the professionalisation of individuals or organisations. This would be a new perspective, not recognized in literature.

According to T., professionalisation comes down to practical and strategic aspects – which for the first aspect might entail building a website and creating a business case which requires professional support, and for the second aspect might mean understanding the cooperatives' position as a cooperative in the field – the relations to the municipality and politics, using the local press and advocacy. This would match professionalisation of activities as well as the perspective of S&E.

Though A. agreed with the statement that professionalisation is not about how much knowledge and skill cooperatives have but more about the organisation and how members treat each other. They also hinted that professionalisation comes down to moving to an organisation with paid work and creating more projects with business cases. This captures professionalisation from the perspective of individuals, organisational structures and processes and activities.

S. stated that there is large diversity in cooperative's primary focus – which makes it difficult to create a definition. Still, increasing the function of the board and creating self-awareness among board members, improving financial means, and reducing the dependency on volunteers are important aspects. If a cooperative grows, they cannot be just pioneers, but the cooperative needs a better structure, better work arrangements, or board members might need to let go of certain aspects if e.g. a manager or director is hired. This would match professionalisation of organisational structures and processes, activities, and individuals.

M. also had a very different view on professionalisation. They look at the sector as a whole: does an entire region have capacity to act out their plans, or are they stuck in discussing about what they want and how to continue? M. explains that local cooperatives are often part of larger regional umbrella cooperatives, which are part of a provincial umbrella organisation, and in this way the whole sector is layered. Not everything has to be done professionally on a local level, is the opinion of M, but it can also happen on a regional level. There is a project agency that has between 15 and 20 local cooperatives as members and work on project development, so that local cooperatives don't have to hire project managers or have the knowledge to execute the projects.

Insights from interviews

The interviews showed that professionalisation in the cooperative sector is not necessarily about gaining 'expertise' from the draft interpretation ('the process to improve the expertise and behaviours of (board)members'). This is the case as no definition specifically included the importance of expertise, though T. does mention a need for 'understanding' how to position a cooperative towards other stakeholders and S. mentions a need for 'self-awareness' which relates to knowledge. It might be that expertise and skill is needed to achieve the aspects of the

definitions mentioned – e.g. for creating a clear strategy, developing the organisation in a way that work is well-portioned, or increasing the function of the board. Nonetheless, it appears that a change in 'behaviours' is recognized.

There appear to be a few different views on professionalisation from the interviews. Most appear to mention aspects relating to professionalisation of organisational structures and processes, activities, and individuals. Professionalisation as a by-product of external processes or of jobs did not come forward.

Added to the different perspectives is professionalisation in terms of the position of the cooperative in relation to other organisations. This came forward in the definition of T. and S&E., though there is no clear consensus: T. mentions the increased strategic positioning of the cooperative in relation to other organisations, while S&E. discuss the independence of the cooperative of subsidies.

Secondly, there is professionalisation of the cooperative movement. This came forward in the definition of M. only. Their interpretation of professionalisation is in contrast with the definition of S&E., as this interpretation shows how cooperatives can depend on their umbrellas for expertise and skill opposed to becoming more independent.

Professionalisation of organisational structures and processes, individuals and activities seem to all relate to professionalisation of the cooperative itself and many of the mentioned aspects seems to match the definition of organisational capacity building.
Organisational capacity building comes down to 'developing the capabilities of an organisation to improve its effectiveness and sustainability' (Cornforth & Mordaunt, 2011, p. 431). Though the purpose of professionalisation did not come forward in the interviews, the purpose is described in Chapter 3.3 and matches that of organisational capacity quite well.

Cornforth & Mordaunt (2011) discuss the definition of Bolton & Abdy (2007) that defines organisational capacity in the following dimensions: leadership capacity (organisational leaders must inspire, make choices, innovate and give direction to the organisation with a focus on its mission), adaptive capacity (the ability of the cooperative to evaluate and respond to both internal and external developments), management capacity (the ability of the cooperative to efficiently and effectively use the resources of the cooperative) and technical capacity (the ability of the cooperative to actually implement important programs and services). Adaptive capacity building includes networking and collaboration, evaluation of the effectiveness of the organisation and programs and services and planning. Technical capacity includes specifically e.g. marketing and communications, facilities development and maintenance, budgeting, legal work, research, implementation of technology, accounting, etc. (Bolton & Abdy, 2007).

Leadership capacity and adaptive capacity are captured by the definition of S. as they note the importance of growing the capacities of the board and the reflection of the board members, and the ability of board members to respond to needed changes such as directors.
The response to external developments – relating to adaptive capacity - is not captured as much in the interviews, though T. does discuss the relations to e.g. municipalities and politics. M. discusses the importance of the cooperative movement network as a means to avoid professionalisation altogether. M. also discussed the Compile project, that reviewed the maturity of European cooperatives. That is not the same thing as professionalisation according to M., but it is a condition. The Compile project states that you are mature if you are able to deal with both opportunities and barriers in the market in which you operate. For example, that the

cooperative can respond adequately when a municipality says that there might be an opportunity for a sizeable wind park, or that a cooperative is able to understand and translate changes in energy taxes to the cooperative. So it appears that adequate responses to external developments is not part of professionalisation but a prerequisite.

Management capacity came forward in the interviews with A., J., S. and the first definition by M. Improved work arrangements to respect the time of the volunteers and employees came forward in these interpretations.
For technical capacity, M., T. and A. discuss the importance of more or healthy business cases and plans and actual fixed or clear income streams. M. notes the importance of good administration. There did not appear to be a consensus on the need for paid work just from the interpretations of professionalisation. Becoming more independent from subsidies (from the first definition) also relates to technical capacity.

That especially leadership capacity and adaptive capacity were not central to the interpretations might be caused by the fact that there is in general less attention to these aspects as noted by Bolton & Abdy (2007). They state that awareness is growing that in a world growing in complexity, community and voluntary organisations need to build leadership and adaptive capacities as well.

The second perspective on professionalisation – that of the whole movement – would reduce the need of cooperatives to actually professionalise. Still, there are a some dimensions of professionalisation that are difficult to cover through the network. More on this will be discussed in Sub-section 3.3.7.

3.2.3 Conclusion on definition

So, in summation, the literature review highlights that professionalism and professionalisation are highly related: professionalisation allows for professionalism to develop within civil society organisations. Still, professionalism – relating to individuals – is only one aspect of professionalisation. There are five perspectives on professionalisation - of individuals, organisational structures and processes, jobs, of activities or as a by-product of an environmental change - that can be recognized in literature, yet only three of them were recognized in the interviews – of individuals, organisational structures and processes and activities. These together matched the description for organisational capacity found in literature, consisting of leadership, adaptive, management and technical capacity.
There are two other interpretations defined in the interviews – professionalisation of the cooperative movement or professionalisation of cooperatives in relation to other organisations - though these were only backed by a few interviewees, aspects of these can also be related to the definition of professionalisation as the process of building organisational capacity and there were inconsistencies between them. The final definition of professionalisation that best matches the findings of the interviews and as backed up by literature is thus:

Professionalisation of a cooperative is the process in which a cooperative builds organisational capacity

3.3 Need for professionalisation and alternatives

With a working definition for professionalisation, it is investigated why cooperatives professionalise and whether there are no alternatives that can help cooperatives easily overcome this barrier.

3.3.1 Need for professionalisation

The importance of professionalisation was already shown to some degree in Chapter 2.2 – professionalisation and professionalism were mentioned as a challenge in multiple papers throughout the years. Also, low professionalism/professionalisation appeared to be central to the map shown in Figure 1. Nonetheless, Chapter 3.2 has shown that the aspect of 'expertise' of individuals in the original interpretation of professionalisation does not seem to completely match the interview findings. This raises whether the centrality of professionalism in Figure 1 is justified, as it relied on a different interpretation of professionalisation. Still, the argumentation for the centrality of professionalisation in Figure 1 seems to mostly rely on the behavioural aspects of the interpretation, which were widely recognized in Chapter 3.2.

The consideration of board members to professionalise starts when the cooperative is at a crossroads. The topic of professionalisation might be discussed at meetings and they need to decide how to continue (Heylen et al., 2020). That decision might be built on a need to deal with increasing project and portfolio complexity which the highly volunteer-based model cannot support, as also mentioned in Chapter 2.2 (De Graaf et al., 2023; Proka et al., 2018b). Yet, other cooperatives might want to become 'competent players in the competitive energy market [...] taking a business-like approach in project development' (De Bakker et al., 2020, p. 6) and professionalisation would allow cooperatives to scale their operations more effectively (De Bakker et al., 2020). In addition, cooperatives might want to accelerate their impact towards the energy transition and find that professionalisation can boost operational efficiency and long-term sustainability (Klagge & Meister, 2018). From these perspectives it can be concluded that professionalisation allows cooperatives to expand project portfolio and complexity and increase their organisational efficiency, and sustainability on the long-term.

3.3.2 Theory behind alternatives

However, there are options available when the cooperative does not professionalise. In particular, they can decide stagnate, merge, spawn, exit or avoid professionalisation while assuring growth of project portfolio and complexity through collaborations.

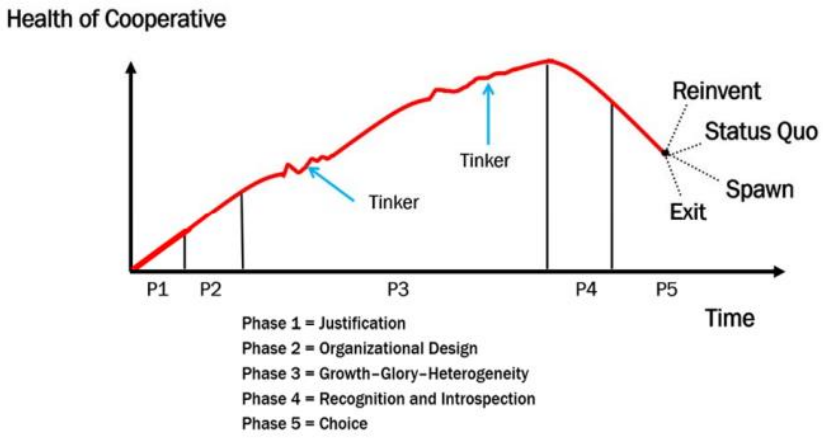


Figure 2: The cooperative life cycle (Cook, 2018, p. 5)

Cook's model is aimed at agricultural cooperatives specifically, but still provides relevant insights (Figure 2). The first phase can be generalized to the realisation among citizens that the market is failing, and that collective action is needed – the initiation of the cooperative. In the second phase, the organisation is set up and an organisational form is chosen and metrics for determining the success are picked – which perhaps can be seen as a start-up phase. In the third phase, the cooperative grows and, in the process, encounters some barriers, such as heterogeneity in preferences of members. In the fourth phase, the cooperative leadership sees the member diversity is causing fragmented coalitions and must decide how to continue – arriving at the aforementioned 'crossroads'. In phase 5, the cooperative must decide to stop the cooperative (exit), keep the status quo (stagnation), spawn, or reinvent themselves. Though Cook (2018) does not mention professionalisation, professionalisation is considered the 'reinvent' step.

The reinvent step in Cook (2018) includes changing the purpose of the organisation and changing the member and employee culture – matching features of organisational capacity building - though Cook (2018) also includes changes in legal aspects. Still, the model appears to show similarities with energy cooperative development and therefore it may be used for understanding the alternatives to professionalisation.

According to Herbes et al. (2017), professionalisation – which they describe as employing salaried staff and management – or collaboration with external partners (taking away the need to professionalise, as these take over many aspects) are the alternative steps to stopping, stagnating or merging (Herbes et al., 2017). Still, there are significant downsides to really deep collaborations with e.g. energy companies or other actors, as will be further described in section 3.3.7. The following sections will describe the alternatives to professionalisation and the final section of this chapter discusses if professionalisation is still relevant.

3.3.3 Stopping the cooperative/exit

Firstly, cooperatives can decide to stop the cooperative or stop certain projects (Herbes et al, 2017). During this process, the cooperative board must ask several questions (Avina, 1993):

- Is the close-out happing in phases which allow the beneficiaries to adapt to the departure of the cooperative?
- Are there certain links to the project that need to be preserved to make sure the project remains sustainable?
- Is there a different system in place to make sure it the impact created is not reversed (e.g. a solar panel farm is taken over by an organisation that does not have the community's best interest in mind)

If the answer to these questions is 'no', than the cooperative must first prepare their organisation for close-out or choose another option (Avina, 1993). When a cooperative does meet the requirements, there are still potential barriers: there is a risk in damaging the faith in future initiatives in the community (Meijer, 2020). There is also a risk of damaging community member relationships and social capital (Meijer, 2020). Lastly, there is a risk of undoing the impact done, especially when the cooperative sells renewable energy to its members - members might return to non-renewable energy (Lin, 2016).

3.3.4 Stagnation/keeping the status quo

An energy cooperative can also decide to stagnate. It maintains existing projects, and can therefore remain true to their local, small identity, respecting the values of the cooperative board. After this, the cooperative will most likely eventually close out or merge with another cooperative to continue its survival (Herbes et al., 2017; Cook, 2018). Over time, energy incumbent's offers might become more attractive as these still adapt, eventually leading to the organisations demise (Lin, 2016). Another barrier is that it is difficult to keep volunteers motivated and attract new volunteers (Miller et al., 2007).

3.3.5 Merging

When a cooperative decides to merge, they avoid close-out and they have the ability to invest in larger projects and combine resources (Herbes et al., 2017). Still there are a few value tensions and barriers that need to be taken into account. Firstly, there might be a loss of local support as the merged organisation might not represent local needs as well (Germes et al., 2021). Secondly, there might be a strategic and organisational misalignment between the cooperatives, which might result in tensions (Supriyanto & Burhanuddin, 2018).

3.3.6 Spawning

The cooperative can also separate into a different venture, that takes its own pathway. This might occur when there are clear sides in a cooperative conflict. Still, spawning might result in loss of expertise at the parent cooperative, and the daughter might lack professional knowledge of core members. A large conflict that results in spawning also causes significant loss of motivation in both cooperatives (Brummer et al., 2017). Still, most cooperatives tend to handle internal conflict well, and therefore it might be unlikely that spawning due to conflict happens often (M., J.). There is no research into spawning of energy cooperatives due to conflict, though cooperatives do create initiatives that operate more independently, for example in the case of Westerlicht in Amsterdam (Energie Coöperatie Westerlicht, n.d.). Still this is not an entirely new cooperative.

3.3.7 Collaboration versus professionalisation

M. already mentions the reduced needs of individual cooperatives to professionalise themselves through umbrella organisations. Furthermore, cooperatives can create a tighter relationship with municipalities or energy companies.
Herbes et al. (2017) state that collaborations with external parties is a proven strategy that nearly 40% of regional RECs and above 60% of supra-regional RECs (at the time of the study) had adopted. Herbes et al. (2017) find that the main strategy here includes the selling of green energy through a partnership with an aggregator that takes over the administrative tasks and partly also the marketing of energy. An example is the collaboration with energy company SamenOM (Appendix 2.2). Yet, there are also other types of collaborations with energy incumbents.

In Figure 3, collaborations found in literature and interviews are mentioned that can reduce the need for professionalisation. The scientific and grey literature support for the findings are placed above the findings in the figure. It is important to note here that cooperation with a municipality is often necessary for any type of production project, and therefore it is worthwhile to reach out for the municipality. Still, cooperatives can also decide not to reach out for the municipality – e.g. because they want to give an example to the municipality about how to make sustainable decisions, as was the case with Vogelwijk Energie(k). Eventually when the municipality started to become more invested in sustainable projects, Vogelwijk Energie(k) joined forces (Pesch et

al., 2018). Still, the rules of the collaboration need to be clear to both parties – a dependency on subsidies can cause municipalities to damage the autonomy of the organisation (T.).

What can be seen in Figure 3 is that there are potential issues and barriers that cooperatives might encounter when collaborating with municipalities, yet especially municipalities play an essential role in project execution, especially for locally aimed projects.
The energy cooperative network is an important source of expertise for cooperatives and improved municipal relations, yet expertise on complex projects is limited. Furthermore, it appears that provincial umbrellas mostly offer project specific support and improve the professional image of cooperatives.
Companies can be an important source of learning for technically complex projects and marketing, yet there are significant downsides regarding loss of identity and autonomy (if the company does not carry the same values as the cooperative). A mediator might be needed to resolve tensions, which requires financial capital.

Employees as part of professionalisation can overcome many issues when it comes to expertise and managerial competences, yet finding the right employees and funding forms a large barrier, as also stated by De Graaf et al. (2023) and Herbes et al. (2017). Therefore, it is understandable that many cooperatives choose a collaborative pathway with an energy company (De Bakker et al., 2020).

3.3.8 Discussion and conclusion

The first section of this chapter has shown that professionalisation is needed to allow cooperatives to expand project portfolio and complexity and increase their impact on the long-term. Though there are a few routes that a cooperative can take without taking on new collaborations or professionalising, these all seem to carry significant barriers: exiting results possibly in damage to faith of the community in future initiatives, damage to community relations or undo impact done, stagnation will eventually lead to exiting or merging, and merging can result in a loss of local support. Spawning was not really found to occur in cooperatives.

Another option to professionalisation was collaboration. Yet, from these findings a specific ‘collaborative’ pathway and a professionalisation pathway do not come forward. There are distinct nuances in the collaborations, which offer specific benefits, yet do not cover all benefits that professionalisation offer. Notably, there does not appear to be strong support for leadership capacity – most support seems to be aimed at the adaptive (networking), management and technical aspects of the organisation.

In addition, all interviewees do not give the impression that umbrellas have been able to cover all aspects of cooperative development, as they signify the importance and lacking of the capabilities of cooperatives. These deficiencies come forward in Section 3.5. For the aforementioned reasons, professionalisation of energy cooperatives is still an important topic.

(De Graaf et al., 2023; Proka et al. 2018b; Lagendijk et al, 2021; Warbroek et al., 2019; Germes et al. 2021; Zuilhof et al., 2022; Hoppe et al., 2015; M. & J.)

Work with the municipality

- Municipal processes can be slow
- Municipalities can stop funding or support during an organisational change
- Some municipalities already expect a higher level of professionalisation and they typically have a very different organisation, causing a mismatch in expectations
- Some municipalities have a dislike for certain projects, such as wind energy
- Some government officials are not a fan of civil society initiatives
- Some municipalities do not have the capacity to take on the project or offer continued support
- Communicational skills are essential. An intermediary agent might be needed.
- Can offer roofs for solar roof production and increase membership
- Might be possibility for loans or subsidies
- Access to network of municipality
- Good relations are essential for most projects (M.)

(Seyfang et al., 2014; De Graaf et al., 2023; Warbroek et al., 2018; EnergieSamen, n.d.d)

Work with umbrella organisations or work with other cooperatives towards a local cooperative of cooperatives

- Limited knowledge when it comes to more complex projects.
- Special training available for energy coaches
- Broad knowledge base & access to financial and management services for projects
- Access to professional support, which are adjusted to cooperative needs
- Access to cooperative network
- Improve the professional image of the cooperative towards municipalities and other actors and advocacy

Work with a (sustainable) energy incumbent

(De Bakker et al., 2020; Appendix 2.2)

- Organisations cannot be both producer and distributor by national law. A partnership with an energy producer is therefore always needed (M.). SamenOM is a good solution for this. SamenOM also provides support for marketing.

Resale partnership

- No actual local membership, a large amount of the profits goes to the business, but works well for financially struggling cooperatives
- Covers the complexity technical and organisation complexity of producing energy completely and low in cost

Private production partnership

- Only some civilians have access, which clashes with energy democracy
- Create a 'community feeling' when only a certain community has access to the energy
- Covers the complexity technical and organisation complexity of producing energy completely and low in cost
- Energy companies such as SamenOM can make sure the energy is delivered locally

Participation only partnership

- Covers the complexity of producing energy completely and very low in cost
- The mission that renewable energy is produced by and for citizens is completely lost (no energy democracy)

Public production partnership

- Communicational skills are essential. A project manager might be needed.
- All citizens in the area have access
- Still requires technical and organisational expertise, as in this case the cooperative produces, and investment in materials.
- Energy companies such as SamenOM can make sure the energy is delivered locally

Co-development-ownership partnership

- Covers the complexity of producing energy and lowered in cost
- Energy producers prioritize profits and the energy is possibly not produced locally. It is possible that this can create tensions within the partnership, and most likely a strong project manager is needed for negotiations. The target is to strive for at least 50% local ownership as compliant with EU targets.
- Might cause the producer to take on more sustainability values

Figure 3: Visual of known collaborations for cooperatives with sources above, barriers in red and benefits in green triangles. An additional note is made with a yellow triangle.

3.4 Conceptualisation of professionalisation pathways and factors

As a first step to better understanding professionalisation, a framework is created to organise research data. Success examples from literature and interviews have been investigated. These results are used to create a set of 'pathways' and matching professionalisation success factors and barriers.

3.4.1 Determining a suitable organisational framework

Many frameworks have been found that describe the life cycle of an organisation (Dufour et al., 2018), yet very little focus on cooperative development and mostly on companies with a strong market-focus, while cooperatives typically have a strong social and environmental focus. All these frameworks seem to follow cooperatives from initiation to large-scale development (Mintzberg, 1987; Flamholtz 1995; Commins, 2010; Avina, 1993; Reiser & Dean, 2019; De Vasconcelos & Lezana, 2012). At the same time, the issue of professionalisation seems to be especially prevalent at a certain moment in cooperative development – e.g. when the project and project portfolio complexity is thus large that a change in organisational structure is needed. The model by Nagel et al. (2015) offers a professionalisation framework for sports federations, yet the framework is focused on the forms of professionalisation and its consequences, which this is not the focus of this research. Also, this framework does not differentiate the different types of directions that cooperatives might take, as will become apparent in 3.4.2. This is also the case for the framework by Ruoranen et al. (2016). Saurugger (2012) which focuses on EU's civil society organisations, does not provide a concrete framework but more of an in-text exploration. Therefore, these frameworks might not be very relevant to structure relevant findings on professionalisation pathways, success factors, and barriers of energy cooperatives.

Of course, most frameworks are generalisations that do not exactly fit on a specific organisation. Still, it is useful to create a new framework. This allows the inclusion of aspects from different frameworks and the emphasis on the phase of professionalisation that is currently being experienced – where the organisation is already quite stabilized and e.g. wonders whether to let go of a volunteer organisation.
Therefore, it has been decided to create a conceptual framework to structure the results from literature and interviews, using some relevant aspects from organisational theories and frameworks and the different capacities of organisational capacity.

3.4.2 Successful examples: lessons about professionalisation

Six success examples - found in literature – are described so as to better understand the different ways in which cooperatives might professionalise and identify success factors and barriers in order to create a set of different 'professionalisation pathways.' These are Ecopower, Zeeuwind, Lochem Energie, KlimaKommune Saerbeck, Bronsgroen, and Beauvent.

Ecopower & Zeewind

Zeeuwind started up in 1987 when there were no other cooperatives in Zeeland and had around 3000 members in 2022. It grew its early years with the support of a local NGO, which gave Zeeuwind its provincial level focus. The possibilities of municipalities to join as members – and not just citizens – was unique for a cooperative. Housing corporations and small businesses were allowed to join as well. Over the course of Zeeuwind's development, local politicians became involved in its development. The variety of members strengthened the cooperative's position in the local context (Maqbool et al., 2023).

Ecopower started from a group of students in 1991 in Flanders and now has over 50.000 members. Many members joined when there were no other green energy suppliers and the cost of the energy was quite low. Also, in Belgium, energy producers are allowed to directly supply to their members (Bauwens et al., 2019).

Ecopower and Zeeuwind scaled up by using a provincial approach in the case of Ecopower and a regional approach in the case of Zeeuwind. Zeeuwind and Ecopower are both cooperatives with a focus on wind and they invested at a moment where wind was still in its infancy, which resulted in them attracting many new members and high profits (Maqbool et al., 2023; Bauwens et al., 2019).

With large membership growth as a result of a high number of members in the case of Zeeuwind and Ecopower especially come the needed changes that relate to professionalisation.
Ecopower had to gain new human resources and acquire new skills. They have a lot of full-time employees with specific skills – mostly related to ICT skills, to help to deal with the technologies needed for the development of projects. As project complexity and size grew, the capacity of the organisation developed – more staff was hired and structures were installed to compensate for the increasing size (Bauwens et al., 2019). The organisation of Zeeuwind works with a supervisory board elected by members and a board of directors. They advise the board of directors on large decisions and keep a check that Zeeuwind's decisions align with organisational regulations and rules relating to budget plans, cooperative strategy and projects. The board of directors consists of employees which have regular meetings in which concerns can be raised. Members can also directly go to these employees with concerns, maintaining the local focus (Maqbool et al., 2023).

Ecopower and Zeeuwind did not just generate wind energy and sold it to its members. Ecopower gave out loans to smaller cooperatives that did not have access to funding and they started investing in energy efficiency projects across the entirety of Flanders. Because they do not have experience in this, they learned from Beauvent and Bronsgroen through skills on how to implement operational efforts locally (Bauwens et al., 2019).
Zeeuwind switched its strategic direction - the first time the organisation was struggling to manage its growth - to become a knowledge centre on renewables, and technologies beyond wind were included as well, such as solar and heat pumps. Next to awareness raising events, they advised municipalities on renewable energy projects (e.g. a feasibility study) and participated in experiments for new technologies. These activities helped improve the local network, its knowledge base and standing (Maqbool et al., 2023). Though there is the general idea that cooperatives will lose their local focus when professionalising, as shown by Zeeuwind energy cooperatives can still achieve (some) local support through additional activities, and therefore this study does not intend to scare cooperatives off from choosing larger projects if they have the capacities to maintain local support (Maqbool et al., 2023).

What is seen in the examples of provincial level renewable cooperatives is the importance of a connection to the municipality for maintaining local support. Both examples also invested in a profitable energy type at its infant state. Not only did these cooperatives focus on renewables, but they diversified to include different types of projects to increase their local standing or increase the size of the cooperative movement – not competing with other cooperatives but supporting them. Networking seems to be essential to both Ecopower and Zeeuwind's activities.
During professionalisation, both cooperatives have employees to deal with the increasing

complexity of their portfolio. Clear organisational structures and rules were created, and in the case of Zeeuwind citizens are still a central part of decision making (Bauwens et al., 2019; Maqbool et al., 2023)

LochemEnergie and KlimaKommune Saerbeck

For LochemEnergie, which was erected in 2010 and had over 500 members at the time of the study by Hoppe et al. (2015), the organisation only really took off when a government official joined a municipal board. He analysed the roles of civil society and local government for the existing cooperative and engaged with community members in several ways. The official created a vision for the municipality of Lochem and picked local pioneers who would make a good board for the cooperative. A municipal subsidy helped the cooperative create a business plan. The cooperative worked with energy incumbents, which was deemed necessary at the time for project execution (Hoppe et al., 2015).
The goal of the cooperative was to increase the local economy, by using profits generated through energy sales to citizens for maintaining (and improving) the community's living standard. Combined with this goal was the goal to reverse any effects that are the result of climate change (Hoppe et al., 2015).

For KlimaKommune Saerbeck, created in 2008 and with 389 members in 2015 as an energy community and energy cooperative in Germany, the focus was on renewables within their municipality. This cooperative is difficult to compare because it was able to quickly professionalise due to a prize they won and a better institutional space in Germany compared to The Netherrlands, yet there are some interesting features relating to professionalisation. The mayor of the town decided to join a competition that could get the town the investment needed for climate neutrality activities. The mayor, not tied to a political party and therefore released from any restrictions from them, invited skilled individuals, such as engineers, scientists and economist and other residents from Saerbeck to join the project. After some further actions such as clear goal setting and giving substance to projects, the organisation won a prize that helped fund many professionalisation steps such as hiring a project manager. Saerbeck has a supervisory board just like Zeeuwind (Hoppe et al., 2015).

Some important steps are mentioned. For both Saerbeck and LochemEnergie, active, public leadership was deemed essential as they engaged in strategic and thoughtful ways to manage the energy transition – this started with engaging citizens, then creating actions plans and using their professional networks that reached beyond the local for achieving subsidies, thirdly engaging in experiments locally, and lastly attracting attention with results to further gain resources from regional and national networks (Hoppe et al., 2015).
In both examples, the use of managers to mediate between actors – especially the municipality, citizens and the professionalising energy cooperative was also deemed very important (Hoppe et al., 2015).
Hoppe et al. (2015) also said that the initiatives learned to overcome barriers rapidly and professionalised quickly.
Though the municipality played such a central role, especially in the Searbeck example, decision making in the LochemEnergie example was mostly done by citizens.
By involving local citizen initiatives (sports clubs, youth clubs, churches) in LochemEnergie, action was taken – e.g. by teachers raising awareness among students.
Nonetheless, both cases have not been able to attract the many members that they wanted – in the Lochem case this can be blamed by the 'group think' that had developed during professionalisation that was distinct from that of the community's citizens.

Bronsgroen

The focus of Bronsgroen, a Belgian cooperative erected in 2012 and with 275 members in 2019, was to have a very local focus and a close relationship with beneficiaries – which is poor households (Bauwens et al., 2019). Most benefits generated by projects are disconnected from membership. The beneficiaries don't have to purchase shares to benefit from the projects and is therefore very distinct from their members.

Households are given EE advice to combat energy poverty, which is done using voluntary work by its members and in collaboration with a few small municipalities in Limburg. The focus on energy efficiency is attractive due to low investments into energy generation. They believe becoming a supplier would severe the very local connection. No paid worker has been hired so far – Bronsgroen shows very limited organizational growth (Bauwens et al., 2019).

Bronsgroen offered its members electricity and heat from Ecopower and relied on their expertise for wind power to develop some collaborations for joint investment in the future. The collaboration between the 3 was formalised through the constitution in 2015 of REScoop Vlaanderen, which also involves other cooperatives.

The pooling of financial, managerial, and technical capacities and regular meetings of REScoop enforces the cooperative movement. It also engages in awareness raising and sharing of information (Bauwens et al., 2019).

Beauvent

Beauvent, a Belgian cooperative created in 2000 and with over 2000 members in 2019, had the goal for energy efficiency and savings and the development of renewable energy facilities. They did not have the financial and human resources to compete on the wind market and becoming a supplier would mean the loss of its local character. Still, they have a few windmills they built early on and use profits generated to advise citizens on sustainable construction and saving energy. There were some differences within the board on how to continue when the energy market was liberalized – become a supplier and grow at the expense of its local character or keep a close connection with the members as was highly valued at the start of the cooperative. They decided to keep a local character, partly also because EcoPower was already a supplier, but with a twist: BeauVent decided not to try to attract the capital from its members but encouraged investment in other projects. The cooperative shows moderate organizational growth according to Bauwens et al. (2019). New projects are still highly oriented towards EE and savings – on a national scale even. Also, it looks for small, innovative projects through which to experiment with new technologies and innovations and shares this openly, playing the role of an innovator. Beauvent also worked with Ecopower to create a few joint wind and solar projects, benefiting from Ecopower's expertise (Bauwens et al., 2019). The relations between Ecopower, Bronsgroen and Beauvent show how cooperatives avoid competition with each other.

Discussion of success examples

The goals and values carried by the cooperatives have affected the changes needed in the organisation. Ecopower and Zeeuwind developed into highly professionalised organisations that were capable of acting competitively on a provincial and regional level. They show high levels of adaptive capacity through investing at the right time, high networking, and adapting activities to the needs of the cooperative movement or internal changes. Zeeuwind also showed high leadership capacity through changes in the board. Management capacity was achieved by the creation of a board as well and through investment in internal structures and employees. The latter, combined with high profits, has also helped improve the organisation's technical capacity. Zeeuwind maintained local support through projects and board structure. Bronsgroen

remained the smallest in terms of members and did not have any employees resulting in low technical and management capacity – this is possible because they focused on energy savings and efficiency (which demands low investment) on a very local basis. Beauvent did decide to keep a local character as well yet did have a few (shared) production facilities and it used profits for energy efficiency projects on a national level and for smaller experiments that are openly shared, becoming an innovator and showing moderate organisational growth.

LochemEnergie combined social and sustainability goals for the local community and therefore kept a local focus with many local actors involved. Still, the quick professionalisation might have harmed the relation to the locals. Klimakommune Saerbeck had a strong sustainability-focused goal locally and also professionalised quickly and though they have achieved very high energy production they did not meet their membership goals. It appears that professionalisation must be a very conscious process, ensuring the inclusion of locals – adaptive capacity must be taken into account. In both cooperatives leadership capacity was very high due to a strong municipal official and they were able to execute projects due to high technical capacity achieved by pressuring the municipality.

With this in mind, it is possible to identify a few professionalisation pathways. The provincial or regional profitable pathway, involving an increase in the geographical scope of the cooperative demands a highly professionalised organisation which considers adaptive capacity especially. The local energy efficiency and savings pathway, which is aimed at providing energy savings and efficiency on a very local basis, allows for very little professionalisation, but the member base might remain at low scale. The innovator pathway, aimed at supporting small innovations and through this the energy transition and sustainability, demands some more professional development, but not to the same degree as with the first. Then there is the broad local pathway, which includes both social and renewable production goals on a local basis and demands a certain amount of professionalisation, though also not on the level of provincial or regional, due to the limited project portfolio that comes with a local focus.

From the sources it also becomes apparent that a cooperative's specific external conditions are important for their professionalisation pathways, and therefore there is no 'one size fits all' for these pathways. For instance, Cooperative Saerbeck had an opportunity to use an old military building, Zeeuwind happened to be stationed next to an NGO that would prove crucial for its professional development, Ecopower, Bronsgroen and Beauvent adapted their activities to match each other's, learning from each other along the way. The large wind cooperatives were in a geography where windpower is attractive, resulting in high turnover.
Notably, both Zeeuwind and Saerbeck had a supervisory board. This can allow the cooperatives to maximize the effectiveness of the board.

Whether to include the provincial or regional pathway for cooperatives currently is questionable. There appear to be differences in older and newer cooperatives in terms of allowed growth. Zeeuwind and Ecopower, as one of the first cooperatives in their region, were able to grow without struggling with competition with other cooperatives and invested in wind at a time when competition was low. Bronsgroen and Beauvent, created later, adapted their goals to Ecopower. Considering there are many energy cooperatives now – 86% of the municipalities in The Netherlands has one – cooperatives might have to avoid regional or provincial level renewables goals, to avoid competition with other cooperatives.
There is not much mention of collaborations between cooperatives in Hoppe et al. (2015).

LochemEnergie had a local focus and worked mostly with the municipality and energy incumbents, while Klimakommune Saerbeck avoided the inclusion of energy incumbents and the municipality played a central role. These cooperatives are part of REScoop, though it did not appear to play a central role in the paper. Both cooperatives did not reach their member base goals, though it cannot be stated with certainty that little collaboration with other cooperatives is the blame of this.

Conclusion on success examples

The examples described show clear success factors for professionalisation as described by Bolton & Abdy (2007). The cooperatives that have not been able to completely reach their membership goals show a lack in adaptive capacity though this cannot be said with certainty, while the ones with the highest member bases show high adaptive capacity, and seem to score high on other capacities as well.
The pathways just described are first concepts, yet they lack substance due to the inclusion of only a few examples. Also, there remain some questions to include a provincial and regional pathways. Perhaps, interviews with professionals in the energy cooperative field can offer further insights into success examples.

3.4.3 Insights from the interviews

The interviews were not able to offer a comprehensive storyline of successful cooperatives. Still, they have given insights into important aspects of professionalisation, which differ among cooperative types.

Interview results

M. mentioned a few examples, mostly wind cooperatives who have raised high financial capital, helping the cooperative to hire employees and get projects off the ground. Another mentioned case has a very high organisational strength, even though they have not yet produced any projects. They have a team with high diversity in skills, with clear rules and a few employees. They have used a loan from an umbrella organisation, a provincial and municipal subsidy and capital from members. Another example does not have a lot of capital but it still able to achieve change through great organisation.

M. is the only interviewee who had knowledge of cooperatives outside of The Netherlands. Denmark is an example in terms of a strong cooperative movement, though yet this was possible through a strong supportive role of the government. France and Belgium have large wind power examples, just like in The Netherlands. Still, there are few strong examples in Europe due to the cooperative sector being so young.

J. believes it is difficult to talk about success in cooperatives because some cooperatives have been active much longer – a successful one in the Netherlands was started 30 years ago, has an excellent geography for wind and is a serious business. They have managed to achieve scale while still keeping a connection to their region. Here, wind power has resulted in high turnover. The context for younger cooperatives is very different. Other strong examples have a broad member base with many different activities. They are built on a local, collaborative culture. This is much more of a challenge for cooperatives in cities.

T. mentioned large wind-based cooperatives mentioned by M. and J. as well. These cooperatives worked together to create a windmill park. T. thanked the high turnover for wind energy and that they made the step to paid employees (for administration and project development) – paid

labour was actually considered a turning point by the director of one of the cooperatives. Still, T. also considered a less commercial initiative as very successful. They work with energy fixers which are employees with a distance to the labour market. In that way, this initiative can both reduce energy poverty and help struggling citizens get a job. They are dependent on subsidies, and they also have strong collaboration with the municipality. Still, these types of cooperatives remain at a certain scale due to their dependency on subsidies and the fact that rental houses, corporately owned houses, and problematic families are not easily reached with energy savings cooperatives. They are very suspicious of energy savings projects and will often not let energy fixers in. This comes down to being persistent and patient. Sometimes fixers need to ring five times. Through word of mouth, citizens become less suspicious over time.

S&E. also deemed a wind-based example successful due to large turnover but added that it has its own building – S&E acknowledged that professional cooperatives can be recognized by having their own location where people can walk into. They also added findings on two cooperatives that investigated their surroundings and their respective needs, and they have citizens in their team with knowledge in this regard. It is not just about energy generation, but also playing into the societal and community feel. In that way, these cooperatives were able to make big steps. Through portioned tasks, the cooperatives were able to bind many members, of which some were later paid as they grew. When more money came in eventually, the first thing they did was get a building where people could walk into and go. S&E further elaborated that one of these cooperatives realised they were not improving the number of members. So the cooperative investigated: what does the actually look like? It turned out that many people live in energy poverty, so then they needed to reach a different audience.

S. believes there are many successful cooperatives, yet the ones with a very broad project base and attention to different themes are which particularly charmed them. S. sees that cooperatives which only have solar roofs are not able to grow, because it is difficult to reach new owners. One success example has been active for ten to eleven years, and are working on mobility, savings and solar. They have been working with SamenOM for a long time, allowing them to offer contracts to their members. Another cooperative has also been active for about 10 years, has a broad project base and great attention for the social aspects. S. believes they owe their success to a very broad and diverse board member base, and that multiple disciplines are discussed – not just technical aspects. The organisations are self-aware. Also, they have had more time to develop than younger cooperatives. In younger cooperatives, the success is highly dependent on the handful of board members.

Discussion on success examples from literature

Firstly, to continue with the discussion of whether to include provincial pathways, J. is of the opinion that cooperatives now do not have the same opportunities as the older provincial level cooperatives in The Netherlands. S. also states that young cooperatives do not have the time to grow their organisations like some older cooperatives did, and this creates a strong dependency on the power of the board – leadership capacity is more important than it used to be. Furthermore, there is now EnergieSamen that manages the cooperatives on a provincial level and engages in projects on a larger scale, which might further enforce that the provincial or regional road might be outdated (Appendix 2.2).

Next, most interviewees mentioned success examples as large energy cooperatives of the Netherlands which are highly professionalised. For these cooperatives the high capital raised from wind energy has helped invest in employees, which can be seen as an important turning

point for the success of a cooperative as a step towards high technical capacity. These examples match the provincial or regional profitable pathway.

Other cooperatives were mentioned as well. These have high leadership, management, and technical capacity – high diversity in skills among board members, clear rules and sometimes employees. A strong organisation reduces financial capital needed. The two examples by S&E used portioned tasks to bind members, that could later be rewarded through payment. Using capital to get a building where citizens can walk into whenever was a next important step – this was also something that one of the largest wind cooperatives did. These cooperatives also did not just generate electricity, they played into the societal and community feel. One of them even investigated the local needs to improve the number of members – playing into social aspects was also stressed by S. Cooperatives that only have e.g. solar roofs cannot reach new members – to reach new members, the cooperatives must play into more needs and diversify their project base. This shows a need for adaptive capacity. The cooperatives mentioned here seem to match the examples for the broad local pathway, except that the ones here have employees and were able to keep a local focus by investigating local needs. S. stated the importance of self-awareness. Low self-awareness and investigating local needs might have been steps that were missing among the LochemEnergie board that did not allow them to grow as much as liked. These would be leadership and adaptive qualities that often receive less attention in organisations, and this therefore matches Bolton & Abdy's (2007) findings.

A dependence on subsidies, which is especially the case for cooperatives with a focus on energy savings projects, limits the cooperative and prevents them from reaching scale (which relates to low technical capacity). These types of cooperative also rely on persistence and patience to reach the societal groups they want. These groups often think the cooperative is shady. This example matches the local energy efficiency and savings pathway.

Conclusion

The interviews have not been so fruitful when it comes to success examples, though some examples match the pathway concepts described in section 3.4.2 and add additional important success factors. The regional or provincial pathway does not appear relevant to younger cooperatives and is therefore ignored.
The success factors include for a broad local pathway especially a strong cooperative board, high diversity in skill among board members, clear rules – e.g. when it comes to task division, employees and a location that citizens can walk in and out of. Also, special attention need to be paid to social aspects, such as creating a community feel and investigating the needs of the community.
The 'innovator' type did not come forward though, and therefore there is less support for this type. Still, this does not mean this type does not exist and therefore it is still included.
In Figure 4 on the next page, a visual has been created that shows the results of Section 3.4. The three relevant pathways are shown on the left with to what degree professionalisation is needed and to what degree the aspects on the right are needed. Each pathway has a colour that is represented in the professionalisation success factors, which are organised in the capacities from Section 3.2. These colours are used because some of the aspects might be more relevant for specific pathways – aspects with a local focus are more relevant to the local pathways than the innovator pathways, and aspects with a high member base focus will be more relevant to the broad local pathway. The different capacities have been used to give a clearer overview of the aspects and show that aspects of all of these are important.

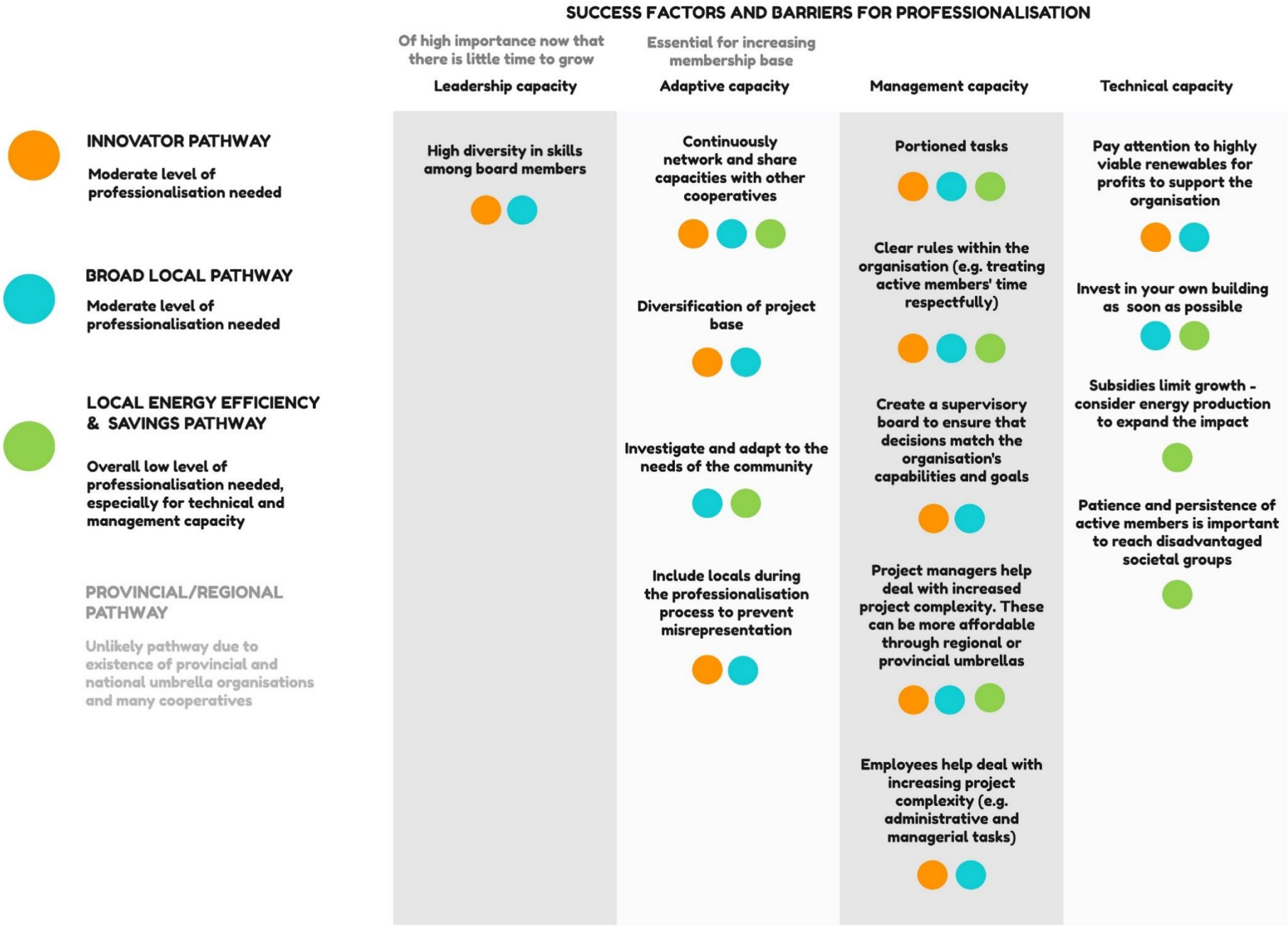


Figure 4: Visual of first attempt at a professionalisation framework, including professionalisation pathways and matching barriers and success factors.

3.5 Enriching the professionalisation framework

The previous section helped identify the main pathways that cooperatives can take and how this impacts the professionalisation needed. To further enrich the framework, interview results achieved with the method described in Chapter 3.1 are structured onto aspects of organisational theories and frameworks to identify important characteristics of professionalisation that a cooperative might have to address during their development. These organisational frameworks might also provide insights into aspects that will become important in cooperative development, even if they are not supported by the interviews. On the other hand, not all interview findings were recognized in the applied organisational frameworks.

3.5.1 Results

Leadership crisis – leadership capacity

Business life cycle theory might teach a few lessons about CSO growth in the direction of businesses. The framework by Greiner (1997) is well-known. At a point in cooperative scale-up growth, new members and employees cannot be managed just through informal communication, and they might not share the same enthusiasm – employees which are especially good at reaching financial goals might not share a strong sustainability mindset. A strong manager with the knowledge and skill to introduce new business methods might be needed in that case, and the founders have to step aside. This is called the leadership crisis (Greiner, 1997). This was also recognized by S. through personal experience, who realised they were stuck in a 'pioneer mindset'. A new board member with expertise in stabilisation and professionalisation was needed. Board members might need to leave tasks to managers or directors.

Something that is not explored in the organisational literature is a different kind of leadership crisis. Over the existence of a cooperative, the steering group will have to change - members retire, and take knowledge, capacities and passion with them. There is a special need for younger people in the case of multidecade projects – though to reach these, communicational skills are needed (Germes et al., 2021). S. also expressed that no one wanted to replace their function within the board, until they decided to make the decision to leave. S. also expressed that it is necessary to reach younger generations, but they think that hiring them as employees will be necessary to reach them. A. recognizes a quest for younger and more diversified board members.

Priority for self-assessment – leadership and management capacity

In the paper by Commins (2010) about the NGO lifecycle, the first tension that arises is the difference in the value of professionalism and voluntarism. When the organisation starts hiring staff, the question arises on how 'professional' an NGO should become. As an NGO grows, the challenge arises of whether an NGO is able to handle more tasks and grow further. A growing NGO is able to build its capacities around the main initiatives and goals, to build up basic leadership capacities, technical skills and managements systems, which will show to donors the NGO's professional capacity and its ability to achieving the strategic mission.
Skills are needed in areas such as program development and evaluation, financial management and applied technologies.
When an NGO reaches maturity – though NGO's typically never achieve real stability – it will give more attention to strategic thinking, assessment of client (member, community) needs, an assessment of the internal organisation, financial systems and external communication.
It is important that as the NGO grows, the founders are criticized for the survival of the

organisation. What changes in the lives of the benefactors is an integral part of assessing the success of NGOs – though often this indicator is missing in NGOs (Commins, 2018).

Some aspects of these steps are also found in the interviews and literature. The importance of leadership capacities, technical skills and management systems for professionalisation, project management have already been shown as important in Chapter 3.4. What changes in the lives of benefactors did not come forward in the example cooperatives and interviews – this might also be the case because most cooperatives have a sustainability and not a social focus and because cooperatives are inherently democratic organisations, representing the needs of the members, which are often the benefactors.

The importance of criticizing the founders has been discussed by S. Most interestingly though, from the interview with S. it was apparent that self-assessment – which relates to self-awareness, which is also described in Chapter 3.4 - is a relatively new topic under development – this might also be because this is something only really done by more mature organisations. S. did a type of self-assessment with their own cooperative and believes this is very important. This step might be forgotten because cooperative members are always overwhelmed with tasks, but it requires attention. The supervisory boards described in Chapter 3.4 are a form of self-assessment that cooperatives might use if they have the available manpower.

Tensions with the municipality – adaptive capacity

Showing the professional capacity of the cooperative to donors as noted as important in Commins (2010) is in reality not as important for members but it is important for the local government to view the cooperative as a professional player – this can also happen through backing organisations such as EnergieSamen (M., J., T., A., S.). According to A., municipalities portraying them as little volunteer clubs and constantly having to prove their reach, size and representability can be exhausting, and therefore is important for the municipality to see the cooperative as professional.

Though this did not come forward in the frameworks, main tensions are experienced while working with municipalities and other stakeholders according to M. and S. M. said that municipalities are the main stakeholder that cooperatives interact with. According to M., the discussion is very different when citizens are given the power by municipalities to decide on energy generation from the start of a sustainable energy generation project and become an owner, than if a developer comes in a with a plan and asks citizens their opinion. When the citizens have the power, the discussion is not ‘there is someone who wants to put windmills here and we don’t like it’ but ‘what is the goal? How do we want to achieve that? What are the pros and cons for the community for different decisions?’. Also, the money generated can be used to better the community – for example, per windmill you could expect 100.000 profit a year, but if a private developer owns that mill, the citizens would receive around 10.000 as a compensation. The discussion might not be ‘is it bad for the environment’ but ‘do we want to put a windmill here? Can we do projects from the profits, perhaps to compensate for the impact?’. Tension with the municipality will also result in tensions within the cooperative, as some members might want to continue the struggle, while other are inclined to abandon conflict. Especially with 100% local ownership, these struggles are avoided, according to M. If 200 people are put together to talk about windmills in a situation where they have been given control, there will be some frustrations, yet these fare not a serious barrier in comparison to poor municipal relations, according to M.

Cooperatives can use the Opgroei Verkenner from EnergieSamen or bring EnergieSamen to a meeting with the municipality to help create understanding and show professional backing (M., J.). Energie van Rotterdam shows the importance of a good relationship with the municipality and the usefulness of a local umbrella(see Appendix 4.1). Making clear plans with the municipality about what the cooperative works on and the municipality works on can prevent clashes according to M., S. and A.

Autonomy crisis – adaptive capacity

After a period of growth, there might be an autonomy crisis (Greiner, 1997). Lower-level managers want to become more autonomous. Most companies then delegate more power to these. This can also cause problems because low level managers are not used to this increased responsibility. New coordination systems are implemented and further growth. Still, a lack of confidence grows between the field and headquarters. Local managers start to resent strong directives from those that are not aware of local conditions. The complexity of the company's system can no longer be managed with simple, rigid system – instead, the cooperative must take a more flexible and behavioural approach to management, focused on team action. This phase is where most large U.S. companies are at in 1997, and there are no energy cooperatives which have reached this stage. Also, in the interviews no evidence on tensions in this phase were found. Except from the fact that this life cycle is not a cooperative framework, it is aimed on physical product production, and therefore there might also be some differences (Greiner, 1997). It is not expected that cooperatives will run into these issues any time soon.

Self-generative capabilities – adaptive and technical capacity

Avina (1993) determines two types of NGOs: self-generating and externally financed. According to this study, there are clear differences in the development and barriers. The NGOs which are self-generating often follow semi-formalised patterns with low level managerial and administrative sophistication and accountability. During scale-up growth, this might cause problems. The NGOs which are dependent on external funding are often beholden to the funder in more ways than just standard reporting and accounting, and typically experience more professional leadership as pushed by their parent organisation. While an externally funded organisation can very well survive the duration of its fundings without great local enthusiasm, it will most likely not survive, unless it uses the funding as a buffer period in which it attracts local interest and understands local needs.
The importance of becoming independent from subsidy support as part of professionalisation is noted by T. and S&E. Understanding local needs already came forward as a strong factor for success in Chapter 3.4. The paper by Avina (1993) supports the importance of these professionalisation factors.

Social and networking capabilities – leadership and technical capacity

Attracting local interest as noted by Avina (1993) can be related to good marketing. Reaching communities is a problem in cooperatives – marketing and social aspects often do not receive enough attention, and they also do not come forward strongly in the success examples or in the organisational frameworks, though marketing is an aspect of technical capacity.

It can be a challenge to reach new members if the 'pioneers and early adopters' group of these are already involved, following the Diffusion of Innovations Theory framework by Rogers (1962). The early majority might still join for practical reasons (e.g. lower energy bill) and a sustainability message will typically not be effective, resulting in high marketing requirements (De Graaf et al.,

2023). Typically, working with the municipality can help create trust between the cooperative and local citizens, showing the importance of improving the relationship, and therefore might lower marketing needs (HIER, 2023a; Warbroek et al., 2019).

Still, A., T., S&E, M. all mentioned a lack of communication capabilities within cooperatives, to find new members and new volunteers. For 'belonging tensions' in NGOs as described by Gonin et al. (2012), the discussion is how to manage different identity expectations among members and employees, but also among stakeholders, and how to present themselves towards external audiences. The latter is an issue that Lagendijk et al. (2021) also discusses – this paper mentions that cooperatives should find ways to portray themselves more actively in the media as beacons of transformation – currently, the framing of energy cooperatives is bland, unimaginative and with a too general mention of sustainability. As a success-example, the paper mentions a more professionalised example 'Burgers Geven Energie', a cooperative from the Arnhem-Nijmegen region, which invest in lobbying, story-telling and engage in influencing regional policy (Lagendijk et al., 2021). HIER has prepared a report to help cooperatives reach new societal groups for memberships, and central to this is the way the cooperative is represented – general messages about sustainability do not seem to be effective (Evers, 2023).

A. mentioned that cooperative boards lack an understanding that their values do not match those of others. Cooperative boards often consist of old men with a focus on technology and that are stubborn – they think they can take care of everything themselves.
S. says they either see that cooperatives put too much effort into marketing aspects and forget about technical aspects or the other way out. Cooperative members have to become more aware of what they don't know. EnergieSamen has developed a framework that differentiates 4 different disciplines for heat projects which are communication and participation of citizens, technique and business cases, collaboration with partners and governments and lastly financing. By differentiating the disciplines, it makes sure cooperatives don't focus too much on one aspect.

Monitoring of projects and impacts – adaptive capacity

In the framework described in De Vasconcelos & Lezana (2012), remarkable is the focus on measuring impacts of projects and sharing this. As social enterprises, you would expect energy cooperatives to also be highly involved in this. The fact that measuring energy cooperative impact does not seem a much discussed topic in success examples though its central in this framework, this might say something about cooperatives inability to measure their impacts properly (De Vasconcelos & Lezana, 2012). According to Avina (1993), it is important for an NGO to closely monitor project activities and the community responses to them. Very often this does not occur, or it is poorly done and needed changes in the methodology of the program does not happen (Avina, 1993).
Monitoring of progress actually did not prove to be a serious barrier according to the interviews. S&E stated that cooperatives can easily monitor electrical generation and some even give live updated on their website. J. sees that cooperatives are still underdeveloped when it comes to indicators and measuring impacts and expects that on average that the success of the cooperative is either measured by how many people are reached with the cooperative and the electrical generation of the projects. For energy savings project, T. describes how for a cooperative clear goals were formulated – doubling the number of energy coaches and house visits etc. Monthly a project manager visits an official to discuss the progress. Still, this does not monitor the community's responses to the projects on a more qualitative basis.

Performing tensions

The paper by Gonin et al. (2012) discusses 4 types of tensions: performing tensions, organising tensions, belonging tensions and learning tensions. Belonging discussion has already been discussed in 'Social capabilities and networking '.
The first tension is focused on the fact that financial and social metrics might collide – while an event can mean success for one metric, it might be failure in another. When cooperatives start to create actual metrics to measure their impact, they might run into struggles deciding on metrics and might struggle to create support for both metrics. This struggle is not something that came forward in the interviews or success examples.

Organising tensions

Organising tensions might emerge from clashing internal dynamics, such as cultures, structures and practices. On the one hand, the cooperative might want employees that enable the achievement of social or environmental goals, while they would also want employees that are good at achieving efficiency and financial gains that might not share the same passion for the mission. Though this struggle is expected to mostly arise in social enterprises wondering whether to take non-profit or for-profit legal route. This issue did not really arise in the interviews, presumably partly because cooperatives have already decided on a legal form.

According to the interviews, barely any strong, unresolvable tensions were experienced due to different opinions on the identity of the cooperative. M. described any clashes within the organisation of a cooperative – e.g. when the cooperative board is more ambitious than the members - as 'discussions', and J. described problems when it comes to professionalisation as 'necessary growing pains'. Still, the direction that the cooperative should take, can cause some frictions according to J. The older board might want to cooperative a 'cozy little club', while newer members are more keen to cooperative growth. S&E called corrected the interviewer that cooperatives do not experience internal 'problems' when it comes to professionalisation, but rather resolvable 'challenges'.

T. explained an example where a cooperative was deciding who to pay within the organisation for their labour. Members during the general meeting expressed how they thought the board earned a loan, but some board members thought that this would give off the wrong message – that they would be creating their own jobs with subsidy money. Still, one board member had a paid position as they coordinated energy coaches and wanted it to stay that way, and therefore they were asked to leave the board. They did, though with protest, as they would get a position lower in the organisation's hierarchy. Still, this relation has been salvaged over time, and it has not resulted in further developmental delays.

Learning tensions & strategic capacity – leadership capacity

For learning tensions, the discussion is about tensions of growth, scale and different time horizons. A social mission typically requires a long time horizon (this is especially the challenge with large energy projects, that can span over 30 years), while business ventures focus on short-term benefits. Attending both short and long-term goals is a challenge which is familiar to cooperatives according to literature – they generally lack strategic direction and long-term goals and metrics (Proka et al., 2018a; Germes, 2021; Brummer et al., 2017).

The importance and/or lack of strategic thinking – 'thinking in context about how to pursue purposes or achieve goals' (Bryson, 2011) - was also discussed in some form in most interviews. On the level of goalsetting, indicators, measuring and monitoring etc., cooperatives are barely

developed according to J. M. said that firstly, a cooperative must start with defining a clear strategy of what they want to achieve. If that's not there, cooperatives will not achieve their goals. M. discussed Local4local, an experiment in which energy communities generate their own energy and sell it to their own members – a price outside the market, normally energy cooperatives have to sell their energy to the market. Becoming an energy community like this is a very different goal than placing to solar parks in the village. The first would demand that a cooperative becomes a very serious player in the energy market as both producer and supplier, while the second could possibly be done in an excel sheet without further professionalisation. This shows the importance for generating a strategy. T. stated that creating a good strategy will be about gaining a new spot in the energy system – e.g. in the form of Local4local. Most cooperatives don't see this as their end goal yet – now cooperatives work more on a project to project basis. S&E do not experience that cooperatives have a strong strategy when it comes to communication. Though information is provided on how to campaign, getting the message out is often a difficulty. On other aspects, cooperatives seem to strategize a lot more. S&E do not think that cooperatives have a poor communications strategy because they lack knowledge, but because they have never done it and the board members are often pensioned, have a technical background and are busy with project realisation. Especially when it comes to production projects, cooperatives need to carefully consider how they will use their income (A.). According to A., cooperatives need to ask themselves during strategic thinking what they will need from the municipality and how they will deal with project developers, and what changes will mean for the team, and how to interact within the team. S. believes that the concept of energy communities is a good way for cooperatives to give substance to their strategy. Cooperatives need electricity generation, in order to develop de concept of energy sharing also for heat pumps and mobility.

There are no clear goals from provincial umbrellas that cooperatives can aspire to currently. There is a goal from the European climate agreement and strived by EnergieSamen about 50% local ownership of new wind and solar energy installations (De Graaf et al., 2023; EnergieSamen, 2022b). Still heat is not included in 50% local ownership concept, though heat is also a significant aspect of the energy transition. The term energy community was also mentioned by M. and S. S. says that what is considered local generation in the energy community vision is still unclear. It could be village level or regional – windmills can often not be placed in cities, but they are needed next to solar. For Local4local, the goal is that by the end of 2025, the local4local model will be developed and successfully implemented within seven pilot energy communities (Local4Local, n.d.). Perhaps this pilot will result in a clear goal for individual cooperatives, yet the goal of an energy community does appear to be quite ambitious, and might not fit cooperatives with a local focus on energy savings and efficiency.

3.5.2 Discussion and conclusion

With the use of organisational frameworks and interview results, a set of additional barriers and tensions have been identified that cooperatives need to overcome. The most relevant are 'Leadership crisis', 'Priority for self-assessment', 'Tensions with the municipality', 'Self-generative capabilities', 'Social and networking capabilities' and 'Learning tensions & strategic capacity'.

Still 'The autonomy crisis' is not yet relevant for cooperatives. 'Performing tensions' and 'Organising tensions' are also not prevalent in the interviews. Therefore, these aspects will not be included in the framework.
'Monitoring of projects and impacts' also does not appear to be a struggle during

professionalisation of cooperatives, though cooperative literature might suggest otherwise. The importance of monitoring is confirmed by Germes et al. (2021). Most initiatives were said to have objectives, though they are rarely formulated clearly and have clear outcomes. Monitoring of progress was not done by the initiative themselves – therefore, the initiatives were not able to determine if they had reached their objectives. Clear determination of indicators will be needed for every pathway, and this determination is part of becoming a more professional organisation (Germes et al., 2021). Therefore, this aspect is still included in framework.

In Figure 5 on the next page, the findings of this section have been added to Figure 4 of Section 3.4. Aspects that have been adjusted based on Section 3.5 are greyed out.

Logically, barriers need to be addressed first or success factors may not be realised. Many of the barriers for professionalisation lie with leadership capacity, which according to the S. is especially relevant now that there is an increasing pressure for cooperatives to grow. Specifically, there are some barriers within the (self-)awareness and mindset of the board. A clear strategy is an essential starting point for professionalisation in energy cooperatives, yet there is often a lack thereof – they work too much on a project-to-project basis - as stated by all interviewees. This matches the finding by Proka et al. (2018a) that cooperatives lack strategic direction. Due to its current relevance now that many cooperatives are starting to professionalise as stated in Chapter 1 this barrier is especially relevant to tackle in the next part of this thesis.

Notably, all aspects either increase the quality of collaborations with other actors (such as municipalities) or increase the member base or community support, which are eventually important for project execution or to directly help cooperatives achieve their goals, or they directly help cooperatives with project execution. At the same time, good relations with municipalities can improve the participation of community groups. These relations and to which category of the three each aspect belongs is also included in Figure 5. It provides understanding of how factors might relate.

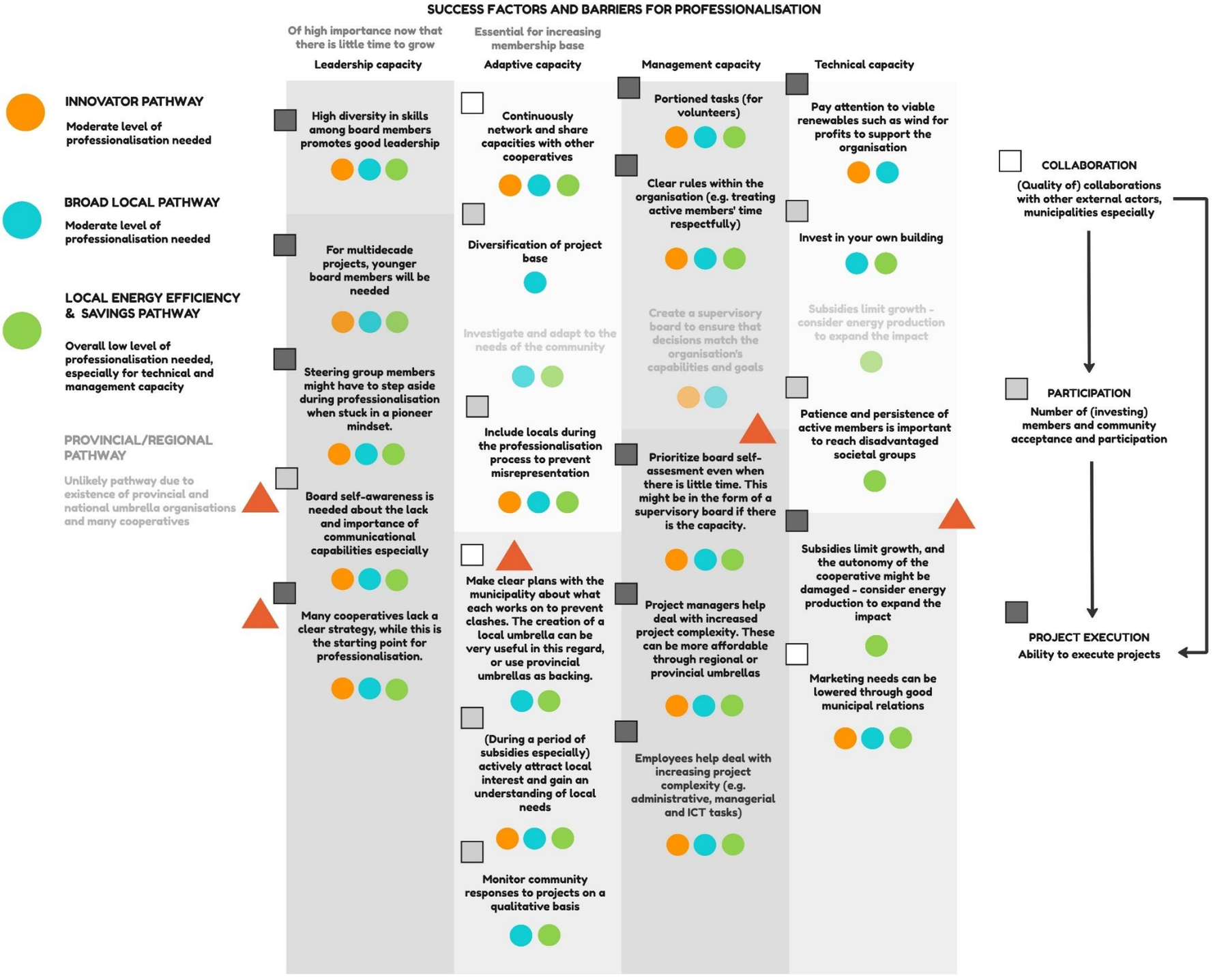


Figure 5: Visual of a more elaborate professionalisation framework, including professionalisation pathways and matching professionalisation success factors and barriers added with red triangles. Also, each factor/barrier contributes to either collaboration, participation or project execution

4 From professionalisation to gaming

In this chapter, the findings of Chapter 3 are translated to a serious game. Firstly the decision to use a serious game is explained and system elements are selected and translated to game elements and the game is designed and tested with students using flow theory.

4.1 Serious gaming to tackle professionalisation barriers

From Chapter 3, it has become apparent that strategic thinking needs to be increased in cooperative boards as a first step towards professionalisation, which is an important factor for cooperative success. A tool (beyond sharing the findings of Chapter 3) might be necessary to help this transfer of knowledge and insight, cooperative board members tend to be stubborn and stuck in a certain perspective (S., T.). Furthermore, Edwards et al. (2019) state that there is a significant need for tools for complex problems involving multiple stakeholders and scales, which the challenge of professionalisation appears to be, due to the large variety of variables involved, connectivity between variables (Figure 1), evolvement of the problem over time (the road to professionalisation is different for younger than older cooperatives), the complexity of the variables involved and the involvement of multiple goals (Funke, 2003).
A variety of approaches to training have been assessed by Martin et al. (2013). The most relevant ones are shown below in Table 2. The paper discusses training for jobs and is therefore different from cooperative team members, though the definition is adapted to this in Table 2.

Table 2: Different training methods according to Martin et al. (2013)

Training method	Description
Game-based training	Participants immerse themselves into decision-making challenges, exploring various strategic possibilities and experiencing results that affect other participants, without posing any real-world risks to themselves or the organization
Lecture	The spreading of study materials through verbal instruction by a coach to a group of participants
Mentoring and apprenticeship	A one-on-one partnership between a novice cooperative with a developed one, or a team member learns from a team member of a developed cooperative. Mentorship is about the provision of support to less experiences cooperatives/team members, while apprenticeship is for job skill development
Programmed instruction	Instruction is delivered through an electronic device (e.g. computer, CD) without a coach being present
Team-training	Includes the interaction of participants in a group, to increase mutual knowledge or train the entire group a specific team-skill
Role play	Participants act out a certain character in a made-up scenario or multiple scenarios, and learning occurs upon reflection of the scenario(s)
Simulation	A simulator is used to improve specific skills of participants through repetition, within a multisensory environment that imitates the real environment. VR training is a special form.

The methods are not mutually exclusive, though hybridity of methods is not thoroughly discussed by Martin et al.(2013). Of particular interest for this research is so-called game-based training, for it allows the cooperative board members to try different strategies for their cooperative. Since energy cooperatives lack the resources to try different professionalisation strategies in real life, a game can create an arena for experimentation (Gugerell & Zuidema, 2017).

Closely related to game based learning is serious gaming. Of both, the goal is to use the entertaining characteristics of games for the objective of learning, and serious gaming can be seen as the tool for game-based learning (Schrader, 2022).
Serious games can be both physical, digital and hybrid (combining physical and digital elements). The development of a digital game is typically costly and time-consuming to create, so within the timeframe of this thesis, a physical game is most suitable as a learning tool (Haring et al., 2011).

4.2 General method for the game design process

Chapter 4 is inductive, explorative research and design based research, meant to investigate the ways in which energy professionalisation can be supported through a serious game (Azungah, 2018). There is a large variety in serious games. Simulation games have been proven effective in research, policy and education (Duke & Geurts, 2004; Klabbers, 2006, 2009). They can be defined as: 'experimental, rule-based, interactive environments, where players learn by taking actions and by experiencing their effects through feedback mechanisms that are deliberately built into and around the game' (Mayer, 2009 p. 825). Serious (simulation) games can be made with the method of Peters & Van de Westelaken (2014) of which the steps are to gather design specifications to create necessary conditions and a vision for the game, to do a systems analysis in order to better understand the problem and to be able to accurately simulate the system in which the problem exists, to actually design the game and lastly to evaluate the game. Lukosch et al. acknowledges the usefulness of the method by Peters & Van de Westelaken and adds another step focused on debriefing, for which a structured method can be found in Kriz (2010). The Triadic Game Design Philosophy is useful for structuring the results, which focuses on balancing reality, meaning and play in the game. The steps in Peters & Van de Westelaken (2014) are elaborately described below and a debriefing step is added.

1. Gather design specifications

Firstly, the objectives of the game needed to be clearly stated. The interviews performed for question S3 have given insight into necessary design specifications – e.g. the composition of the board, the personalities that exist therein and the context in which the game might be played. Further details on the design specifications can be found in Section 4.3.

2. Systems analysis

The goal of the systems analysis is to find the factors and actors of the energy system relevant to different strategies and their relations (Peters & Van de Westelaken, 2014). A large portion of the system analysis is done through the map from Section 2.2, which showed a variety of interrelated factors that affect cooperative success. Further system analysis is performed in Chapter 3. These findings showed the different routes cooperatives typically take and how this relates to a variety of professionalisation barriers and success factors. Next, the funding and project options, also essential for the professionalisation process, are investigated. The specific method and additions to the system analysis can be found in Chapter 4.4.

3. The game design

In this step, a selection of relevant system elements is made for the game, then the translation into game elements is done, the choice for a game format (e.g. board game), and the game is worked out 'on paper' (Peters & Van de Westelaken, 2014). This took various iterations with students as participants. Flow theory is used to improve interactive gaming experiences (Hammady & Arnab, 2022; Kiili et al., 2014). This step is covered in Sections 4.5 – 4.7.

4: The construction and final testing

This step is left to the last sub-question and covered in Chapter 5. This step has been separated from this chapter as this required a different methodological approach – whereas the game design requires an exploratory approach, the latter is evaluative.

4.3 Design specifications

The paper by Peters & Van de Westelaken (2014) contains a list of questions to ask to generate design specifications. The first questions concerns the goal of the game is. To reiterate, the goal is to increase strategic thinking for energy cooperative board members. Next is the topic of evaluation of the game, whether the goals have been achieved, which will be elaborate described in Section 5.1.

To tailor the game to meet the specific needs and circumstances of energy cooperative board members, the characteristics of this target group need to be specified. This will increase the relevance and effectiveness of the game and avoids creating any broad, false generalisations. Most cooperatives are typically run by pensioned men (and sometimes women) with a technical background (M., T. S&E). The cooperatives themselves are started by citizens, and not by companies or municipalities, considering these might run into the largest professionalisation barriers as these lack a professional foundation (Avina, 1993).
Furthermore, identifying the developmental stage in which cooperatives find themselves is important. The focus will be relatively young Dutch initiatives (loosely estimated around 3-5 years old) which have started up and finished their first few projects yet lack clear strategy for the future and struggle with the complexity that comes with starting more projects – meaning that they have arrived at the question on how to continue described in Section 3.3.1 (HIER, 2023a). This means that older, highly developed cooperatives such as Zeeuwind, which was established in 1987 and with 2997 members is the largest cooperative in The Netherlands are not the main focus of this research (Maqbool et al., 2023). About 257 energy cooperatives were created in the start-up period of interest, which is more than a third of all cooperatives, meaning that there is a large group of cooperatives that could potentally benefit from the game. Concrete examples might include Haagse Stroom Cooperatieve Vereniging U.A., started in 2018 or Energiecoöperatie Westerlicht U.A in Amsterdam, started in 2019 (HIER, 2023a).
Further design specifications are described in Table 3.

Table 3: Design specifications as based on the interviews. The questions are taken from Peters & Van de Westelaken (2014, p. 53-57).

Category	Question	Design specification
General considerations for the design	What is the (preferred and allowed) size of the group of participants	The number of cooperative members run a cooperative can vary. Some cooperatives are only run by 2 people, though this cooperative is still very small. Cooperative boards often have the position of chairman, secretary and treasurer, so the game should be playable with 3 people.
	How will participants be grouped during the simulation game?	It is beneficial for creating a mutual decision if cooperative board members can work together towards a plan. Yet, as this is also an inspirational tool, it should be possible to split the group to generate more ideas.
	Looking at the 'tone' of the simulation game, what aspect(s) should have the emphasis and in what way will the participants be involved in the simulation game?	There will be intellectual processes and the emphasis is on intellectual involvement, though the game may also be useful to resolve any emotional tensions within the team on decision making due.
	Are the issues addressed within the simulation game predetermined or are they generated by the participants, and to what degree are they able to choose their own actions?	The issues addressed are somewhat generated by the participants during the game. The participants can determine their own 'base conditions' to start with, to simulate the position that their cooperative is in. In terms of freedom, participants will be given a set of choices to make to reach their goals. They will be presented the potential downsides of each choice.
	Are there specific messages, ideas, solutions, that have to be conveyed by means of the simulation game?	This message should be transferred implicitly. By not making good, conscious choices, the cooperative might not get the result they want.
	Is the simulation game to be 'loaded' with a predefined representation of the 'real life' situation	The game follows a predefined representation of reality, though many of the pathways that cooperatives might take are possibly not yet used in successful cooperatives, therefore giving freedom to experiment
	What level of abstraction is desired?	Reality should be accurately represented to allow cooperatives to try different strategies that they can apply to their cooperatives. Still, the system analysis has shown a great deal of complexity, and therefore some processes - such as aspects of project execution - will be simplified.
	Are there any time limitations and will the same group of participants play the game more than once?	Cooperatives are typically only active for a few days a week and volunteers don't have a lot of time. One round of the game should preferably be playable within an hour. A cooperative can try new routes as much as they like. For the testing (this is not with cooperatives) there should be 15 min included for preparation and 15 for debriefing.
Elements of the simulation game	Is the sequence of actions sequential or iterative?	The sequence of actions is both iterative and sequential, as would accurately represent reality – certain projects cooperatives can do multiple times, yet some can only be done once.

Category	Question	Design specification
Elements of the simulation game	Is the use of a computer based accounting system needed?	The use of a computer based accounting system might not be necessary. Though a computer based accounting systems allows for a very realistic scenario (especially in the case of e.g. financial management), the results of the game will not be about highly exact metrics and metrics will be simplified, reducing the number of metrics that the players need to keep track off. E.g. keeping track of money, environmental impact, wider societal impact and community impact.
	Is there information that should be kept back?	The facilitator should not show during the game which routes work best, so the players can figure out themselves what works best for them.
The use of the simulation game	Are there wished and/or restrictions in relation to the room where the simulation game is to be executed?	Cooperatives often don't have their own location to play the game. Still, they might play the game at a member's house, at an umbrella organisation building or a municipal building. There are no significant restrictions related to this.
	Should participants be placed in a positions similar to the real life situations	It will not be essential to put participants in a position relating to their real-life situation. The game is instead meant to give members a new perspective. Also, the number and position of participants might vary, making it difficult to assign specific positions.
	Are there any wishes concerning activities immediately preceding and following the simulation?	Cooperatives must be able to easily understand the rules - for this, a prior presentation should not be necessary and a clear manual is needed, so they can play it whenever they want. Part of the manual should be dedicated to reflective questions the cooperative members can ask themselves after. The game will be played on its own, so board members can easily play it in a short time frame.
	Who will be the facilitators of the simulation game and what are their skills?	The facilitators of the actual game will be the cooperatives members themselves, allowing for flexibility. Municipalities or umbrella organisations that are keen on playing the game with certain cooperatives might also facilitate. One member might be appointed to making sure the game flow is fluent (e.g. stopping discussion when it becomes unfriendly or too lengthy) and explaining any rules along the way. The facilitator needs to be good at managing the communication during gameplay and explaining the game (some communicational skill), so probably a Chairperson.

4.4 System analysis

The system analysis is useful to understand the problem of focus and the system and reality in which the problem persists in order to simulate it accurately. In this thesis, the problem is low cooperative success and specifically a lack of professionalism. As the reader might notice, a large portion of the system analysis has already been done Chapter 2.2, which has given a system map of barriers for the success of energy cooperatives and Chapter 3 has shown the different basic pathways that cooperatives take and the different barriers and success factors for professionalisation that exist within these. Still, there is not a complete picture of the system in which professionalisation of energy cooperatives persists: the projects that cooperatives engage in and the funding they use for these projects and the cooperative's organisation closely relate to professionalisation – they are important aspects of an energy cooperative's reality. The following sections describe these aspects.

4.4.1 Energy cooperative projects

This section provides an overview of projects that cooperatives typically engage in and what barriers (e.g. marketing, collaborative) and benefits (e.g. financial, social) are expected. As section 2.2 has shown, executing projects is a central part of energy cooperative reality.

Energy cooperatives benefit from broadening their portfolio in order to reach new community groups (S.). Furthermore, project types might vary in viability over time, for example because of variations in capital costs - because there is very high demand or political issue - or because good locations for wind are running out (Internal Energy Agency (IEA), 2023; Hand & Wiser, 2012). At the same time, costs for technologies might drop – this is quite likely for wind and solar, for example due to lower capital cost and design improvements (Hand & Wiser, 2012). Renewable energy projects might do especially well in times of gas related crises though crises can also result in governments cutting out fundings (Kraan, 2023). On the other hand, lower gas prices can significantly delay energy cooperative progress. Cooperatives might be forced to take more risks and be more responsive to market changes (HIER, 2023b). An economic crisis can have negative effects on the entire energy transition even though gas prices might drop (Yergin, 2022).

This section does not encompass all projects that cooperatives engage in, only the ones with the highest relevance. According to De Lokale Energie Monitor (HIER, n.d.), most cooperatives engage in solar, wind, heat projects and savings projects. Solar projects, which more than two-third of the cooperatives work on, include typically solar roof and solar field (on land) projects. Wind projects typically include windmills on land – there is not mention on wind on sea in De Lokale Energie Monitor - though there has been increasing effort from EnergieSamen for wind mills in sea (Appendix 2.2.). Heat projects include the collective procurement of heat pumps or other individual solutions (such as insulation), green gas, and most cooperatives that engage in heat are working on a heat network. There is a large variety of sources for heat networks. Most cooperatives use heat from surface water, rest heat or mixed sources. Some use heat from sewer water, geothermal, biomass, or soil. A few of these sources were further investigated to get a better understanding of the types of barriers cooperatives might encounter in these projects. Energy savings projects typically include energy coaches or helps, informational meetings, sharing website information and the sharing of energy savings kits (HIER, n.d.). Some other projects that will become more prevalent in the future or that do not match these categories are included as well.

Next to the interviews described in 3.1, terms including the energy source, 'energy cooperative' and 'The Netherlands' or 'energie cooperatie' and 'Nederland' were used through Google Scholar searches for actual scientific data on the use of these technologies by energy cooperatives if available. Consensus was also used as a tool to get more specific sources which were not available through Google Scholar (Consensus, 2024). Google search was used for articles from e.g. HIER, EnergieSamen, news outlets for public responses and to fill gaps from scientific searches.

District heating

District heating projects require cooperation with multiple parties and the distribution of responsibilities and tasks (T.). According to HIER, the heat transition presents a significant challenge. It often involves complex and capital-intensive projects that require a great deal of specialized expertise and the transport distance for heat is often limited. Responses from cooperative survey participants of HIER indicate that not all energy cooperatives are eager to venture into collective heating projects for these reasons. Cooperatives feel that they lack the necessary expertise. Often, district heating projects involve different partners from both state and market. Cooperatives might join initiatives. At the moment, there are a few 'frontrunner' cooperatives which can almost start their district heating network or are already in initiation (Schöne, 2024). These emphasize the importance of the relation with the municipality for project realisation. A few energy sources are reviewed to give further insights in district heating projects.

For **aquathermal energy** (e.g. heat from surface water and sewer water) more and more cooperatives are taking initiative towards investigating new heat sources, such as in the case of Soester Energiecoöperatie, after the municipality and water authorities had dismissed the idea in the area due to high complexity and cost (Sellis, 2024a).
In the case of the town Heeg, described by HIER, the costs ran up to 23 million, which could be paid through subsidies and funds. A different company was created to carry the risks of such an investment. Still, whether the project was capable to continue, was highly dependent on the citizens of the area, because they would pay for the energy (Veldkamp, 2023).

For **geothermal energy**, the legal and technical hurdles are large, considering geothermal energy needs to comply with strict safety and technical regulations and there can regularly be stops in the supply due to technical and safety issues (Nederlands Instituut Publieke Veiligheid, 2024; Brandenburg et al., 2023; Van Seters et al., 2021). Also, on average a geothermal plant requires significant investment and therefore a strong business case (for 30 years) is needed to convince authorities permission, and financial knowledge is needed to run the project – therefore a consultant or project manager is needed (Geothermie.nl, 2021; Brandenburg et al., 2023; T.). Around geothermal energy there might be some anxieties about possible damaging tremors or other risks, as is the case with geothermal energy in Delft (Omroep West, 2024).

A bioplant is often used as a last resort in The Netherlands to overcome technical complexity barriers that arise with other renewable technologies according to HIER. It is typically quite expensive in comparison to gas (Jorna, 2018). Ijskoud is a cooperative that uses biogas from different cow farms to supply to a few companies nearby – they say to supply an equivalent of energy use for 900 households a year (Ijskoud, n.d.). Yet there are also other facilities that create gas from bread, such as of Amsterdam Energie, yet they say to only be able to supply cooking for about 8 homes a day (Rietveld & Lie, 2018). So, the generated heat can vary, but it is in general

too little to form a significant source of heat, and it cannot be implemented on the existing gas network if it not first turned into green gas (Jorna, 2018). There were no sources found that explicitly stated large citizen resistance to biogas projects – the problems seem to be more from a technical nature.

For **industrial waste heat**, the marketing aspects towards citizens seem to not be a barrier, as there is no mention of this in literature. The technical complexity of rest heat is low – the company that generates the heat often takes care of those aspects (Nationaal programma lokale warmtetransitie, n.d.). The industry often offers the heat out of goodwill and will demand compensation for management of the heating – still, the investment must be attractive enough for the companies that generate the heat (Nationaal programma lokale warmtetransitie, n.d.; Kampman et al., 2019). The production generated depends on the heat generated by the industry and the heat is typically used in companies and home nearby. In Rotterdam, a project finished in 2014 was said to supply 95000 home-equivalents of heat through a pipe originating from the industrial areas of Rotterdam (Didde, 2014).

Collective procurement or isolation or heat pumps - Marketing knowledge needed is dependent on existing energy prices – when energy prices are high, it will be easier to gather people for collective procurement. It is always important to have a clear understanding of the target citizens - marketing plays an essential role in collective purchases by highlighting the benefits and creating awareness among potential participants (Wang et al., 2013).

Wind

Off-shore wind projects are an example of wind energy production. The legal, technical, financial and marketing requirements are very high in comparison to other projects. This is because for building off-shore windmills various permits and licences are needed, such as environmental permits (Akerboom et al., 2019), the project requires significant technical expertise due to complexity of construction and maintenance, and to financially manage such an expensive project is a hurdle due to the need to set up a strong business case to receive funding and permits – often collaborations with large energy companies are needed (Bauwens et al., 2019; Proka et al., 2018b). The marketing can also be an issue, considering it might take serious effort to convince shoreline communities to accept the off-shore windmills, if they're close to shore (Steins et al., 2021). The last tender that EnergieSamen engaged in failed (EnergieSamen, 2024).

The oldest cooperatives were based on **on-shore wind** projects, and cooperatives are especially useful for creating acceptance for these type of projects, as the public typically shows a NIMBY mentality (De Graaf et al., 2023). The production capacity can be high, depending on the size of the project – larger windmill park projects such as of Zeeuwind experience a different production than a single (often inefficient) village windmill (Maqbool et al., 2023; Proka et al., 2018b). Marketing is also a special challenge, as many communities, municipalities and provinces (such as Utrecht, Groningen and Friesland) have a dislike for wind energy (De Graaf et al., 2023). Wind energy has been a serious success factor in older cooperatives, but urban and younger cooperatives might not be able to profit from wind energy like these cooperatives did, because it can be difficult to gain access to locations. Many good locations have been claimed by non-local parties, and project developers buy ground meant for sustainable energy development (De Graaf et al., 2023). Wind projects can cost up to more than 10 million, while solar roofs cost only a few tons, and are with this expensive projects for cooperatives (S.). Cooperatives can invest in wind mills together to be able to afford this (T.).

Solar

Solar fields are overall more accepted than windmills, reducing marketing expertise needed. Overall, technical knowledge needed for photovoltaic solar systems is low (Brummer, 2018). A. agreed that solar is overall easier to implement than wind. Still, a typical solar field generates much less electricity than a windmill (Provincie Zuid-Holland, n.d.; Son & Ma, 2017).
Small net capacity is another problem that both (especially larger) wind and solar parks experience. Long waiting times for connections lead to project delays and delay in access to subsidies and reaching subsidy terms (De Graaf et al., 2023). S&E mentioned an example where a project that a cooperative was working on for years was called back by the municipality due to net congestion. This was not communicated properly, resulting in frustrations within the cooperative.

Roof solar panels typically involve little technical expertise in comparison to wind. Often they can be placed through ready-made packages (Brummer, 2018). Marketing is overall quite easy, as roof solar panels are often regarded positively by both citizens and companies. Still, there are legal and financial issues relating to solar panels – there are intense fire hazard and theft laws that typically require additional investment for fiscal support (De Graaf et al., 2023).
Also, companies are not willing to share their roofs, because, for example, with the current energy prices it is more attractive to invest in solar panels themselves, and it can be difficult to cooperate with housing corporations, mixed owners associations and municipalities (De Graaf et al., 2023). Production is mostly small upon finishing a project (in comparison to wind production according to J.) – e.g. placing solar on a company roof.
In larger cities there is often space for solar roof projects, and net-capacity is not seen as an issue. Still, human capacity at the net manager can cause delays (De Graaf et al., 2023).
S&E explained that a cooperative often starts with a few volunteers that get a subsidy from the municipality for realisation of a solar roof. Next, the cooperative looks for investors (members) to realise the first project, and a contract is made with a supplier. The path from starting a cooperative to the realisation of the first project can often take multiple years. During that period, only money is spent, putting cooperatives in a difficult position – the Valley of Death, as T. explains it. To get projects off the ground – talking to roof-owners, to suppliers for good pricing for panels and use good documentation to gather money from owners – takes a lot of effort according to S. S. sees that cooperatives which only have solar roofs are not able to grow, because it is difficult to reach new owners.

Savings projects

Savings projects are general much more labour intensive than production projects because you are dealing with many houseowners, which are also diverse and therefore difficult to grasp (S.). As savings are generally attractive from a cost perspective, marketing offers often need to be low – yet if the aim is on reaching people that live in energy poverty, it might is difficult to reach them and create trust (T.). Energy helps (which make small adjustments to a home and can give basic advice on savings) can be set up quite easily, as typically a 2 week training for volunteers is needed to make them energy helps that can give citizens advice and make small adjustments to their home, such as place radiator foil (Gibot et al., 2023; Hilgersom, 2023). These materials are often low in cost and in some cases paid by the municipality (e.g. in the case of Delft) or paid through donations (Hilgersom, 2023; Gibot et al., 2023). The direct impacts are often not very large – energy coaches give advice, but based on a study by Milieu Centraal (2020) only 19% actually implements all the improvements, and 39% a part (mostly

isolation tips). Savings projects can be well combined with job creation, e.g. for people who are distanced from the job market (Hilgersom, 2023). Savings projects typically do not generate financial benefits for the cooperative, which can be problematic if there is no existing production (as shown in Section 3.5). Energy cooperatives often collaborate with municipalities for energy savings projects, and these sometimes offer funding (HIER, n.d.).

Future technologies

Two types of energy projects are included that are still in a very experimental phase, but that might become more viable in the coming years. Considering the strategic focus of the game, it is important to consider the future of cooperatives. It has been decided to include **battery storage** and **heat through hydrogen**. The IEA (2021) write in their Net Zero by 2050 pathway report that they believe that towards 2030, the government will have to focus on making new low or zero-emission technologies marketable. From 2030 to 2040 these technologies are to expand. Battery storage and hydrogen are two technologies which are in development – in 2020, the first cooperative hydrogen projects were launched, which were still experiments. Hydrogen can be generated using cooperative wind power and solar (HIER, 2020b). The Dutch government has goals to increase the electrolyse capacity of The Netherlands to 8 gigawatts in 2032 – (Ministerie van Economische Zaken en Klimaat, 2024). The first subsidies have been given out to hydrogen producers and accounts for 101 megawatt in 2028 – therefore there is still a long way to go, in which cooperatives might play a role. Large-scale battery storage – which can also be in the form of hydrogen - is also currently at a pilot stage on a national level (Sellis, 2024b).

At the same time, large-scale battery storage has a more questionable future according to HIER. They might not be needed for the energy transition. Currently, the business case for large-scale batteries relies on the statement that it might resolve net congestion. Yet, net congestion is already being directly addressed. Still, HIER states that batteries are to become important for the energy transition, as a means to avoid the need for subsidies to keep projects and business models viable (Sellis, 2024b). The IEA states that 'Batteries are key to the transition away from fossil fuels and accelerate the pace of energy efficiency through electrification and greater use of renewables in power' (IEA, 2024, p. 12).

It is difficult to make conclusions on the benefits and barriers for hydrogen projects and grid-scale batteries due to its novelty and the fact that grid-scale batteries might be created using different technologies. Still, it is expected that marketing efforts will not be particularly high for hydrogen. Hydrogen might be created inside windmills (HIER, 2020b). Most issues for hydrogen development appear to be technical (Le et al., 2024). Meanwhile, large-scale battery projects might have a significant scenic impact, which might also result in higher marketing requirements (Sellis, 2024b). There is a fear that there will be issues with requiring material for construction due to high future demand and ethics related to the production of rare materials needed, yet this will also play a role in currently viable technologies (Murdock et al., 2021; Energy Transitions Commission, 2023).

Other

Awareness raising activities (which were not discussed in De Lokale Energie Monitor, but do seem to play a large role according to Section 3.4) can be a bit more difficult in terms of marketing, considering awareness raising does not have direct financial benefits for citizens. Awareness raising activities are relatively inexpensive to organise. Still, there is little assurance for actual savings (Hoppe & Coenen, 2016). Awareness raising events can be combined with other community activities to increase the local interest (Maqbool et al., 2023).

Community events and investments could improve awareness about the energy cooperative, the environment and enforce a community feeling from which a cooperative also benefits. Some marketing effort might be needed to attract people, depending on the event – a neighbourhood party might attract people faster than an awareness raising event, as many citizens do not feel attracted by a sustainability message (Evers, 2023). Community members are directly involved. Examples are the building of a community centre and monuments by Zeeuwind or investment into a neighbourhood bus as described by A.

E-mobility, which combines well with car sharing, is also possible. 50 out of 702 cooperatives work on e-mobility, though De Lokale Energie Monitor did not give a thorough analysis of this technology at its current stage (HIER, n.d.). Vogelwijk Energie has started a electric car sharing service trial, and Soester Energie has 8 cars (VogelwijkEnergie, n.d.; SoesterEnergie, n.d.). Marketing can be complicated due to the existing anxieties around electric vehicles and sharing. Savings depend on if the electricity used for driving is renewable and how frequently the car is used – it is important for cooperatives to research this to ensure an improved impact (Verschuur et al., 2019). E-mobility can be connected to e.g. cooperative solar panels, using the cars as storage for solar energy. Often e-mobility projects stop due to little local interest (HIER, 2020a).

Experimentation spans over a variety of technologies. HIER mentions amongst others innovation in cable pooling, direct delivery to the customer and energy storage. Experimentation allows energy cooperatives to test new technologies and business models in a safe, controlled environment, fostering innovation (Van der Waal et al., 2020). Even though experimentation might not directly result in income, it is able to change the institutional context in which cooperatives exist, e.g. in the case of national government experiments (Van der Waal et al., 2020). Experimentation also involves local citizens, possibly increasing local interest.

Conclusion on project types

There is a large variety of projects that cooperatives engage in and there are significant benefits in engaging in many instead of focusing on one type only. Furthermore, it is important that cooperatives move along with changes in the energy market and take more risk when it comes to projects. Heat projects are often of such complexity and cost that they are not interesting for individual cooperatives to invest in on their own. Also, many of them are still in development towards a viable technology. Engaging the community to pay for such communities can be a crucial aspect.Wind on land and solar field and roof projects are viable technologies, but the cooperative movement has not been able to participate in wind at sea. Still, solar projects often encounter significant legal and infrastructure barriers. Wind projects are often of significant cost yet highly viable. For both, finding locations to place new parks are becoming increasingly straining. Engaging the local communities can be a problem for both technologies.
Savings projects, which typically includes informational events and energy coaches, do directly engage citizens yet do not produce an income, creating a dependency on external funding if no production projects are present, as also discussed in Chapter 3.5.
There are also other projects that do not fall within these categories, but can help community engagement or form an addition to other technologies.
Hydrogen energy and large-scale batteries, which will probably play a more significant role in the future, are included as well. It is difficult to make conclusions on the barriers these technologies will encounter due to their novelty yet material and ethical barriers will most likely be encountered here as well.

4.4.2 Sources of funding

Sources of funding need to be taken into account as it is needed to start new projects and improve the professionalism of the energy cooperatives - such as hiring employees, as stated by Herbes et al. (2017). A clear income stream is important according to the interviews. M. stated that a cooperative has to be financially healthy as part of professionalisation. According to S. having financial means is an important part of professionalisation, because without money you stay dependent on volunteers, and these will inherently leave with time and are limited in availability. While there are many funding possibilities, this study mentions the main ones as determined through EnergieSamen (n.d.c). To get an understanding of the available types of funding, a large portion of grey literature was needed – there are few scientific sources that give up to date information on funding types, which vary over time as shown in the case of Zeeuwind.

Larger projects are funded for 80% to 90% with bank loans or funds, and access to funding has strongly improved over the years, especially because of the efforts of the cooperative umbrellas (HIER, n.d.). It is important to note that some funding types change over the years, for example governmental funding, and therefore not all types are relevant over time (Chapter 2.2). For now, with increasing attention for sustainability in Dutch policy that will be needed to match EU policy, it is expected that government funding will remain a possibility – still, as the institutional space has been unstable in the past as seen in the history of Zeeuwind (Maqbool et al., 2023) (European Commission, n.d.c). Three national government funding types are included: innovation subsidies, the Subsidieregeling Cooperatieve Energieopwekking (SCE) and Stimulering Duurzame Energieproductie (SDE). Most collective solar is funded through SDE-subsidies (HIER, n.d.). The first and third are non-specific for energy cooperatives, though the second is. Furthermore, the Realisatiefonds is a fund specific for solar projects. It demands that a cooperative already has access to SCE. The Ontwikkelfonds is there to help cooperatives set up larger wind and solar projects. Cooperation with energy incumbents can be a good way to avoid funding. Banks are also a way to access funding, though there are significant barriers for large or small projects. Lastly there are subsidies or loans available on the provincial or municipal level, though these vary significantly. Sharing investment with other cooperatives is also possible, and can assure 100% local ownership (Geskus, 2022). Furthermore, there are subsidies on the European level (ELENA), but these have not been used much yet (HIER, n.d.). Also not included is the Programma Aardgasvrije Wijken subsidie, which is deemed essential for district heating projects and can be combined with other subsidies. Yet, at the time of study it was uncertain when this subsidy would be available again (De Graaf et al., 2023; Schöne, 2024).

Discussion and conclusion on funding

In Figure 6, the different types of subsidies and loans are compared on multiple axes. This is a qualitative judgement based on the information below each funding type. From this it does appear that for most projects there is some type of funding available. Still, for very large heat projects there does not appear to be consistent funding available, for it typically ends within 15 years or is only for starting up the project, while very large collective heat projects typically run over 30 years (De Graaf et al., 2023). Also, for (neighbourhood level) district heating projects, there is uncertainty for essential funding. For subsidies and loans extended to civil society initiatives or specifically cooperatives, there are less boundaries when it comes to financial (and businesscase) or legal requirements. The more local a cooperative gets in terms of loans and subsidies, the smaller the loan that can be expected and the more uncertain that funding or a subsidy is available or will remain constant over time, though the opportunities for creating a strong local foundation and networking possibilities increase.

(De Graaf et al., 2023)

Government subsidy (Innovation subsidy)

- Does not need to be paid back
- Demands that there is already funding available for administrative costs and necessary co-funding
- Only covers costs of employees, not temporary hires

(De Graaf et al., 2023; HIER, 2020c)

Government subsidy (SCE)

- Does not need to be paid back
- Funding for smaller & larger projects through exploitation (receive funding for energy generation)
- SCE only for production, of wind (on land), solar and water
- Government funding can suddenly change over time during political changes or economical crises
- Typically only offer loans for 15 years. Doesn't work for large collective heat sources, as they need 30 year funding typically

(EnergieSamen, n.d.a)

Realisatiefonds (umbrella organisation and banks)

- Easier access to funding than through bank
- Min. € 30.000 and max. € 1.000.000 - finances when a bank think the investment is too small
- 25% of project funding needs to be covered by the initiative
- Only for solar projects
- High and varying interest rates
- Demands access to SDE or SCE

(Rijksdienst voor Ondernemend Nederland, n.d.)

Government subsidy (SDE++)

- Many different technologies (also geothermal), funding through exploitation (receive funding for energy generation)
- Does not need to be paid back
- Only large scale production
- Application demands very good business case and technical expertise
- Typically only offer loans for 15 years. Doesn't work for large collective heat sources, as they need 30 year funding typically

(EnergieSamen, n.d.b)

Ontwikkelfonds (umbrella organisations, government)

- Easier access to funding than through bank
- Guidance and expertise support from EnergieSamen included
- Meant for funding starting up a project (research, permits)
- Funds setting up the SCE/SDE subsidy
- Guidance and expertise support from EnergieSamen included
- Does not need to be paid back if a project cannot be executed
- Only in Drenthe, Limburg, Utrecht, Zuid-Holland en de Achterhoek
- 30% of project funding needs to be covered by the initiative for solar/wind and 20% for heat projects
- In case of project success, a large portion needs to be paid with the loan (up to 200%) depending on the technology

(De Bakker et al., 2020)

Cooperation with energy incumbents

- SEE: Sources of learning 'work with an energy incumbent'

(Geskus, 2022; Seacoop, n.d.)

Sharing investment with other cooperatives

- Keep 100% local ownership
- Opportunity for networkbuilding
- Might financially become complicated for very expensive projects, and therefore demands central cooperative of cooperatives (such as with Seacoop)
- Prior production projects can be necessary to chip in

LOWER NEEDED FUNDING

(De Jong, 2023; De Graaf et al., 2023; Provincie Gelderland, 2024; Nucciarelli et al., 2010)

Provincial subsidies/loans

- Does not need to be paid back in case of subsidies
- Opens pathways for further networking on more provincial/national level
- e.g. 3500 - 100.000 or 200.000 euro funding - so typically only smaller projects
- 25% of costs needs to be covered by the cooperative itself in both cases
- Varies per province which funding is available, and some provinces are not interested in wind, such as in Utrecht

(De Graaf et al., 2023; Proka et al. 2018b; Lagendijk et al, 2021; Warbroek et al., 2019; Germes et al. 2021; Zuilhof et al., 2022; Muftugil-Yalcin & Mooijman, 2023)

Municipal subsidies/loans

- Does not need to be paid back in case of subsidies
- Opens pathways for further cooperation and networking
- Typically, funding is extended only to smaller projects
- Varies strongly per municipality which funding is available - some municipality are altogether not interested in sustainable energie production (by cooperatives)
- Funding is sensitive to changes in the goals of the municipality and can be vague
- Municipality can push for certain types activities

(De Graaf et al., 2023; EnergieSamen, 2022a)

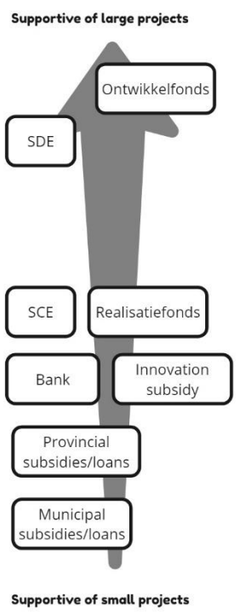
Bank

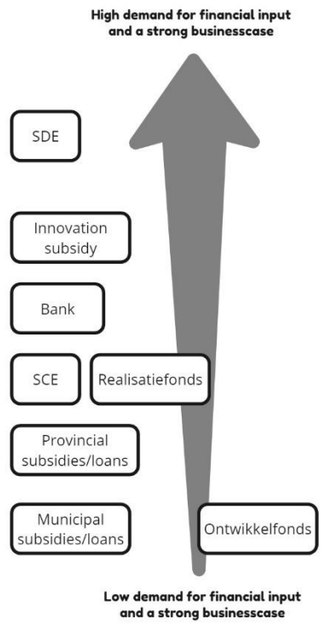
- High loans available
- High and varying interest rate
- Typically only offer loans for 15 years
- Doesn't work for large collective heat sources, as they need 30 year funding typically
- Doesn't work for large scale wind and solar, due to EU UBO legislature, that demands that all benefiting members are screened

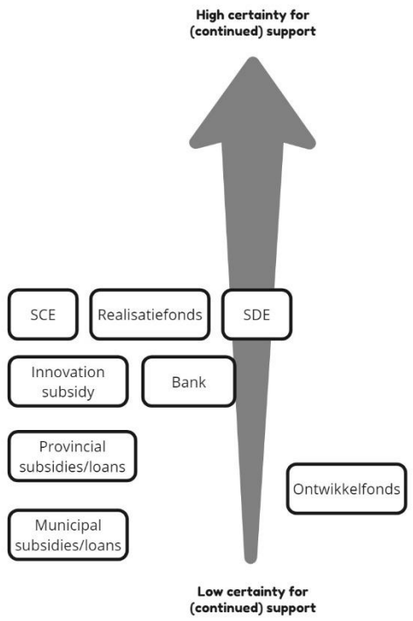
(De Bakker et al., 2020, Wierling et al., 2018)

Existing projects/funding & investment from members

- Keep independence
- Most cooperatives will most likely not have the resources on their own to support large projects
- Cooperatives in general avoid investments with a higher risk when dependent on members







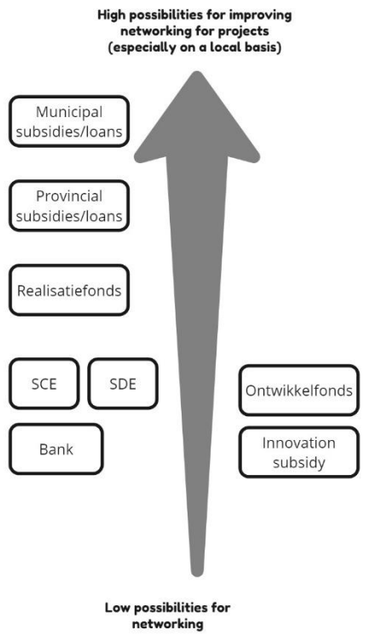


Figure 6: Visual of known sources of funding for cooperatives as based on the literature above the sources with barriers in red triangles and benefits in green triangles & a comparison on a variety of axes

4.5 Ensuring flow

For designing and improving the game, the concept of flow is taken into account. Flow is important to make educational games enjoyable and entice learning. In this section the concept of flow is explained. In Section 4.6 any considerations on flow are discussed in the translation of system elements to game elements and in Section 4.7 for each alteration made to the game an explanation is given about how flow is altered.

The paper by Kiili et al. (2014) includes a framework to design and test flow in games (Figure 7), as based on the concept as firstly described by Csikszentmihalyi. The words in the grey areas represent 'flow antecedents', which are factors that support the 'flow state' (Kiili et al, 2017, p. 369). The white triangles surrounding the star (context, pedagogy, representation of content, learning objectives and learner characteristics) represent significant factors influencing the design of the learning experience and are not further explained in the paper. On the edges of the pentagon, five 'mind lenses' are included, which are based on the concepts of cognitive load theory, constructivism and multimedia learning theory. Flow antecedents do not bind to factors surrounding them and the order of them is not relevant. Flow antecedents include:

- **Clear goals** that are needed so that the player can stay focused on tasks within the game. A goal is best chosen at the start. The goal should also be divided into sub-goals and have the players reach them at a fitting pace to create a feeling of success. The goal is to be related to the learning objectives within the game.
- **Feedback** that is needed to let the player know how they are performing and show whether they are approaching their goal. With immediate feedback, the player will stay focused, while cognitive feedback will entice players to reflect on their experience and change their gameplay strategies. Personal feedback is preferred if possible.
- **Playability** which means that controlling the game should be automatic and spontaneous, while the educational content is to be processed consciously and reflected upon. It is about making a game that matches the skills of the players. Bad playability can result in the player directing too much attention to the inappropriate activities. Still, the designer should be careful not to oversimplify the gameplay so that no learning occurs.
- **Challenge** which is about balancing boredom and anxiety. The player could alter their goal to match their skills. Flow can be increased by letting players solve problems together.
- **Sense of control** which is about having the player feel like they are in control even when they are not. The player must sense that they can reduce mistakes to almost zero by improving their skill.

The mind lenses include:

- **The lens of the sensing mind** which is about sensory memory. Players can only pay attention to some things at once. The player must select the most important game elements for processing in the working memory, which can be done through design – e.g. audio-visual elements could be used to grasp the attention.
- **The lens of the processing mind** which considers that humans typically can handle no more than seven elements of information at once. It should be remembered during

design that every action takes up space in the working memory. Working with visual, haptic and auditory information simultaneously can expand how much information a player can handle so they learn more.

- **The lens of the integrating mind** which is about the role of long-term memory in intellectual skill development. The prior experience and knowledge of the player matters, and they might not be able to deal with a certain level of complexity. By connecting prior knowledge and new knowledge from the game, which could result in long-term learning.
- **The lens of the relating mind** which is about how multiplayer games can increase learning, because players want to learn to increase their social status. Also, players need to be encouraged to collaborate, e.g. through collaboration scripts that structure interaction. Also, breaks in gameplay where players can have informal discussions can trigger learning.
- **The lens of the transferring mind** which is about the different ways in which knowledge can be transferred. There is a distinction between near and far transfers. Near transfers are about using learned knowledge in very similar context, whereas far transfer is about using knowledge in very different contexts.

In the 'flow state', **concentration** is important to allow the player to forget about e.g. what other players or the facilitator think of them, thoughts that could impair their gaming experience. When the player does not think what other players think of them, there is **loss of self-consciousness**. **Time distortion** happens when players are having fun or find the activity so interesting that they forget the passage of time. The game itself should also be a **rewarding experience** (because it is fun and interesting).

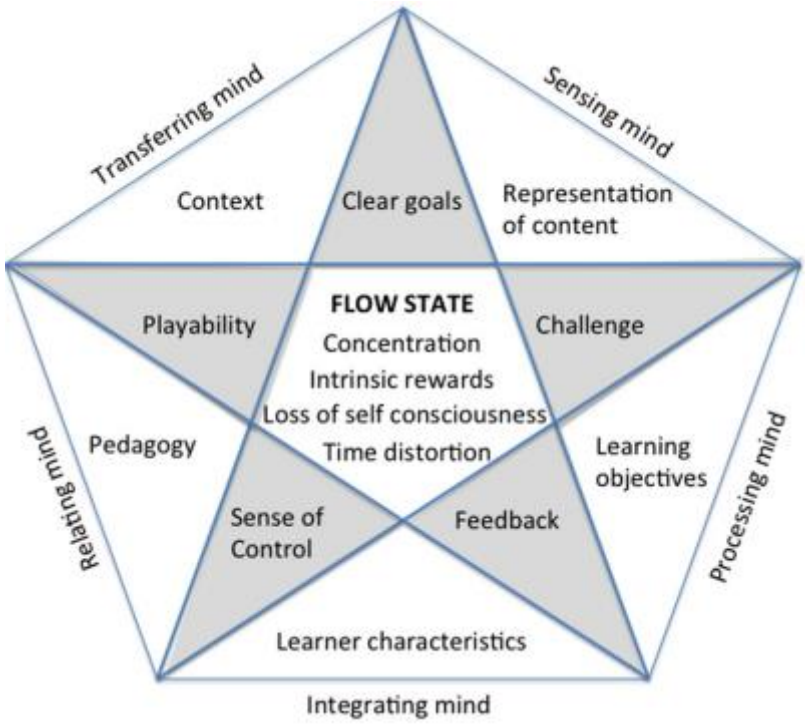


Figure 7: Flow framework for educational games (Kiili et al., 2014, p. 369).

4.6 Decision for system elements & translation to gaming elements

To translate the findings of the system analysis into the game, some choices need to be made. Not all elements from the pathways are relevant. Each relevant system element has its own title and is connected to a gaming element, see Table 4 (Peters & Van de Westelaken, 2014). The choice for the system element and how it is represented in the game is shown as well below the table. The matrix helps identify if certain gaming elements or system elements are poorly represented, helping to determine game balance. Though the matrix's main intent in Peters & Van de Westelaken (2014) is to improve ideation and checking the inclusion of elements during the first steps of the design process, it is here mostly used as a final check.

What becomes apparent from the matrix is that there is a lot of 'data'. Many of the features need additional information on the board or on cards. This amount of information might become overwhelming in final testing – although icons are used to maintain the board's cleanliness. It also becomes apparent that there are quite a few accounting systems, especially when you take into account that the sustainability indicators are multiple bars – this can also make it difficult to track the game.
Furthermore, there are many decisions the player can make to increase their organisational capacity or project portfolio. This can be overwhelming as well, and therefore the players might need to take a few minutes to look at all options before playing their first action. This could relieve the **processing mind** and improve **playability**. Playability could also be improved through reducing the number of project types and organisational actions available, yet testing would tell if this was really necessary. Preferably the options are kept to improve realism and representation of professionalisation. In **bold**, aspects of game flow are included.

Table 4: Matrix of game elements and system elements

	Cooperative	Projects	Organisational capacity	Communication & participation (marketing)	Collaboration with partners & governments	Funding	Goals	Project execution	Sustainability indicators	Time	Long-term strategies
Scenario											
(Un)expected events											
Roles											
The macro cycle											
Steps of play											
Rules											
Decisions											
Data											
Indicators											
The accounting system											
Paraphernalia											

The cooperative (Section 3.4)

- *Roles* - The cooperative itself is the player. There are no other roles in the game. A multiplayer cooperative game will allow the board members to discuss and cooperate in a way that they would if they would be talking about their own cooperative. Also, it would be possible that cooperative members play with each other, though as separate cooperatives. This might convey the message of how collaboration is important between cooperatives. Still, the game is aimed at professionalisation of individual cooperative.

  Cooperatives tend to not compete with each other such as stated in Section 3.4 and rather complement each other competences. A competitive game that each player as a cooperative tries a different strategy therefore might not represent reality. The other

players might also be other actors, such as energy companies, because cooperatives might compete with these. Still, the game is then expected to mostly convey messages about how to deal with energy companies, which is not the main message. Also, it might be difficult for cooperative leaders, as idealistic, post-materialists to place themselves in the position of companies. They might not behave like real companies would. Still, cooperative board members could also play the game on multiple tables in 2 groups, improving learning and fun through the **relating mind** as a multiplayer game.

- *Decisions* – at the start of the game, the participants can decide on starting conditions to better match their current state – helping connect prior knowledge and new knowledge through the **integrating mind**, improving long-term learning, and the game will feel more applicable to the real-life situation (increasing the inclusion of the **transferring mind** through near transfer).

Projects (Sub-section 4.4.1)

- *Decisions* - There are many project actions the player can choose. Not all projects are included for simplicity and some are combined to relieve the **processing mind**. 'Community improvement' is a simplification of 'Other environment-focused and/or community-focused events and activities, such as repair events and village shops'. Many large heat projects have been removed in the game as a project in the Projects area, because realistically the cooperative can only really join a large heat project as one of many partners. Instead, many larger heat projects are included in opportunity cards, as projects to join. This does not necessarily accurately represent aquathermal or bioenergy, of which there are examples of cooperatives organising these projects themselves – the choice to place these in opportunity cards is mostly one of reducing complexity by reducing the number of project options on the board.

- *Data* - an area on the board is dedicated to project actions, with icons and a description, and requirements.

Organisational capacity (Figure 5)

- *Decisions* - There are many organisational actions the player can choose. These are all based on the barriers and success factors found in Chapter 3.5 to have the game feel more realistic to what professionalisation entails. 'Self-assessment and/or supervisory boards' are not included, as the game itself is already a form of self-assessment. This is the same for 'Monitoring of projects and impacts'. The number of actions is reduced to 10 to relieve the **processing mind**. All organisational aspects help improve the capacity of the cooperative to do projects and achieve their goals in one way or another: some directly by allowing cooperatives to increase their project portfolio, others by increasing the participation of community citizens and others to increase the collaboration with other actors - such as municipalities. The different actions are described below:

  'Invest in human resources' combines portioned tasks, clear rules within the organisation and looking for new board members (with new skills/that are younger and do not carry a pioneer mindset). 'Hiring a project manager', 'Hire paid staff', 'Invest in your own building' and 'Make clear plans with the municipality' are directly taken from Figure 5. 'Investigate local opportunities' combines continuously network, actively attract local interest and gain an understanding of local needs and monitor community

responses to projects on a qualitative basis. 'Opportunity cards' can boost members through cooperation with local actors such as churches and repair shops, which offer physical locations to interact with members and help spread the word. The specific examples within opportunity cards are taken from the sources of the success examples and interviews (Appendix 2.3, Bauwens et al., 2019; Maqbool et al., 2023; Hoppe et al; 2015). Meanwhile, 'Exchange knowledge with other cooperatives' and 'Invest in other citizen initiatives' represents continuously network and share capacities with other cooperatives. Also, 'join forces for a cooperative of cooperatives' includes the creation of a local umbrella to improve relations with the municipality. 'Invest in marketing and social skills' allows the players to directly invest in lacking communicational capabilities.

- *Data* - An area is dedicated to organisational actions, with icons, a description and requirements.

Communication and participation (Figure 5 & Chapter 3)

- *Rules* - you need a certain member base to be able to invest in many of the projects. The member base shows how many community members within your area support and invest in your projects. Investment in the organisational growth section increases your member base.
- *Indicator* - This is an indicator, in the game simplified to 'Members'. Members increase the amount of money.
- *Data* - Icon and a name is used to indicate on the board if investment increases the score for this indicator
- *The accounting system* - There is a simple bar with a pawn that tracks the progress for this indicator, showing direct **feedback**.

Collaboration with partners & governments (Figure 5 & Chapter 3)

- *Rules* - you need a certain investment in collaboration to be able to start many of the projects. The idea behind this is that you need the municipality's and often other actor's support to be able to successfully create projects and networking can help find new opportunities, which will be needed in an energy industry in which non-local actors are aggressive to take viable locations.
- *Decisions* - The cooperative can decide to invest in relations with the municipality (organisational actions), work together on projects (options in opportunity cards/pilot projects) and invest in other cooperatives or share information to get more collaboration. Opportunity cards can boost collaboration through cooperation with local actors such as churches and repair shops.
- *Indicator* - This is an indicator, in the game simplified to 'Collaboration'
- *Data* - Icon and a name is used to indicate on the board if investment increases the score for this indicator

- *The accounting system* - There is a simple bar with a pawn that tracks the progress for this indicator, allowing for quick **feedback**.

Funding (Figure 5 & Sub-section 4.4.2)

- *Decisions* - You need a certain monetary investment to be able to pay for many of the projects and also get access to funds and organisational actions. The player can choose 4 different types of funding. In Figure 6, there are many more types of funding, yet to relieve the **processing mind**, fundings are combined – municipal and provincial subsidies due to their similarity are combined and loans are combined. The governmental subsidies (SCE & SDE) – which is highly important to many cooperatives – are taken into account as well, as is own investment through the cooperatives own fund. The goal of the game is not to have players think about funding too long, as this is not the central focus. Dependency on subsidies can be limiting and risky for cooperative development, and local funding is riskier than governmental funding, following 4.4.2. and the relating barrier from Figure 5.

- *Data* - Each funding has its own colour and with text on the board the funding is explained. Chips that match the colour of each funding type are used to keep track of which funding the players have used.
  A stacked coin icon on the board shows if the cooperative will receive money for actions or at the start of steps.

- *Accounting system* - Coins of 1, 5 and 20 are used. Paper money is possible as well, but coins are less dominant, making the game feel less like a monopoly game, which is important as money is, though an important factor in cooperatives, not the main goal.

- *Paraphernalia* – it might be necessary to, at the end of game, use pen and paper to calculate costs for loans.

Goals of the cooperative, movement, Dutch government and EU (based on Chapter 1 and 3)

- *Rules* - The final goal – e.g. 60% new renewable energy in the area - can be chosen by the player. 50% local ownership of wind and solar is an important goal stated in Chapter 1 and 3.5, yet preferably cooperatives take a step further to dominate energy production with 60% local ownership. Also, heat is not included in 50% local ownership concept though heat is also a significant aspect of the energy transition, and therefore it is included.
  The in-game goal makes a first attempt at stating what an energy community may entail: including 60% locally owned production and maximized member involvement. Furthermore, a goal is included to alleviate energy poverty (as was an important goal of Bronsgroen) and one related to energy savings on a larger level (in the case of Beauvent). Also, a goal is included towards boosting sustainability overall in The Netherlands, as was observed in Beauvent and Zeeuwind (later on its development).

- *Data* - How to reach the goal is explained on a 'goal card', in this text stars are used to indicate to what degree the player has achieved their goals. **Clear goals** are created with clear markers on the board for some of the goals.

Project execution (Sub-section 4.4.1)

- *(Un)expected events* - Issues that might arise before, during or after project execution are represented as event cards. Projects have a run time of a few steps, allowing problems with project execution to come in between. Some estimations are made here about the amount of steps needed for each project.
- *Data* - the cards explain in text what happens and what the player needs to change. Event cards, and positive and negative results of event cards are sometimes represented with boosts or hinders. This is done because some events can affect specific actions (e.g. wind projects are negatively affected) – and then a small object can be placed on the board, instead of using a large card with a lot of irrelevant information, relieving the **sensory mind**. 'Diversification of the project base' from Figure 5 is included through hinders and boosts, as not every project is always profitable. Event cards improve the fun of the game by adding another element of surprise.

Sustainability indicators (Sub-section 4.4.1)

- *Indicator* - Electricity, heat and energy savings are included. Heat and electricity increase the amount of money, because savings projects are often not economic. Only these sustainability indicators are used because most cooperative projects focus on either of these. Other sustainability indicators are not included to relieve the **processing mind**, though e.g. how many community projects you do does form part of one of the goals, so in that way other social indicators are included.
- *Data* - icons and a name are used to indicate on the board if a project increases the score for an indicator.
- *The accounting system* - There are simple bars that track the progress for these indicators, pawns are used to track the progress on the bars, offering immediate **feedback**.

Time (Sub-section 4.4.1)

- *Steps of play* - There are 21 steps, from 2025 to 2035. There are two actions per step. This number of steps was decided because some estimations can be made for the period towards 2035 (Sub-section 4.4.2, but after that it is mostly speculation, and 2035 is already a significant goal for energy cooperatives when they currently think more in a project to project basis.

Long-term strategies (Section 3.5)

- *The macro cycle* - The participants are encouraged in the introduction, during gameplay and debriefing to consider thinking in long-term strategies through the facilitator and discussion. Also, the game itself encourages a future outlook. Through questions, the **integrating mind** can directly be triggered. Personal **feedback** can be offered by a facilitator or by co-players.

4.7 Iterative game design testing with students

The game elements described in the previous Chapter were achieved through a series of iterations, where the game was redesigned and tested with the help of students from the TU Delft. In total, 6 students helped improve the game through informal workshops. The goal was to have the game be played within an hour as determined in the design specifications, accurately represent professionalisation, be playable (at home) and motivate strategic thinking. When adaptations to the game were made, this was often in batches due to time constraints. Before testing with students, there was always a test by the researcher to make sure that any added game elements would not break the gameplay or complicate it too much, so playability was always maintained. In **bold**, aspects of game flow are included.

4.7.1 First game concept

Firstly, the first game concept was generated. A set of goals was created for 2050, considering that's when the EU has major climate goals and a set of options was created for actions that the player can do and how these actions would relate to the 4 disciplines. These actions were then split in to organisational actions and project actions to create a clear distinction for the player (relieving the **sensory mind**).

4.7.2 First round of tests – researcher only

The first decision for a game format was a board to track the steps of the game, the progression of projects and to create an area to put action cards that were played – thereby creating mostly a card-based game. The idea was that cooperatives could easily print and prepare the game at home. Firstly, the researcher did two game tests and improvements were done only through paper prototypes to test the mechanics mainly – creating a somewhat functioning game. Though the mechanics did work, with the amount of cards for projects, organisational actions and funding types, the game became quite cluttered and confusing, as was expected from Section 4.6 As a result, the decision was made to move everything except the organisation actions to the board. 'Funding chips' would show how many times a project was done. Organisational actions were kept separate because it was not necessary to use a board for them (no chips or trackers needed to be placed on them). Through the use of different kind of items, the **processing mind** is relieved.

4.7.3 Second round of tests – 1 player

After the researcher made sure the improved version worked, a first test was done with a student, because they might play the game very differently or not understand it the way the researcher had. It became clear that there were still issues with the balance of the game – it was very hard to achieve the goals, mostly because the event cards would result in significant hinders and subsidies would often end suddenly, creating large problems for running projects. Even though this might be realistic, the subsidies were adapted end within a few turns and the consequences of most cards would be less detrimental, improving the **sense of control** and the **challenge** the player experiences and with that the fun. This would also represent current reality more, as the Dutch government is prioritizing sustainability more and more – whereas Zeeuwind often struggled with funding, access to funding has been improving (Maqbool et al., 2023; HIER, n.d.). Also, some important organisational actions were not played at all due to high cost - the initial costs were rough estimates and they did not represent the benefits they offer, making other actions with similar benefits and lower costs more attractive - so the cost was reduced, making sure that these aspects are also included.

Furthermore, it was clearly much better to invest in projects in large batches at once due to a mechanic. This most likely does not represent reality, as there has not been proof in the success examples or other research that cooperatives benefit from investing into many projects in waves. To resolve this issue, the player could only invest into projects if they received an opportunity card for them, and they needed to invest within a few turns.
Lastly, the game was unsatisfactory for the player if the players already knew they were not going to reach the main goal. By adding multiple score possibilities through 1, 2 or 3 stars, the player would still be happy to continue even if they knew reaching 3 stars would be impossible. This improved the **challenge** provided as the difficulty is lowered and **feedback** improved as it was given more gradually throughout gameplay as the players over time achieved stars.

4.7.4 Third round of tests – 2x2 participants

After the game was adapted, the game was tested with 2 groups of 2 students. There were two sessions to see how different starting conditions and different event and opportunity cards could affect the results. Also, different types of players might experience the game differently. In the first session, also the manual was tested. This was done because ultimately this game should be playable without a facilitator. Because the gaming session took 2 hours, which was really long for the participants, the manual was not tested in the second session.

In the first session, the players were able to play the game with barely any help, though it took about 5 turns before they completely understood how to play the game – which is problematic. The gameboard was deemed confusing – it was not clear what to find what was described in the manual. A better flow on the board and the inclusion of organisational actions was deemed important and a more visual manual.

In the next session, there was more content-related feedback – it was deemed strange that you would have to wait until you would find the right opportunity for investment. The players would have a lot of money, but no possibility to spend it on the wind and solar projects they needed, causing frustration.

Furthermore, the players could use a funding type of 'shared fund' in which the cooperative would pay for a project with other cooperatives or energy companies. It wasn't used in both tests, even if there would be significant reduction in costs. Players would want the entire production output of a project and not half, because then double the turns would be needed to achieve the goal.

As a result, the game was changed to have the organisational actions included on the board and the board was organised in separated areas (relieving the **processing mind** and **sensing mind**). A feature was added where investment at the start in wind and solar was possible or affordable until a certain step to better emulate reality and prevent from players building up investment for one unrealistically large investment. Hydrogen and batteries would become an option when wind/solar became unavailable. This is realistic and adds another aspect of strategizing as these technologies require existing renewable energy. This also reduces boredom during gameplay by adding a new game-phase (improving the **challenge**). The goal was reduced to 2035 instead of 2050 to better match the predictions for the technologies involved.
In the test there was little money at the start, but a lot at the end and no way to spend it. To solve this issue, the following features were added: if there would be investment in 9 organisational actions, this would result in one extra action per turn – this also showed the importance of all organisation actions - and operational costs were added that would result in the organisation becoming more expensive with more projects. These adaptations improve the realism and the

sense of control. When players get the option for an extra action per turn when they invested in all organisational actions, this also entices players to think further ahead.

4.7.5 Fourth round of tests – 2 participants

The latest version was tested again with 2 participants to check how the just added mechanics would change the game. The main issue here was that it was too easy for them to reach the goal of 3 stars – they did show strategic thinking in-game, yet there didn't appear too much challenge for the players. External funding was always readily accessible, not representing reality. This was caused by the problem that subsidies were very overpowered as they almost completely covered all project costs. This became very notable now that there were more actions possible. The subsidies were made closer to reality, which made them less rewarding (increasing the **challenge**)

4.7.6 In-game goal testing & pace

During informal testing with students, the goal used was for 60% renewable energy, because it was expected that most cooperatives would have this goal. The researcher tested all the other goals on their own and made small changes to them as well to improve their **challenge**, but there was no time for elaborate testing. With a high pace, the game could be played within an hour, excluding explanation and a few test rounds. An additional 'fast guide' was made to help players speed up during gameplay.
After feedback from a player and observations it became clear that the maximum of players for this game should be 3. With 2 players, discussion already slowed gameplay significantly, and 3 people is expected to be the limit to keep gameplay fun, while still allowing discussion (relating to **sense of control** and **playability**)

4.7.7 Conclusion on flow

The game required many adjustments to become playable within an hour which was the aimed timeframe decided in the design specifications. Most mentioned features are aimed at relieving the processing and sensory mind, so that players can focus on thinking strategically. Some adjustments were needed to more realistically represent financial struggles. The low initial playability is understandable considering the complexity of the energy system and the different pathways cooperatives can take. Also, there was an issue of little control in the game – this is realistic, though to keep gameplay fun some of the realism needed to be reduced. Special attention needs to be paid in official testing to the processing mind, considering some players might be elderly and not regular gamers. This also relates to playability – players must not be so overwhelmed by different elements that they cannot do actions automatically.

4.7.8 The final game

The final game board is shown in Figure 8. The complete game is included in Appendix 3. It clearly shows all the professionalisation success factors and barriers represented in the organisational actions, except the ones that are represented by the game itself (improving strategic thinking, diversifying the project base and moving away from subsidies). The inclusion of all these aspects is meant to create a realistic representation of professionalisation.
Many projects and funding types are included, yet not all, and a few sustainability or success indicators. The costs for projects, organisational actions and funding are estimates – in the case of projects, the costs relative to each other are estimated based on Chapter 4.4.1. These simplifications reduce the realism of the game, yet the tests with energy cooperative board members will show whether these reductions have an impact on truly how realistic the game

feels. At the same time, the event cards showed several barriers in project execution.

When it came to the three pathways determined in Chapter 3.4, the game allowed players to take a more local, broad focus (e.g. through energy community goals, which demanded investment in heat, energy and participation), an innovative, non-local pathway (e.g. through the improving overall sustainability goal, which involved participation in pilots and in other cooperatives) and the local energy efficiency and savings pathway (which required investment in energy coaches and community improvements). The energy reduction pathway to 60% reduction also fit the broad local pathway description, as this also required investment in energy generation projects for income. Also, it is attractive to invest in different energy types through the inclusion of hinders and boosts.

Still, in reality a broad project base increases the member base. This was now not included, because it further complicated calculations and would cause very high increases in participation. Therefore, e.g. in the case of the energy community goal, it was in the game not attractive to invest in savings projects, while this is seen as a membership increasing factor in reality.

The game in its final state motivates the player to think ahead: to invest in projects, you need investment in organisational actions, which require funds, which require projects, and some projects directly require the investment of other projects – e.g. existing electricity generation is needed to invest in batteries and hydrogen.

2025	2	3	4	5	6	7	8	9
								10
								11
								12
								13
2035	20	19	18	17	16	15	14	

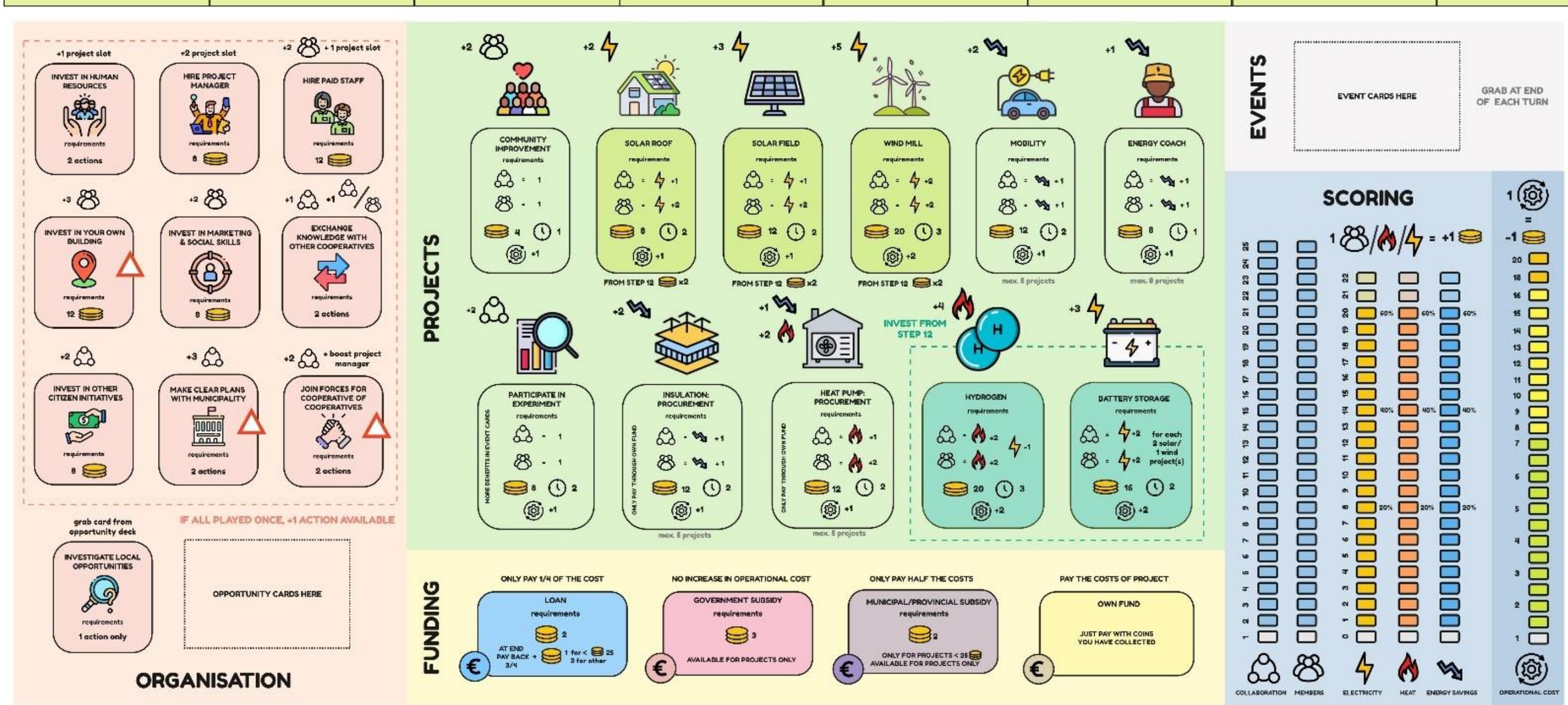


Figure 8: The board used for the game evaluation (English version)

5 Game testing

In this chapter, the game produced in the previous Chapter is evaluated using the Triadic Game Philosophy, which involves the dimensions realism, meaning – achievement of the goal to entice strategic thinking. The goal of evaluation is to judge whether the game might support professionalisation in Dutch energy cooperatives instead of accurately revealing its effectiveness in the field, for the number of game sessions is limited to 4. Interviews, in-game comments and observations have been used to evaluate qualitatively on the aforementioned dimensions. The method for the workshops is described in detailed before discussing the results. The game version used for testing can be found in Appendix 3.

5.1 Method for workshops

The researcher Jasmijn Goudsmit acted as a facilitator, introducing the game, explaining how the game works with the use of the manual and guiding the game to make sure the correct actions are performed, without guiding decision-making. The game is called 'EcoCoop: road to 2035' or 'EcoCoop: route 2035' in Dutch. Firstly, the general method for evaluation is described and then the phases of the workshops.

5.1.1 General method for evaluation

The Triadic Game Philosophy by Harteveld (2011), which will be used as a framework to organise the results from the workshops, involves the dimensions realism, meaning and play. It will be a qualitative judgement whether the game is scoring acceptably on these dimensions.

Firstly, reality refers to the representation of the real-world context. The game should be grounded in actual experiences, challenges and scenarios that the energy cooperative board members face, and accurately represent the process of professionalisation. The reality of the game will be judged based on observations – do the choices the cooperatives take accurately represent what they might do in real life? Do the features of the game function the way they would in real life? Also, comments during gameplay about whether the game represents the player's reality can also be indicators of a realistic game. Lastly, debriefing questions about the realism of the game – which will be further described in the next section - give further insights.

Meaning is about the objectives of the game and other lessons included in the game – is the strategic capacity of the cooperative members increased. Any comments the participants make during gameplay about the importance of thinking further ahead can be an indicator. Also, debriefing questions about lessons and takeaways might show if there is an increase in strategic thinking. Sometimes players might be asked about the specific learning goal, if they have not mentioned it, to give more (though less reliable) insights.

Play refers to the flow of the game. The game will be judged based on the elements of flow. The findings will come from observations mainly, or comments made during the game or in the debriefing.

4 game testing sessions were held. The ethical considerations taken into account for the interviews of Chapter 3 are also taken into account for the workshops, though here video data is used for observational data and the names have been changed to 'player #'. For the first session, the players were from 2 different cooperatives, though they did work together at a cooperative umbrella organisation. The participants were found by sending an e-mail request for a test session to a variety of cooperatives within South-Holland via their websites. It was

beneficial to have the first test with them, as they were able to recommend the game to other cooperatives in South-Holland via e-mail and snowballing, which led to further recruitment and the players for the fourth test were recruited at one of the events recommended by one of the players by the researcher (convenience sampling) (Bhattacherjee, 2012).

The players involved did not all fit the description from Section 4.3. One was younger and 2 were older, only 1 cooperative fell within the 3-5 year timeframe. Due to little response to requests for tests (on short notice), it was not possible to be selective. Still, because the 3-5 year timeframe was only a first estimation for who the game might be fit, it was not deemed detrimental for the quality of this research and the variety of players might actually show for which cooperatives within The Netherlands this game can be especially relevant. Cooperatives that are older or younger might also be in the process of professionalisation.

The treatment that the facilitator gave the participants was not consistent. This was because the facilitator learned how to better guide the players to optimize playability of the game and after recommendations in the first test also tried to entice more discussion in game and after by challenging the participants to think beyond what they are familiar with.

5.1.2 Workshop phases

Introduction

For the introduction, the researcher briefly introduced the game and its goals. The steps of the game would be explained. The manual could not be tested within the timeframe of the workshops. The manual would be handed over so that they could look again for rules, but it was expected that most participants would ask the researcher directly if they had any questions, as was the case during testing with students. The 'fast guide' was given so that the participants could quickly look at that while playing the game.

It was decided to introduce the goal of the game so the players could think during gameplay whether they thought the goal was well represented and give comments on this. This is possible because the test is not testing the effectiveness of the game. Specific details about the method can be found in the detailed workshop results in Appendix 5.

Gameplay

During gameplay, the researcher would answer questions the participants have and make sure all necessary actions were performed each turn, but prevent pushing a narrative. After the first gameplay, in which the game was still in English – translation was not yet possible due to time constraints – the game was translated to Dutch. It was deemed necessary also because it made it more difficult for the participants to relate to the game. More on this can be read in Chapter 5.2. Also, during the first gameplay there was perhaps too much support, causing the players to understand the gameplay quite slowly – therefore there support should be given out strategically.

Debriefing

The debriefing phase for the evaluation gaming sessions are based on the six phases by Kriz (2010). Instead of using a survey, an open discussion is used to relax the participants and generate results with more depth. The facilitator must avoid to guide the answers to questions as much as possible (Kriz, 2010).
The debriefing questions, described in Appendix 4, are different than the debriefing questions

put in the manual – which are also based on the six phases of Kriz (2010). The debriefing questions for the game evaluation are not just to see what the participants learned from the game – which would be the focus if the players played the game for their own interest only - but also to see how they felt about the flow of the game. The questions, which will be asked to the participants in an open discussion, are taken from Kriz (2010, p. 669 - 672).

5.2 Results from the workshops

In this section the results of the 4 workshops described in Appendix 5 are described using the Triadic Game Philosophy as described in the previous section. A picture from a workshop are shown in Figure 9.

Figure 9: Picture from one of the game sessions at end of game

5.2.1 Reality

Overall interpreted realism of the elements and their interplay

Player 1 stated that they were impressed with how realistic the game was – they felt some parts almost exactly matched their reality - and player 2 nodded in agreement.
Player 3 answered to question whether the game is realistic that that the subjects addressed in the game really match what happens in reality. Player 4 said they believe there are some very important aspects in the game. Player 6 said that what he liked about it is that many aspects of the cooperative world are integrated in the game, while they as board members are only really focused on executing projects, and only solar. Player 5 said that just like in real life, you are working on many things at once. On the one hand, you are working on projects, but also need to think about members and collaboration and if you are working both on heat and electricity.
Player 8 stated that they needed some time to get into the game, but when they understood how everything was connected, they thought it was very fun and also very realistic. They also stated that it was obvious that the facilitator considered the different elements well and they thought it was really realistic: 'zo gaat het gewoon' ('this is just as it happens'). They thought the game was highly layered and appreciated this. Player 7 called the game 'ingenious' in regards to realism.
In the first test, the question of how realistic the game felt did not really come forward.

Considering all players stated that the game felt realistic and some even felt that it was very realistic, it may be concluded that the overall realism of the game is acceptable.

Specific realistic aspects of the game

In all the game sessions, the players made comments about the realism during gameplay, often after grabbing event cards. During gameplay, all players would express comments such regarding how they deal with these types of issues (from the event cards) regularly. One player in the second game thought the event cards were 'fantastic' and really represented reality. In two games, the players also expressed that the pace is realistic. In the third game, a player found it realistic how the relations with the municipality varied throughout the game, for example because there are often changes in the officials, which means a break in the relationship with the municipality. Therefore, the event cards and municipal barriers may be aspects of the game that are important for the realism of the game.

Use of loans

The players showed varied investment in loans, yet a few players expressed that using loans to the degree that it was used in the game is not realistic. A player in the first test explained that as a cooperative you are responsible for the investments of your members. This means you are very cautious – a player in the last game expressed this as well. The other player explained that they did use a loan for the windmills that are used at their cooperative, but there was no other way within their business plan. In a different situation, they wouldn't use a loan. According to the first player's knowledge, there are relatively few cooperatives which actually use loans - especially for windmills. Still, both players mentioned an example which is deemed successful and does use loans and also has been able to produce many solar roof projects. Still, they were not sure if using loans to buy many windmills (which worked well for the researcher when she played) is necessarily very realistic. A player from the last test expressed that this game does not represent how they would in reality be much less eager to use a loan. They would avoid loans if payment with own fund was possible. Because some players could also mention examples where a loan was a successful investment, it might be that using loans to achieve your goal is actually very useful in reality, but the players themselves prefer a risk-free approach. Further research is needed to understand the role of loans in future energy cooperative development.

Use of subsidies

There appeared to be no interest in using the governmental subsidy in all gameplays. For the second game, the players also expressed that they forgot a about the funding options and would have liked to use them at the start. The facilitator did say that they had multiple cards about the municipal subsidy stopping and that there are significant downsides to this. They were not aware of this event though they had received these cards before. It is strange that subsidies would not play a significant role at the start, as these are currently very important for cooperatives as shown by De Graaf et al. (2023). Therefore, for the first few rounds at least, subsidies would have to become more attractive in the game to make it more realistic.

Already existing practices

For the second, third and fourth test, the players would acknowledge that they were already doing something which was an option in the organisational actions or in the last test there is an umbrella that would do some of these actions for them. Some of the player's seemed to think it was strange to then invest in these actions to get more collaboration, members and project slots. Over the course of the game, they would invest in these project nonetheless as they got

more engaged in the gameplay. Especially in the second test the players seemed to bothered by the fact that they were already investing in certain actions – still, on a more positive note, everything in the organisational actions was very recognizable for them. This was too expected though, as cooperatives might be in different steps of their professionalisation process, and therefore does not really tell much about the realism of the game.

Opportunities as last resorts

In all the games, opportunity cards were often grabbed as a last resort. In the first game, the players did not appear to be bothered by this and though the cards were realistic, but it felt 'too easy' to just grab event cards. In the other games, the comments were in the lines of 'that is not realistic here', 'we already did that'. In the second game, one of the players took a mocking stance towards the opportunity cards. After suggestion by the facilitator, the players of the fourth game agreed that because the cards would be grabbed when there was no other choice, it felt more like a game element only. That opportunity cards were mostly used at the start of the game, showed that before there is enough own income cooperatives should investigate local opportunities and needs, matching reality. Opportunity cards should be adapted to make players more aware of their importance.

Missing factors

In the first workshop, one of the players expressed that they missed the lack of time of cooperative (board) members as an important factor in the game, as it often causes project stagnation according to them. One of the players of the first test also suggested that you could start your scoring starting conditions on higher levels, so it also becomes more relevant for cooperatives that are more professionalised. One player from the second test would have liked to see the implementation of production chain liability when it comes to e.g. solar panels. As these factors were not mentioned throughout most tests, they are not deemed essential for realism. Still, it should be clarified that respectful handling of members time is part of the 'Invest in human resources' action. The adaptation of starting conditions would be relatively easy to change.

Conclusion on reality

Though in most workshops the overall realism was appreciated and some specific aspects were especially enjoyed, there are some aspects that need further attention: the role of loans, subsidies, already existing practices that seemed unnatural for the players to engage in, opportunities as last resorts and some missing factors. Also, players found it strange to freely use loans, while this might be a sign that energy cooperatives are too risk-averse and loans are actually a good way to accelerate investment.

5.2.2 Meaning

The goal of the game was to increase strategic thinking within energy cooperative boards. The results are described for each workshop.

Workshop 1

In the first workshop, both players – which are from different cooperatives – expressed that the long-term is something they barely consider. They expressed that they will be happy to finish projects, but that preparation for projects in a few years often does not happen. In the first test, the players expressed that they could test that. When asked if they learned anything, a player said that looking strategically at growth like this is something they never really did. They look at the end of a subsidy period, but not more than that. They believe that this game can help

cooperatives to think a step ahead. The other player agreed and added that the game helps you think about what steps you need to start something in 4 or 5 years. One of the players said that the game is fun and said again that they were very impressed.

Workshop 2

In the second game, a player said they were not sure this game would help them further as a cooperative. The other player said, when asked if they learned anything, that they like how this (game or thinking about strategies, this not specified) is important for the cooperative movement. Energy communities (included in the game) are needed that work together on a national level. They like that they can use the game to think about their future in a concrete way. When asked if the players believed other cooperatives could learn from this, one of the players agreed, but the other player said the game might have to become a bit more simple. The first player disagreed and said that they should not glorify their own cooperative and that cooperatives all are good at something in their own way, and they believed this game could really help during the professionalisation process. The other player then agreed with this.

The players would not want to grow their member base because they would not be able to pay their members (for the generated electricity). They also stated later in the game they were not doing 'everything possible', and the partly blamed the Dutch ministry for this. For the starting conditions, they stated that they had strong collaboration with the municipality, but during gameplay it became evident from comments that there was quite some frustration. These players also switched to investing in projects they first deemed 'impossible' the latest of all workshops. The researcher had the feeling that these board members are not very ambitious and might have benefitted with a more trained facilitator to learn more from the game session.

The players of the second test considered heat pumps at some point as it would be good for their members. Still, one of the players thought it would be a completely different theme than they are used to, but invested in this anyways. Also, they decided to invest in staff, while they considered this as extremely unlikely at first. It cannot be concluded whether this shows that the board members changed their thinking about how to approach in reality, or that they stopped seeing the game as an accurate representation of their reality. These types of changes in opinion relative to the current situation of the cooperative were recognized in workshop 3 and 4 as well.

Workshop 3

The players were asked if there was anything they would take with them for the future. One player said that he thought it would be difficult, most likely it (thinking in terms of strategies) is not possible on the short term as they are working on a large project now and collaboration with the municipality. Still, in the long term there are a few aspects (the player pointed at the organisational actions) that they need to start working on. The other player also added as a lesson of the game that in reality the focus (on projects) is good, but you shouldn't forget about the projects you want to achieve in the future and you need to keep reflecting. They said that at around round 7 the players need to take a step back and reflect on what they are doing – are they going to reach their goals and where do they need to make adjustments? Now there might be net congestion, but you as a player could have foreseen this a few turns ago – though it was accelerated by Covid-19 in reality. Batteries is something you need to think about way ahead, make plans years in advance in how you are going to achieve this. The player said they were too slow to realise this in the game session.

Workshop 4

The players were asked if there was anything in the game that had not been done at their cooperative and that they deemed important to consider. One player said they felt like they 'played the game' - they thought it was reassuring to see that they are doing what needs to happen – they work both on expanding projects and organisation and the same time. The other player said they have not done many of the actions in the game in real-life, and that they realised they had neglected energy savings, while this was such a central aspect at the start of the cooperative. If they would play the game again, one player said it would be interesting to investigate how the other goals would turn out, perhaps to see if they could learn something from this.

Furthermore, player 7 said they are not ready at all for the organisational actions in their real-life cooperative. These decisions would be for the future, perhaps when they would become more professional. They also noticed that they first were focused on their current situation as a cooperative, but at some point noticed that it is also important to focus on the future – they thought this was a fun aspect, that you think in the long term. Still, this does not tell if the players would actually take this as a good lesson to apply on their cooperative.

Other findings for meaning (and reality)

Some players expressed other lessons as well. For the third test, the players said that what they learned is that just like in real life, you are working on many things at once. On the one hand, you are working on projects, but also need to think about members and collaboration and if you are working both on heat and electricity. One player said that as a player you are always too late. It is difficult to get the circumstances (e.g. the number of members) right so that you can invest. The other player also said that there are many aspects, especially in the organisational actions, that they are not able to start yet – they are not yet at that stage. A player said that they learned that the game shows that all the variables are important and that the conditional variables are also really important – you need to keep investing in organisational actions and accelerate when it comes to projects. Player 7 thought the division of project and organisational actions was really nice, because it showed well they were both important. Still, just with the third workshop, there does not appear to be a clear lesson about the importance of communications, as expected. It might be useful to emphasize this feature.
That these players learned that investing in all aspects of professionalisation is important shows that it has been well-integrated into the game.

Conclusion on meaning

To conclude, it cannot be said that the strategic thinking of all board members increased, yet at least in 3 of the tests the players were of the opinion that the game could be a good tool to help participants think more strategically. In the first test, the players seemed convinced that the game could be a useful tool to increase strategic thinking towards a more professional organisation. Furthermore, it has been found that there have been lessons about professionalisation overall – the importance of taking into account all the aspects that come with it. This shows that professionalisation is well-represented in the game.

5.2.3 Play

Clear goals, feedback and intrinsic rewards

The goals appeared clear to the players, yet they would often forget to track their target in the first and second game especially. This might have to do with the little attention that was paid to choosing a goal, yet it might also show that the players tend to focus on project execution than on the goals. In the third game this support was not necessary because one of the players was very focused on the goal, and in the last game special attention was paid to introducing the goals and making sure their goal fit their cooperative. The feedback systems within the game were supported by the facilitator throughout the gameplay – this was necessary, because players would often forget to show changes on the board themselves.
In terms of intrinsic rewards – relating to fun - one player expressed that they love playing board games and become quite a fanatic during gameplay. They also said that the game was quite enjoyable. In the last workshop, one player at some point noticed that it is also important to focus on the future – they thought this was a fun aspect, that you think in the long term. The co-player said they needed to get into the game, but when they understood how everything was connected, they thought it was very fun. The topic of fun did not rise in the other games.

Playability and sense of control

Almost all of the players clearly needed guidance throughout the gameplay. Slowly, more rules would become obvious to the players, but the players often needed reminders of rules anyways – specifically the working of the boosts and forgetting the need for project cards. Furthermore, project cards within the opportunity cards were often confusing to the players, and players would forget to invest if the facilitator did not remind them of it – in two games, the players expressed disappointment that they could not invest in the projects anymore – it felt out of their control. Also, it was not always clear what the requirements were for finishing projects and what was received from them. In the fourth test, the facilitator noticed that the frequent repetition of rules (e.g. that some organisational actions take 2 turns or that some actions could not be done multiple times) really caused the players to be more aware of these rules over time. Especially in the second test, the players struggled with the gameplay, and the facilitator needed to offer near constant support.
In the third test, there was one player that was very fast at understanding the game and calculating income. This was the player who likes to play games. The players of the second and fourth test expressed that they barely ever play games, or are even bad at it, which might have resulted in the high need for support: they are not trained at playing games.

Challenge

In the first test, the players expressed that they wanted the game to be more 'optimistic', yet they did think the game was realistic in its difficulty. Still, the players had only played until move 9, while in the longer gameplay reaching the goals becomes easier from that move onwards. One player of the first game expressed that they would like recommendations from the facilitator for how to continue during gameplay.

A player from the fourth test noted that the game was possible with the support of the facilitator only. The game was deemed quite complex – the field is also complex, but as a cooperative member, you ease into it more slowly. Still that same player said the game was very ingenious in the debriefing and said that they were quite involved when they understood the gameplay, and their co-player stated that the game was well-constructed.

The players thought a competitive game, where the board members would play against each other, could be really fun and increase fanaticism and discussions. They thought that many board members in cooperatives might not be aware that their goals for the cooperative are not aligned, and this more competitive game could help.

Time distortion, loss of self-consciousness and concentration

For the facilitator, it could become tiring and frustrating to calculate the income. It could also be difficult to keep track if the requirements were all met for the execution of projects for longer games, and to keep track of how many actions were done when discussion was especially long. Also, in all games repeatedly new event cards needed to be grabbed because they would not be relevant in that moment in the game. This seemed foolish to the researcher and slowed down gameplay and took players out of the game. In the last game, the facilitator quickly would go through the cards before giving one.

The gameplay took 1 hour and 15 minutes to 2 hours and 15 minutes. The long playtime caused some issues for the participants in the second test, and they suggested about half-way the game to stop as they had limited time. While most players needed several turns to really understand all the variables involved in the game, one player understood the game very fast and seemed focused. The facilitator felt as if their support was barely needed after the first few turns. There was no clear proof of time-distortion or loss of self-consciousness for the players.

Discussion and conclusion

For most elements of flow, the game is still lacking. There were especially issues with playability, the processing mind and sense of control across all workshops. There was no clear sign of time distortion or loss of self-consciousness. It required much support from the facilitator, which was quite tiring for the facilitator for the duration of up to 2 hours. Still, the gameplay was deemed enjoyable in the last 2 tests. It is expected that multiple runs of the game will significantly improve playability. Still, the players might still need facilitators, which makes retries at home difficult.

5.2.4 Conclusion on game evaluation

The results of evaluation showed that having cooperatives think in terms of clear long-term strategies that match that of the movement instead of on a project-by-project basis was something that was acknowledged as a (possible) lesson for cooperative boards in all workshops, though the players themselves might not have learned from it themselves. It is possible that the low playability of the game has resulted in the players not being able to focus on strategic thinking in-game. There need to be serious adjustments to the game to make it easier for the cooperative members to play them with or without a facilitator. The reality of the game was praised by the players, yet there are a few features that might need adjustment to not distract players during gameplay.

Age might be a factor to reduced playability in comparison to the students, which might affect the ability of the individual to manage different aspects of the game at the same time (Hoogendam et al., 2014). Most cooperative board members are elderly, and therefore the game should be adjusted to match the processing mind abilities of the players. Also, it was not taken into account that the board members were not used to games at all or even considered themselves bad at them.

6 Discussion

In this section, the results of the analysis of professionalisation of Chapter 5 and the results from the previous chapter are analysed and interpreted. The implications, limitations and validity of this research are discussed the thesis is compared to existing literature. Finally recommendations for further research are given.

6.1 Interpretation of results

6.1.1 Analysis of professionalisation

The analysis of Section 3.2 has made a first attempt of defining professionalisation in energy cooperatives. There are a variety of possible definitions that can be identified, still one is especially supported by the interview results: 'professionalisation of a cooperative is the process in which a cooperative builds organisational capacity'. This capacity consists of leadership capacity, adaptive capacity, management capacity and technical capacity. From the definitions, references to leadership capacity and adaptive capacity were not as prevalent as for management and technical capacity, which was expected to show that these aspects perhaps were neglected by the cooperative movement – Bolton & Abdy (2007) stated that this is often the case in organisations. The analysis of alternative options to professionalisation has shown that collaboration can often replace the need for many aspects of professionalisation to a certain degree, though it often does not solve lacking in leadership capacity. Also, not one partner – for example, cooperative umbrellas - can cover all aspects of professionalisation. This signifies the importance of professionalisation of individual cooperatives that want to increase their impact.

Success examples from scientific studies and interviews with representatives of organisations working with cooperatives have generated a variety of success factors and barriers which could be organised on the 4 capacities of professionalisation, and different directions cooperatives can take in their development – the innovator pathway, the local broad pathway and the local energy efficiency and savings pathway. Some aspects of professionalisation are more prevalent in certain pathways and the local energy efficiency and savings pathway demands a lower demand of professionalisation. Still, these cooperatives will over time need their own generation to create enough income to support their increasing project complexity. A provincial pathway does not fit in the current reality of cooperatives, as there are now cooperative umbrellas working on the provincial level and the young cooperatives don't have as much time to grow as the older, provincial level umbrellas did.
What could be recognized from the aspects mentioned in the professionalisation framework is that they could be further organised in aspects towards improved member participation, collaboration (with other actors) and capacity to do projects and achieve goals. There is also interrelatedness between these. The resulting professionalisation framework can be seen in Figure 10.

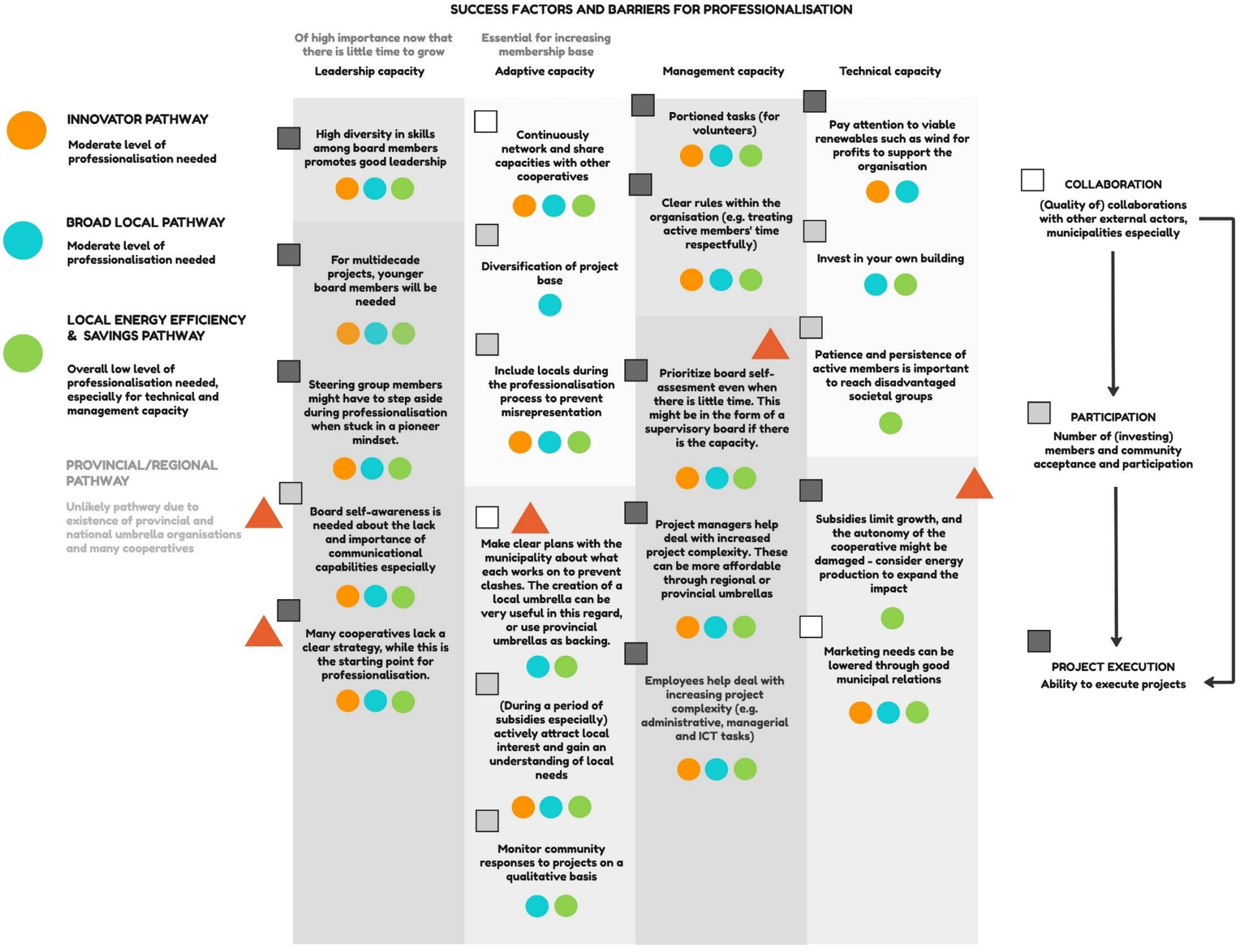


Figure 10: Professionalisation framework, including professionalisation pathways and matching professionalisation success factors and barriers added with red triangles. Also, each factor/barrier contributes to either collaboration, participation or project execution

6.1.2 Game

The goal that was chosen from the game from this professionalisation framework was increasing strategic thinking among cooperative board members, as this goal is seen as the essential first step towards professionalisation and leadership capacities are currently especially important for cooperative development. The game 'EcoCoop: road to 2035' was designed, throughout game design, it became apparent that playability might become an issue during the workshops.

The results of evaluation showed all workshops acknowledged that the game helps cooperative board members think further into the future, though the players themselves might not have learned from it themselves. Low playability might have caused players to not be able to focus on strategic thinking within the game – it is possible that requirements of this specific target group have been neglected by the researcher. Meanwhile, the overall realism of the game was recognized by all players and praised by some, while some specific aspects require further attention.

6.2 Recommendations and implications

6.2.1. Implications for the game design & facilitation

To improve the playability of the game without losing important aspects that made the game realistic, some changes might be needed. These are some of the most important options.

Both event cards related to hinders and subsidies are temporary. Though this is less realistic as the cooperative should not be able to know when the subsidy or hinder becomes available again, it prevents the repetition of irrelevant cards (e.g. a hinder card when there is already a hinder) in the stack. There are two stacks of cards, one for the first 11 steps, and one for the steps from 12 onwards. This reduces the number of cards which are not relevant for the step the players are at, prevent the players from having to grab new event cards multiple times in a row, slowing gameplay. This option was investigated earlier in game design in tests with only the researcher, yet it was ignored because it would be forgotten to swap the cards multiple times. Placing the stack of cards on the step where the cards should be swapped could prevent the players from forgetting to swap the cards.

Furthermore, there should be a greater emphasis on the subsidies on the board. Now, players sometimes forgot that subsidies were options and would only use their own fund, while realistically subsidies play a significant role in cooperative development. There might need to be some tinkering for operational costs, to have them play a more significant role (and therefore also increase the use of subsidies), and it might need to be placed above the project options, because just like the electricity or heat you receive from projects when they're finished, the operational costs are increased when a project is finished.

These changes might not improve gameplay that much, so with the amount of aspects included it might still be difficult for many players to play the first time or without a more intensive introduction. Cutting aspects of the game to reduce complexity can damage the realism that the players appreciated – a more careful analysis of the game might be needed before this happens. The manual would have to be tested to see if it would be more appropriate for older players to learn that way, as they can figure out the gameplay at their own pace.

The game might also become a hybrid digital version or completely digital version to reduce tasks for the players – yet then attention would have to be paid to maintaining discussion amongst players and creating a clear interface. A hybrid version, where only the accounting systems are digital, might maintain discussion while simplifying the game.

6.2.2 Implications for local energy cooperatives, umbrella organisations and other CSOs

This research has shown that professionalisation of cooperatives is an important factor in cooperative development and a first definition has been created of professionalisation in the energy cooperative sector of The Netherlands. This definition – 'professionalisation of a cooperative is the process in which a cooperative builds organisational capacity' can help umbrellas clear any confusion among member cooperatives about this term, and the findings of Section 3.5 might help umbrella's help cooperatives decide if they want to professionalise, understand how they might approach professionalisation and what barriers and useful developments they can expect. This thesis might not just be relevant for the energy cooperative sector but for other volunteer-based and civil society organisations as most aspects recognized in the professionalisation framework are in part recognized in existing frameworks for NGOs and civil society organisations.

Furthermore, the professionalisation framework in Figure 10 might provide guidance to umbrella organisations to better understand how they can help different types of cooperatives in professionalisation. Also, municipalities with high expectations of cooperatives might, based on this framework, understand that giving cooperatives time to grow is necessary and offer the necessary support.

There is a dilemma that cooperatives experience between becoming more professional and the cooperative's core values. This research has shown that there are different ways in which a cooperative can increase their impact without becoming disconnected from their community. Two of three pathways especially grow their impact locally. Still, if the cooperatives want to do more projects – be it locally - a growth in organisational capacity is needed – professionalisation is needed. Also, professionalisation should not be done in haste – cooperatives must keep engaging the local community throughout.

As a foundation for professionalisation, cooperatives must have a good strategy. Energy cooperative board members, lost in their daily tasks to manage projects and run the cooperative, must not forget the vision they choose and how their actions contribute towards this, or else they will not be able to reach their goals. This research has shown the potential of using a serious game to aid in strategizing of energy cooperatives as a tool to entice discussion about the future of the cooperative. Umbrella organisations might also use this tool to have different cooperatives think together about how they should develop further towards shared goals or cooperatives can use the game as a discussion tool with members about how to continue. The game can be played competitively – with the board split into two groups, each playing their own game - to further engage board members, motivating them to consider their choices more deeply, which might result in creative strategies and interesting discussions between board members at the end of the game session.

Currently, there are no clear visions for cooperatives. The terms 'energy community' and 'Local4local' float around among cooperative circles, but there is no clear directive about what this involves now – except being both a local producer and distributor of energy. Insights about

the Local4Local model will become available in 2025. Still, their goals seem quite ambitious – it entails becoming a serious player in the energy transition (M.). Provincial umbrellas should also work on targets befitting cooperatives that are not as ambitious, but do want to play a role in the energy transition, avoiding a one-size-fits-all format.

The new energy law that has been accepted in June 2024 will benefit cooperatives: resource sharing and cost reductions can be achieved by the facilitation of energy hubs and collective distribution agreements (Van de Worp, 2024). The law can also improve negotiation with public network operators. Time will tell whether this law can help overcome professionalisation barriers.

6.3 Comparison with existing literature

This research involves an explorative study, and therefore there are not many sources that could confirm or disprove the results of the study. Still, there are a few scientific articles discussing serious gaming and its use for strategizing. There is no available definition with which to compare the definition generated in this research. Nonetheless, this research does add to existing literature.

All studies included in Section 2.2 that focus on the success of energy cooperatives look at cooperatives on their own. In many of the articles that are created umbrellas did not exist yet or were at a start-up phase. Though this study also focuses on energy cooperatives as singular entities, this study has shown that there are many layers within the energy cooperative movement. Because energy cooperatives are (typically) not competitive with each other, there is an opportunity for a unique layered organisation that could share resources and put pressure on the regime through collective goals, though the research has also shown the importance of growing individual capacities.

Furthermore, instead of just offering success factors, this research takes an integrated approach, looking at how different success factors interact with each other. The studies mentioned in Section 2.1 offer either success factors or give a discussion on case studies of success examples, while this thesis provides further guidance on the specific challenge of professionalisation through pathways that give a better understanding of what a cooperative might do to achieve their goals. This study hopes to resolve any vagueness on the concept of professionalism and professionalisation.

The interviews have further confirmed the importance of the board and the organisation, which are both highlighted by Warbroek et al. (2019) and Boon & Dieperink (2014). Also, the role of the local municipality and the issues with collaboration with them as highlighted by Zuilhof et al. (2022) is still a central issue according to the interviews.

6.4 Research limitations and validity

6.4.1 General limitations

Firstly, the success examples used for this research are limited in number, and therefore it is possible that important pathways are missed. Larger datasets would be needed to compensate for this. Also, the framework created in Chapter 2.2 is based on logic and not hard proof, which might reduce the interpreted relevance of professionalisation, though the rest of the thesis research signifies its importance.

For the interviews, a limitation is that no organisations specific to the east side of The Netherlands were interviewed. Organisations in the east of the Netherlands were contacted but there was no response, or it was not possible for them to plan a meeting. On the east side of the Netherlands there are a lot more rural communities and small villages, while the Randstad is characterised mostly by urban and sub-urban areas (Cornips et al., 2017; Thissen et al., 2010). Also, there were only six interviews possible in the planning, while additional interviews might have shown new perspectives on professionalisation.

Almost all cooperatives involved are cooperatives with a focus on solar, reducing generalisability. Furthermore, the cooperatives that responded to the requests for a game session might be generally more positive towards a game and alternative learning methods, resulting in more positive results. Additionally, one of the players was involved in the interviews, and therefore the game will be more realistic for them. Due to non-probability sampling, it is not possible to generalize the findings to the whole of The Netherlands (Bhattacherjee, 2012).

Furthermore, the gameplay was only done with two players each time, while many of the boards consisted of three people or more. Considering board members have their own roles and interests, more learning might have occurred for the cooperative board as a whole if all were included. Still, the game session would probably not have fit in 2 hours with more board members present due to extended discussion. In the first test, the players are not board members from the same cooperative, which might have resulted in a very different dynamic and thinking from the perspective of their cooperative. At the same time, they were able to offer different perspectives.

In addition, the facilitator themselves is not a trained facilitator or experienced in organising workshops. More initiative from the facilitator was something requested by the players of the first test - a more experienced facilitator might be able to improve learning processes. The facilitator did show more initiative each test, increasingly challenging the player's train of thought. Finally, the manual could not be tested properly within the timeframe of the study, and it would have also been interesting to see what the results would become if cooperative members would play in groups against each other.

6.4.2 Research method limitations

As the researcher is the one interpreting the results from the study and it is a qualitative study, there might be researcher bias. The researcher might focus on certain aspects mentioned within the interviews more than others or interpret the results of any game tests more positively. Also, the game sessions included a period between the gameplay and the discussion where pastry was eaten – this might have caused participants to be more positive towards the game, therefore affecting external validity. Furthermore, the participants might give more positive answers to the researcher because they knew she made the game, and therefore give socially desirable answers.

Part of the research method is a physical game. One of the players of an official game session suggested to change the format to a digital game and Sub-section 6.2.1 has shown that a hybrid version might have been a better option. Further research might design and test a hybrid game.

Furthermore, it was not possible within the research method to properly test the effectiveness of the game, only validate the game. For testing the effectiveness of the game, the game would have to be played with many more cooperatives, throughout The Netherlands, and it would be best to also test the effectiveness on the long term. With the game design included and the limited time available for this thesis, it was not possible to test the effectiveness.

6.5 Future research recommendations

This section aims to offer recommendations for research to overcome limitations and to further continue on research on professionalisation of energy cooperatives.
First of all, future research could expand the game tests to include different types of cooperatives, also which do not show interest directly into game tests, and with more than two board members at once. Facilitators might have to be trained to prevent social desirability bias and allow for testing with multiple cooperatives at once. The manual should be tested with cooperatives. Lastly, research might aim to test which aspects of the game are essential for the realism of the game and the transfer of knowledge and which features could be ignored to improve playability.

Also, research should aim to investigate professionalisation of the cooperative movement as a whole, as this research has shown the importance of collaborations but also its current limits. Proka et al. (2018b) make an effort to investigate collective strategizing of energy cooperatives and generate a collective vision, but it does not go into depth into pathways to achieve the goals within this vision, professionalisation and the different layers that exist within the cooperative organisation as it is now – in 2018, regional umbrellas were at a start-up stage. Investigating what aspects of professionalisation could be allocated to the cooperative and regional, provincial and national umbrella's might speed up professionalisation of the movement and increase its effectiveness.

Furthermore, the pathways created in this study are based on historical examples, combined with organisational theory and a few aspects of future climate scenarios by the IEA. Yet, there has been no in-depth analysis of how the cooperative movement might develop over decades, including elaborate climate scenarios, towards the 2050 climate goals. This study could give the cooperative movement more direction and prepare them for possible threats and opportunities.

Additionally, using loans was something that most players in the workshops did not feel comfortable with, and some were against altogether. Still, loans might significantly speed up growth, allowing for the acceleration that is needed for the energy transition. Further research is needed into understanding the effect of high risk-aversion of cooperatives for accelerating the energy transition.

Lastly, the game tests have shown that cooperatives tend to be so focused on project execution and organisational aspects that they lose track of their goal. The game has offered a method for cooperative board members to increase their strategic thinking, but it offers no guarantee to prevent mission drift. Future research might aim to investigate how mission drift can be prevented in growing cooperatives over time.

7 Conclusion

In this section, the 4 sub-research questions are answered. The conclusion ends with an answer to the main research question.

7.1 Sub-question 1

The first sub-question is: "How do professionalism and professionalisation relate and how can professionalisation for energy cooperatives in The Netherlands be defined? Literature suggests professionalism seems to relate to behaviour and expertise of individuals mostly. Furthermore, professionalisation and professionalism appear highly related, and the first even appears to be a pre-requisite to the latter. Meanwhile, through literature and interview research a variety of perspectives on professionalisation were identified, way beyond individuals. The literature identified a difference between professionalisation of individuals, organisational structures and processes, activities, jobs or as a by-product of an environmental change. Only the first three perspectives were also recognized in the interviews. The aspects found in the interviews befitting these perspectives together match the description of organisational capacity, which consists of leadership capacity, adaptive capacity, management capacity and technical capacity. Other perspectives identified in the interviews would either be related to the position of the cooperative to other organisations or the cooperative movement as a whole. Yet the contents of these perspectives appear to clash, and some of them can be attributed to organisational capacity. The definition for professionalisation used in this research is: 'Professionalisation of a cooperative is the process in which a cooperative builds organisational capacity'. Especially leadership capacity and adaptive capacity have been disregarded by organisations according to Bolton & Abdy (2007), and the next steps of this study would tell if this is also the case for cooperatives.

7.2 Sub-question 2

The second sub-question is "Why do cooperatives professionalise and are there no alternative approaches that might achieve similar outcomes with less complexity?". Based on literature and interview research professionalisation is essential for cooperatives to manage increasing product complexity and portfolios and maintain long-term sustainability. While alternative approaches exist, they carry significant barriers: firstly, stopping the cooperative might damage the community's faith in future initiatives, damage community relationships or undo impact done. Secondly, stagnation of the cooperative will most likely end in exit as well. Thirdly, merging might result in a loss of local support and disconnect from the community and a misalignment of strategy and organisation between the cooperatives, creating tensions. Collaboration emerges as valuable substitute, but it does not fully substitute the benefits offered by professionalisation, specifically in enhancing leadership capacity.

7.3 Sub-question 3

The second sub-question is: S2: what professionalisation pathways, barriers and success factors can be recognized in The Netherlands and abroad, and what happens to cooperatives if they don't professionalise? Success examples from literature, interviews and organisational theory form the basis for a 'professionalisation framework' that includes 3 pathways and matching professionalisation success factors and barriers (Figure 10). The pathways are an innovative pathway, focused on investment in small innovations, a local broad pathway, focused on the local community and the execution of a variety of projects, and the local energy

efficiency and savings pathway, in which the main goal is lowering energy use – e.g. for reducing energy poverty. The first two pathways especially demand professionalisation, yet also in the last professionalisation will eventually play a role with increasing project complexity, for which the cooperative needs to increase their own income. The aspects of professionalisation found were organised in terms of leadership, adaptive, management and technical capacity, which has shown the importance of these capacities and that there are significant issues when it comes to leadership capacity, which is very important for young cooperatives. These include low board self-awareness about the lack and importance of communicational capabilities and a lack of a clear strategy. As a starting point, cooperatives should focus on creating a good strategy – the game in the next section is focused on this.

7.4 Sub-question 4

To answer the third sub-question: "How could an engaging physical serious game support young energy cooperatives in professionalisation?", the cooperative game 'EcoCoop: road to 2035' has been created to increase strategic thinking in cooperative board members, an important aspect of professionalisation. It includes all success factors and barriers from the professionalisation framework, the professionalisation pathways and insights in projects cooperatives engage in and funding, which has resulted in a strategic game which should realistically represent cooperative development over a period of 10 years. Players must pick a specific in-game goal together and then work towards this by investing in organisational actions (representing many of the professionalisation success factors) to be able to initiate more and more complex projects which advances their goals. At the same time, some projects are needed as a foundation for further projects later on in the game (e.g. wind or solar energy is needed for hydrogen) with motivates players to think strategically.

7.5 Sub-question 5

The fourth sub-question is: "Does the serious game meant to improve the success of young energy cooperatives fulfil its objectives?". The conclusion is that the game 'EcoCoop: road to 2035' has the potential to help cooperatives think more in terms of long-term strategies. Still, though the players recognized the game's potential, it might not have helped them specifically. This might be because they themselves already consider long-term strategies, but more likely does the game's playability not allow for true immersion and strategic thinking in-game. Also, the board members cannot retry the game at home (which can further increase strategic thinking as players can try new strategies and see their impact) at its current state as a trained facilitator is deemed essential. The game has to be adjusted to improve the playability and sense of control to allow players to think strategically and reduce the need for a (well-trained) facilitator. Furthermore, the game should be tested with more types of cooperatives. Trying different game settings e.g. with more board members or a competitive setting can entice more discussion.

7.5 Main research question

The research question was: “How can a physical serious game effectively support young energy cooperatives in The Netherlands with professionalisation, thereby maintaining and/or increasing their contribution to the EU's 2030 or 2050 climate goals?”. Firstly, professionalisation has been defined as the process of building the organisational capacity of a cooperative that is essential for allowing cooperatives to increase their project complexity, portfolio and maintain long-term sustainability. To further understand the concept of professionalisation, this study has defined a set of ‘professionalisation pathways’ that the focus of cooperatives and a matching set of professionalisation success factors and barriers organised in the categories leadership capacity, adaptive capacity, management capacity and technical capacity. Especially leadership capacity requires attention, considering young cooperatives are highly dependent on the capacities of their leaders to accelerate the energy transition.

Improving strategic thinking of cooperative boards, an aspect of leadership capacity, is a first step towards professionalisation – the format of a serious game lends well for this. The serious game EcoCoop: road to 2035’ might be a useful tool for young energy cooperatives in The Netherlands by simulating strategic thinking, yet the playability needs to be significantly improved to allow players to think more strategically. This might happen through tinkering of features, though a change to a hybrid or fully digital decision might be needed. It is important that during conversion there is not a loss of realism, which was appreciated by players even though some adjustments are needed. This research sets the foundation for further research into long-term strategizing of energy cooperatives and professionalisation of the energy cooperative movement as a whole.

References

Akerboom, S., Backes, C., Bovet, J., Cavallin, E., Cliquet, A., Köck, W., McGillivray, D., Matthews, F., Schoukens, H., & Anker, H. T. (2019). Wind Energy Projects and Species Protection Law: A comparative analysis of the application of EU law in five member states. European Environmental Law Review, 28(Issue 4), 144–158. https://doi.org/10.54648/eelr2019111

Anheier, H. K. (2013). Civil society. In Routledge eBooks. https://doi.org/10.4324/9781849770736

Avina, J. (1993). The evolutionary life cycles of non-governmental development organizations. Public Administration and Development, 13(5), 453–474. https://doi.org/10.1002/pad.4230130502'

Azungah, T. (2018), "Qualitative research: deductive and inductive approaches to data analysis", Qualitative Research Journal, Vol. 18 No. 4, pp. 383-400. https://doi.org/10.1108/QRJD-18-00035

Battilana J., Dorado S. (2010). Building sustainable hybrid organizations: The case of commercial microfinance organizations. *Academy of Management Journal*, 53, 1419-1440

Bauwens, T., Huybrechts, B., & Dufays, F. (2019). Understanding the diverse scaling strategies of social enterprises as hybrid organizations: the case of renewable energy cooperatives. Organization & Environment, 33(2), 195–219. https://doi.org/10.1177/1086026619837126

Bhattacherjee, A. (2012). Social science Research: principles, methods, and practices. http://repository.out.ac.tz/504/

Black, G. S. (1970). A theory of professionalisation in politics. the American Political Science Review, 64(3), 865–878. https://doi.org/10.2307/1953468

Bolton, M., & Abdy, M. (2007). Foundations for organisational development: Practice in the UK and USA. London and Newcastle on Tyne: Baring Foundation and Northern Rock Foundation

Boon, F. P., & Dieperink, C. (2014). Local civil society based renewable energy organisations in the Netherlands: Exploring the factors that stimulate their emergence and development. Energy Policy, 69, 297-30

Bossers, A., Kernaghan, J., Hodgins, L., Merla, L., O'Connor, C., & Van Kessel, M. (1999). Defining and developing professionalism. *Canadian Journal of Occupational Therapy*, *66*(3), 116–121. https://doi.org/10.1177/000841749906600303

Brandenburg, K., Brummelkamp, S., Chan, H. S., Geurts, L., Linders, M. J., Muller, G., & Segers, R. (2023, October 12). Hernieuwbare energie in Nederland 2022: 6. Aardwarmte. Centraal Bureau voor de Statistiek. Retrieved from https://www.cbs.nl/nl-nl/longread/rapportages/2023/hernieuwbare-energie-in-nederland-2022/6-aardwarmte

Brummer, V. (2018). Of expertise, social capital, and democracy: Assessing the organizational governance and decision-making in German Renewable Energy Cooperatives. Energy Research & Social Science, 37, 111–121. https://doi.org/10.1016/j.erss.2017.09.039

Bryson, J.M., 2011. Strategic Planning for Public and Nonprofit Organizations, fourth ed. Jossey-Bass, San Francisco, CA.

Camargo & Coosemans (2023). Assessing the relevance of renewable energy resources availability for the existence of Energy Cooperatives in Europe. In Assessing the relevance of renewable energy resources availability for the existence of Energy Cooperatives in Europe (pp. 1-8). Energy Proceedings. https://doi.org/10.46855/energy-proceedings-10327

Commins, S. (2010). Lifecycle, NGOs. In: Anheier, H.K., Toepler, S. (eds) International Encyclopedia of Civil Society. Springer, New York, NY. https://doi.org/10.1007/978-0-387-93996-4_559

Consensus. (2024, June 7). Consensus AI-powered academic search engine. Consensus: AI Search Engine for Research. https://consensus.app/

Cook, M. (2018). A life cycle explanation of cooperative longevity. Sustainability, 10(5), 1586. https://doi.org/10.3390/su10051586

Cornforth, C., & Mordaunt, J. (2011). Organisational Capacity building: Understanding the dilemmas for foundations of intervening in Small- and Medium-Size Charities. *Voluntas*, *22*(3), 428–449. https://doi.org/10.1007/s11266-010-9175-z

Cornips, L., De Rooij, V., & Smakman, D. (2017). The Randstad area in the Netherlands. In Routledge eBooks (pp. 162–180). https://doi.org/10.4324/9781315514659-13

De Bakker, M., Lagendijk, A., & Wiering, M. (2020). Cooperatives, incumbency, or market hybridity: New alliances in the Dutch energy provision. Energy Research & Social Science, 61, 101345. https://doi.org/10.1016/j.erss.2019.101345

De Graaf, J., Popma, A., & Meijer, W. (2023). Knelpunteninventarisatie energiecoöperaties: Knelpunten en kansen voor het opschalen van energiecoöperaties in Nederland. HIER. Retrieved October 18, 2023, from https://www.hier.nu/system/files/inline/Knelpunteninventarisatie%20energiecooperaties_0.pdf

De Jong, F. (2023, January 16). Subsidies en financiering voor energie-initiatieven per provincie. HIER. Retrieved June 30, 2024, from https://www.hier.nu/aan-slag-met-collectief-windenergie-opwekken/subsidies-en-financiering-voor-energie-initiatieven

De Vasconcelos, A. M., & Lezana, Á. G. R. (2012). Modelo de ciclo de vida de empreendimentos sociais. Revista De Administração Pública, 46(4), 1037–1058. https://doi.org/10.1590/s0034-76122012000400007

Dictionary of Energy. (2015). In Elsevier eBooks. Retrieved July 4, 2024, from https://doi.org/10.1016/c2009-0-64490-1

Didde, R. (2014, November 5). 'Restwarmte is het nieuwe gas.' Binnenlands Bestuur. https://www.binnenlandsbestuur.nl/ruimte-en-milieu/moderne-warmtenetten-voor-duurzame-energie

Doherty, A., Misener, K., & Cuskelly, G. (2013). Toward a multidimensional framework of capacity in community sport clubs. *Nonprofit and Voluntary Sector Quarterly*, *43*(2_suppl), 124S-142S. https://doi.org/10.1177/0899764013509892

Dowling, M., Edwards, J., & Washington, M. (2014). Understanding the concept of professionalisation in sport management research. Sport Management Review, 17(4), 520–529. https://doi.org/10.1016/j.smr.2014.02.003

Dufour, Y., Steane, P., & Corriveau, A. M. (2018). From the organizational life-cycle to “ecocycle”: a configurational approach to strategic thinking. *Asia-Pacific Journal of Business Administration*, *10*(2/3), 171–183. https://doi.org/10.1108/apjba-05-2018-0095

Duke, R. D., & Geurts, J. (2004). Policy games for strategic management. Amsterdam, The Netherlands: Rozenberg Publishers

Emmen, M. (2020). Sustainable collaboration between municipalities and local energy cooperatives: A design study to the collaboration between Dutch municipalities and local energy cooperatives to contribute to the energy transition. http://resolver.tudelft.nl/uuid:0e76a809-8cc5-4a7e-bf44-7273c5391f7e

Energie Coöperatie Westerlicht. (n.d.). Energie Coöperatie Westerlicht – Duurzaam, schoon en samen. Retrieved August 18, 2024, from https://www.ecwesterlicht.nl/

EnergieSamen. (2022a, June 11). Opstellen financieringsplan. Retrieved June 30, 2024, from https://academie.energiesamen.nu/academie/collecties/82/concept-businesscase-en-projectplan-opgesteld-mijlpaal-e/85/opstellen-financieringsplan

EnergieSamen. (2022b, September 13). Retrieved August 9, 2024, from https://academie.energiesamen.nu/academie/collecties/159/50-lokaal-eigendom

EnergieSamen. (2024, June 11). *Lokale energiecoöperaties vissen achter het net met wind op zee*. Retrieved August 2, 2024, from https://energiesamen.nu/nieuws/3528/lokale-energiecooperaties-vissen-achter-het-net-met-wind-op-zee

EnergieSamen. (n.d.a). Realisatiefonds voor energiecoöperaties. Retrieved July 4, 2024, from: https://www.econobis.energiesamen.nu/pagina/106/realisatiefonds-voor-energiecooperaties

EnergieSamen. (n.d.b). Ontwikkelfonds voor energiecooperaties. Retrieved July 4, 2024https://energiesamen.nu/pagina/77/ontwikkelfonds-voor-energiecooperaties

EnergieSamen. (n.d.c). Financiering. Retrieved July 4, 2024, from: https://energiesamen.nu/pagina/35/financiering

EnergieSamen (n.d.d). Strategisch advies en experts. Retrieved July 4, 2024, from: https://www.energiesamen.nu/pagina/21/Strategisch-advies-en-experts

Energy Transitions Commission. (2022). Degree of urgency: accelerating action to keep 1.5°C on the table. In Faustine Delasalle, Ita Kettleborough, Mike Hemsley, SYSTEMIQ, Climate Action Tracker (CAT), International Energy Agency (IEA), & BloombergNEF, *The Keeping 1.5°C Alive Series*. https://www.energy-transitions.org/wp-content/uploads/2022/11/ETC-Degree-of-Urgency-Accelerating-Action-to-Keep-1.5C-on-the-Table.pdf

Energy Transitions Commission. (2023). *Material and Resource Requirements for the Energy Transition*. https://www.energy-transitions.org/wp-content/uploads/2023/08/ETC-Materials-Report_highres-1.pdf

European Commission. (n.d.a). *Energy transition*. Retrieved August 18, 2024, from https://blue-economy-observatory.ec.europa.eu/energy-transition_en#:~:text=The%20European%20Green%20Deal%20(EGD,gradually%20phased%20out%20by%202050.

European Commission. (n.d.b). Energy communities. Retrieved July 4, 2024, from https://energy.ec.europa.eu/topics/markets-and-consumers/energy-communities_en

European Commission (n.d.c). 2050 long-term strategy. Retrieved 4 July 2024. Climate Action. https://climate.ec.europa.eu/eu-action/climate-strategies-targets/2050-long-term-strategy_en

Evers, J. (2023, February). Van groene koplopers naar de middengroepen, een onderzoek naar nieuwe doelgroepen in de buurt. HIER. https://www.hier.nu/samen-van-het-gas-af/van-groene-koplopers-naar-middengroepen-een-onderzoek-naar-nieuwe-doelgroepen

Flamholtz, E. G. (1995). Managing organizational transitions: Implications for corporate and human resource management. European Management Journal, 13(1), 39–51. https://doi.org/10.1016/0263-2373(94)00056-d

Ganesh, S., & McAllum, K. (2011). Volunteering and professionalisation. Management Communication Quarterly, 26(1), 152–158. https://doi.org/10.1177/0893318911423762

Geothermie.nl. (2021). Elektriciteit uit aardwarmte. Retrieved July 4, 2024, from https://geothermie.nl/downloads/Factsheet%20Elektriciteit%20uit%20aardwarmte%20280422.pdf

Germes, L. a. M. H., Wiekens, C., & Horlings, L. (2021). Success, Failure, and Impact of Local Energy Initiatives in The Netherlands. Sustainability, 13(22), 12482. https://doi.org/10.3390/su132212482

Geskus, S. (2022). Explaining the founding of renewable energy cooperatives: The effect of social capital in Dutch municipalities. In K. Frenken & T. Bauwens, MSc. Sustainable Business And Innovation [Thesis]. https://studenttheses.uu.nl/bitstream/handle/20.500.12932/42355/MasterThesis_Stefan_Geskus_9291628_Explaining%20the%20founding%20of%20renewable%20energy%20cooperatives,%20The%20effect%20of%20social%20capital%20in%20Dutch%20municipalities.pdf?sequence=1

Gibot, A., Van der Steenhoven, M., Hofemann, C., & van der Woude, M. (February 2023). Menukaart lokale aanpak energiehulp. Energie Samen. Retrieved from https://energiesamen.blob.core.windows.net/media/Menukaart%20Lokale%20Aanpak%20Energiehulp%2010.pdf

Gonin, M., Besharov, M. L., Smith, W. K., & Gachet, N. (2012). Managing Social-Business Tensions: A Review and Research Agenda for Social Enterprise. Business Ethics Quarterly. http://works.bepress.com/marya_besharov/13/

Greiner, L. E. (1997). Evolution and revolution as organizations grow. *Family Business Review*, *10*(4), 397–409. https://doi.org/10.1111/j.1741-6248.1997.00397.x

Gugerell, K., & Zuidema, C. (2017). Gaming for the energy transition. Experimenting and learning in co-designing a serious game prototype. Journal of Cleaner Production, 169, 105–116. https://doi.org/10.1016/j.jclepro.2017.04.142

Haggett, et al., Community Energy in Scotland: the Social Factors For Success, University of Edinburgh, Edinburgh, Scotland, 2013.

Hammady, R., & Arnab, S. (2022). Serious Gaming for Behaviour Change: A Systematic review. Information, 13(3), 142. https://doi.org/10.3390/info13030142

Hand, M., & Wiser, R. (2012). The past and future cost of wind energy. In *Presented at the 2012 World Renewable Energy Forum*. https://www.nrel.gov/docs/fy12osti/54526.pdf

Haring, P., Chakinska, D., & Ritterfeld, U. (2011). Understanding serious gaming. In Advances in game-based learning book series (pp. 413–430). https://doi.org/10.4018/978-1-60960-495-0.ch020

Harteveld, C. (2011). Triadic Game Design. In Springer eBooks. https://doi.org/10.1007/978-1-84996-157-8

Herbes, C., Brummer, V., Rognli, J., Blazejewski, S., & Gericke, N. (2017). Responding to policy change: New business models for renewable energy cooperatives – Barriers perceived by cooperatives' members. Energy Policy, 109, 82–95. https://doi.org/10.1016/j.enpol.2017.06.051

Heuninckx, S., Meitern, M., Boveldt, G. T., & Coosemans, T. (2023). Practical problems before privacy concerns: How European energy community initiatives struggle with data collection. Energy Research & Social Science, 98, 103040. https://doi.org/10.1016/j.erss.2023.103040

Heylen, F., Willems, E., & Beyers, J. (2020). Do professionals take over? Professionalisation and membership influence in civil society organisations. Voluntas, 31(6), 1226–1238. https://doi.org/10.1007/s11266-020-00214-9

HIER. (2020a, May 18). *Toenemende aandacht voor deelauto's en laadpalen*. Retrieved August 2, 2024, from https://www.hier.nu/deelmobiliteit/toenemende-aandacht-voor-deelautos-en-laadpale

HIER. (2020b, March 30). Waterstof: dit zijn de eerste coöperatieve projecten. Retrieved July 4, 2024, from https://www.hier.nu/samen-van-het-gas-af/waterstof-dit-zijn-eerste-cooperatieve-projecten

HIER (2020c, December 17). *De SCE-regeling in het kort.* Retrieved June 30, 2024, from https://www.hier.nu/subsidieregeling-cooperatieve-energieopwekking/veelgestelde-vragen-sce-regeling-in-het-kort

HIER (2023a). *Aansluiten bij een lokaal energie-initiatief of energiecoöperatie*. Retrieved July 7 2024, from https://www.hier.nu/stroom-en-gas/aansluiten-bij-een-lokaal-energie-initiatief-ofenergiecooperatie

HIER. (2023b, March 1). *Onzekere energiemarkt biedt ook kansen voor energiecoöperaties*. Retrieved August 15, 2024, from https://www.hier.nu/achtergrondinformatie-over-collectief-windenergie-opwekken/onzekere-energiemarkt-biedt-ook-kansen

HIER. (n.d.). De lokale Energie Monitor 2022. HIER. Retrieved July 4, 2024, from, https://www.hier.nu/lokale-energie-monitor-2022

Hilgersom, A. (2023, June 16). Wil je mensen helpen om thuis energie te besparen? Dan hebben wij een baan voor je! Deelstroom Delft. https://deelstroomdelft.nl/wil-je-mensen-helpen-om-thuis-energie-te-besparen-dan-hebben-wij-een-baan-voor-je/

Hoogendam, Y. Y., Hofman, A., Van Der Geest, J. N., Van Der Lugt, A., & Ikram, M. A. (2014). Patterns of cognitive function in aging: the Rotterdam Study. European Journal of Epidemiology, 29(2), 133–140. https://doi.org/10.1007/s10654-014-9885-4

Hoppe, T., & Coenen, F. (2016). From a governance perspective: How do cities in the Netherlands deal with the quest for sustainable energy?. NIG Annual Work Conference 2016. Retrieved from https://pure.tudelft.nl/ws/portalfiles/portal/13971215/Paper_Hoppe_and_Coenen_NIG2016.

Hoppe, T., Graf, A., Warbroek, B., Lammers, I., & Lepping, I. (2015). Local Governments Supporting Local Energy Initiatives: Lessons from the Best Practices of Saerbeck (Germany) and Lochem (The Netherlands). Sustainability, 7(2), 1900–1931. https://doi.org/10.3390/su7021900

Huybrechts, B., & Mertens, S. (2014). THE RELEVANCE OF THE COOPERATIVE MODEL IN THE FIELD OF RENEWABLE ENERGY. Annals of Public and Cooperative Economics, 85(2), 193–212. https://doi.org/10.1111/apce.12038

Ijskoud (n.d.). Cooperatie IJskoud. https://ijskoud.eu/

International Energy Agency. (2021, May 1). Net Zero by 2050 – Analysis - IEA. https://www.iea.org/reports/net-zero-by-2050

International Energy Agency. (2023). Will solar PV and wind costs finally begin to fall again in 2023 and 2024? – Renewable Energy Market Update - June 2023 – Analysis - IEA. In *IEA*. https://iea.blob.core.windows.net/assets/63c14514-6833-4cd8-ac53-f9918c2e4cd9/RenewableEnergyMarketUpdate_June2023.pdf

IEA (2024), Batteries and Secure Energy Transitions, IEA, Paris https://www.iea.org/reports/batteries-and-secure-energy-transitions, Licence: CC BY 4.0

Jansma, S. R., Long, L. a. N., & Lee, D. (2023). Understanding Energy Citizenship: How Cultural Capital Shapes the Energy Transition. Energies, 16(5), 2106. https://doi.org/10.3390/en16052106

Jorna, J. (2018, February 5). *Waarom Nederland (nog) niet kan overstappen op biogas*. HIER. Retrieved August 9, 2024, from https://www.hier.nu/investeren-in-je-huis/waarom-nederland-nog-niet-kan-overstappen-op-biogas

Kampman, B., Nieuwenhuijse, I., & CE Delft. (2019). Restwarmte, de stand van zaken. In Restwarmte, De Stand Van Zaken [Report]. CE Delft. https://ce.nl/wp-content/uploads/2021/03/CE_Delft_3T32_Restwarmte_stand_van_zaken_DEF.pdf

Kiili, K., Lainema, T., De Freitas, S., & Arnab, S. (2014). Flow framework for analyzing the quality of educational games. Entertainment Computing, 5(4), 367–377. https://doi.org/10.1016/j.entcom.2014.08.002

Klabbers, J. H. G. (2006) . The magic circle: Principles of gaming & simulation. Rotterdam, The Nethernalds: Sense Publishers.

Klabbers, J. H. G. (2009). Terminological Ambiguity: Game and Simulation. Simulation and Gaming, 40(4), 446-463.

Klagge, B., & Meister, T. (2018). Energy cooperatives in Germany – an example of successful alternative economies? *Local Environment*, *23*(7), 697–716. https://doi.org/10.1080/13549839.2018.1436045

Kooij, H., Oteman, M., Veenman, S., Sperling, K., Magnusson, D., Palm, J., & Hvelplund, F. (2018). Between grassroots and treetops: community power and institutional dependence in

the renewable energy sector in Denmark, Sweden and the Netherlands. Energy Research & Social Science, 37, 52–64. https://doi.org/10.1016/j.erss.2017.09.019

Kraan, J. (2023, February 14). *Meer mensen wekken samen energie op, coöperaties hebben het lastig*. Retrieved August 18, 2024, from https://www.nu.nl/klimaat/6251117/meer-mensen-wekken-samen-energie-op-cooperaties-hebben-het-lastig.html

Kriz, W. C. (2010). A systemic-constructivist approach to the facilitation and debriefing of simulations and games. Simulation & Gaming, 41(5), 663-680

Lagendijk, A., Kooij, H., Veenman, S., & Oteman, M. (2021). Noisy monsters or beacons of transition: The framing and social (un)acceptance of Dutch community renewable energy initiatives. Energy Policy, 159, 112580. https://doi.org/10.1016/j.enpol.2021.112580

Le, T. T., Sharma, P., Bora, B. J., Tran, V. D., Truong, T. H., Le, H. C., & Nguyen, P. Q. P. (2024). Fueling the future: A comprehensive review of hydrogen energy systems and their challenges. International Journal of Hydrogen Energy, 54, 791–816. https://doi.org/10.1016/j.ijhydene.2023.08.044

Lin, H. (2016). Risks of stagnation in the euro area. IMF Working Paper, 16(09), 1. https://doi.org/10.5089/9781513586175.001

Local4local. (n.d.). *Hoe het werkt | Local4Local*. Local4Local. Retrieved August 9, 2024, from https://www.local4local.nu/hoe-het-werkt/

Lukosch, H., Bekebrede, G., Kurapati, S., & Lukosch, S. (2018). A scientific foundation of simulation games for the analysis and design of complex systems. Simulation & Gaming, 49(3), 279–314. https://doi.org/10.1177/1046878118768858

Maqbool, A. S., Van Der Waal, E., & Van Der Windt, H. (2023). 'Luctor et emergo', how a community energy initiative survived the changing policy and technology landscape of the Dutch energy system? Energy Policy, 177, 113528. https://doi.org/10.1016/j.enpol.2023.113528

Martin, B. O., Kolomitro, K., & Lam, T. C. M. (2013). Training methods. Human Resource Development Review, 13(1), 11–35. https://doi.org/10.1177/1534484313497947

Mayer, I. S. (2009). The gaming of policy and the politics of gaming: A review. Simulation & Gaming, 40(6), 825-862

Meijer, M. (2020). When it goes wrong . . . learning from challenged (and revived) community initiatives. *Journal of Rural Studies*, *74*, 1–9. https://doi.org/10.1016/j.jrurstud.2019.11.006

Meister, T., Schmid, B., Seidl, I., & Klagge, B. (2020). How municipalities support energy cooperatives: survey results from Germany and Switzerland. Energy, Sustainability and Society, 10(1). https://doi.org/10.1186/s13705-020-00248-3

Milieu Centraal. (2020). Dakisolatie: lagere energiekosten. Retrieved July 4 2024, fhttps://www.milieucentraal.nl/energie-besparen/isoleren-en-besparen/dakisolatie/

Miller, D., Breton-Miller, I. L., & Scholnick, B. (2007). Stewardship vs. Stagnation: An Empirical Comparison of Small Family and Non-Family Businesses*. Journal of Management Studies, 45(1), 51–78. https://doi.org/10.1111/j.1467-6486.2007.00718.x

Ministerie van Economische Zaken en Klimaat. (2024, May 31). Waterstof. Duurzame Energie | Rijksoverheid.nl. Retrieved July 4, 2024, fromhttps://www.rijksoverheid.nl/onderwerpen/duurzame-energie/waterstof

Mintzberg, H. (1984). Power and organization life cycles. ˜the œAcademy of Management Review, 9(2), 207. https://doi.org/10.2307/258435

Muftugil-Yalcin, S., & Mooijman, A. (2023). Making sense of each other: Relations between social enterprises and the municipality. *Public Policy and Administration*. https://doi.org/10.1177/09520767231188790

Murdock, B. E., Toghill, K. E., & Tapia-Ruiz, N. (2021). A Perspective on the Sustainability of Cathode Materials used in Lithium-Ion Batteries. *Advanced Energy Materials*, *11*(39). https://doi.org/10.1002/aenm.202102028

Nagel, S., Schlesinger, T., Bayle, E., & Giauque, D. (2015). Professionalisation of sport federations – a multi-level framework for analysing forms, causes and consequences. *European Sport Management Quarterly*, *15*(4), 407–433. https://doi.org/10.1080/16184742.2015.1062990

Nationaal Programma Lokale Warmtetransitie. (n.d.). Restwarmte. https://www.nplw.nl/technieken/warmtebronnen/restwarmte/default.aspx

Nederlands Instituut Publieke Veiligheid. (2024b, July 25). *Geothermie - Nederlands Instituut Publieke Veiligheid*. https://nipv.nl/onderwerp/geothermie-aardwarmte/#wet-regelgeving

Nucciarelli, A., Sadowski, B. M., & Achard, P. O. (2010). Emerging models of public–private interplay for European broadband access: Evidence from the Netherlands and Italy. *Telecommunications Policy*, *34*(9), 513–527. https://doi.org/10.1016/j.telpol.2010.07.004

Omroep West. (2024, March 7). Veel vragen naar aanleiding mislukte boring naar aardwarmte: “Risico dus niet nul.” *Omroep West*. https://www.omroepwest.nl/nieuws/4814148/veel-vragen-naar-aanleiding-mislukte-boring-naar-aardwarmte-risico-dus-niet-nul

Oteman, M., Wiering, M., & Helderman, J. (2014). The institutional space of community initiatives for renewable energy: a comparative case study of the Netherlands, Germany and Denmark. Energy, Sustainability and Society, 4(1). https://doi.org/10.1186/2192-0567-4-11

Pesch, U., Spekkink, W., & Quist, J. (2018). Local sustainability initiatives: innovation and civic engagement in societal experiments. European Planning Studies, 27(2), 300–317. https://doi.org/10.1080/09654313.2018.1464549

Peters, V., & Westelaken, M., (2014). Simulation Games—A concise introduction to game design. Nijmegen, The Netherlands: Samenspraak Advies

Proka, A., Hisschemöller, M., & Loorbach, D. (2018a). Transition without Conflict? Renewable Energy Initiatives in the Dutch Energy Transition. Sustainability, 10(6), 1721. https://doi.org/10.3390/su10061721

Proka, A., Loorbach, D., & Hisschemöller, M. (2018b). Leading from the Niche: Insights from a Strategic Dialogue of Renewable Energy Cooperatives in The Netherlands. Sustainability, 10(11), 4106. https://doi.org/10.3390/su10114106

Provincie Gelderland *(*2024). *Lokale hernieuwbare energieprojecten*. Retrieved July 4 2024, from https://www.gelderland.nl/subsidies/lokale-hernieuwbare-energieprojecten

Provincie Zuid-Holland. (n.d.). *Bouwstenen van een zonneveld*. Retrieved August 9, 2024, from https://www.zuid-holland.nl/onderwerpen/ruimte/ruimtelijke/handreiking/bouwstenen-zonneveld/

Reis, I. F. G., Gonçalves, I., Lopes, M. a. R., & Antunes, C. H. (2021). Business models for energy communities: A review of key issues and trends. Renewable & Sustainable Energy Reviews, 144, 111013. https://doi.org/10.1016/j.rser.2021.111013

Reiser, D. B., & Dean, S. A. (2019). The social enterprise life cycle. In Cambridge University Press eBooks (pp. 223–240). https://doi.org/10.1017/9781316890714.014

Rietveld, M., & Lie, R. (2018). Buurtenergie in de Wildemanbuurt. Wageningen University & Research. Retrieved from https://edepot.wur.nl/441618

Rijksdienst voor Ondernemend Nederland (n.d.). *Stimulering Duurzame Energieproductie en Klimaattransitie (SDE++)*. Retrieved 4 July 2024. RVO.nl. https://www.rvo.nl/subsidies-financiering/sde

Ruoranen, K., Klenk, C., Schlesinger, T., Bayle, E., Clausen, J., Giauque, D., & Nagel, S. (2016). Developing a conceptual framework to analyse professionalisation in sport federations. European Journal for Sport and Society, 13(1), 55–74. https://doi.org/10.1080/16138171.2016.1153881

Saurugger, S. (2012). The Professionalisation of EU's Civil Society. A conceptual framework. *New Participatory Dimensions in Civil Society*. https://www.researchgate.net/publication/280819426_The_Professionalisation_of_EU's_Civil_SocietyA_conceptual_framework

Schöne, S. (2024, April 17). *Warmtenetten met een bewonerscoöperatie: koplopers aan het woord*. HIER. Retrieved August 5, 2024, from https://www.hier.nu/samen-van-het-gas-af/warmtenetten-met-een-bewonerscooperatie-koplopers-aan-het-woord

Schrader, C. (2022). Serious Games and Game-Based Learning. In: Handbook of Open, Distance and Digital Education. Springer, Singapore. https://doi.org/10.1007/978-981-19-0351-9_74-1

Seacoop. (n.d.). Burgerwind op zee - Seacoop. Retrieved July 5, 2024, from https://seacoop.be/nl/ontvangst/

Sellis, A. (2024a, April 4). *Van vijvers naar verwarming: Soester Energiecoöperatie pioniert met groeiend warmtenet*. HIER. Retrieved August 9, 2024, from https://www.hier.nu/samen-van-het-gas-af/van-vijvers-naar-verwarming-soester-energiecooperatie-pioniert-met-groeiend

Sellis, A. (2024b, April 23). Zijn batterijen voor lokale energieprojecten een goed idee? HIER. Retrieved June 29, 2024, from https://www.hier.nu/netcapaciteit/zijn-batterijen-voor-lokale-energieprojecten-een-goed-idee

Seyfang, G., Hielscher, S., Hargreaves, T., Martiskainen, M., & Smith, A. (2014). A grassroots sustainable energy niche? Reflections on community energy in the UK. Environmental Innovation and Societal Transitions, 13, 21–44. https://doi.org/10.1016/j.eist.2014.04.004

Soester Energiecoöperatie. (n.d.). Elektrische deelauto. https://soesterenergie.nl/deelauto/#:~:text=Met%20een%20elektrische%20deelauto%20van,je

%20eigen%20(tweede)%20auto.&text=Met%20een%20passend%20abonnement%20van,de%20abonnementen%20en%20je%20kostenbesparing.

Son, J., & Ma, K. (2017). Wind energy systems. *Proceedings of the IEEE*, *105*(11), 2116–2131. https://doi.org/10.1109/jproc.2017.2695485

Steins, N. A., Veraart, J. A., Klostermann, J. E., & Poelman, M. (2021). Combining offshore wind farms, nature conservation and seafood: Lessons from a Dutch community of practice. Marine Policy, 126, 104371. https://doi.org/10.1016/j.marpol.2020.104371

Supriyanto, A., & Burhanuddin, B. (2018). Effective Strategies to Lead Merging Organizations. Proceedings of the 3rd International Conference on Educational Management and Administration (CoEMA 2018). https://doi.org/10.2991/coema-18.2018.47

Thissen, F., Fortuijn, J. D., Strijker, D., & Haartsen, T. (2010). Migration intentions of rural youth in the Westhoek, Flanders, Belgium and the Veenkoloniën, The Netherlands. Journal of Rural Studies, 26(4), 428–436. https://doi.org/10.1016/j.jrurstud.2010.05.001

Van Der Waal, E. C., Das, A. M., & Van Der Schoor, T. (2020). Participatory Experimentation with Energy Law: Digging in a 'Regulatory Sandbox' for Local Energy Initiatives in the Netherlands. *Energies*, *13*(2), 458. https://doi.org/10.3390/en13020458

Van de Worp, J. (2024, June 5). Energiewet met overgrote meerderheid aangenomen door Tweede Kamer. VEMW Kenniscentrum En Belangenbehartiger Van Zakelijke Energie- En Watergebruikers. https://www.vemw.nl/nieuwsbericht/2024/06/05/energiewet-met-overgrote-meerderheid-aangenomen-door-tweede-kamer

Van Seters, P., Mook, T., Sloog, M., Speel, P.-H., Verschuur, G., Willemsen, S., & Energie Samen. (2021). Geothermie voor lokale warmte-initiatieven. In Geothermie voor lokale warmte-initiatieven. https://energiesamen.blob.core.windows.net/media/geothermie%20voor%20lokale%20warmte-initiatieven.pdf

Veldkamp, T. (2023, May 31). *Energie samen*. Retrieved August 2, 2024, from https://energiesamen.nu/verhalen/87/cooperatieve-warmte-uit-water-gaat-het-gebeuren-in-heeg-

Verschuur, G., de Kock, J., & Tekelenburg, T. (2019). Stappenplan exploiteren van elektrische deelauto's. Retrieved from https://d2sra5koyio669.cloudfront.net/files/Stappenplan-exploiteren-van-elektrische-deelauto-s.pdf

Vogelwijk Energiek. (n.d.). Elektrische deelauto. https://www.vogelwijkenergiek.nl/elektrische-deelauto/

Vringer, K., De Vries, R., & Visser, H. (2021). Measuring governing capacity for the energy transition of Dutch municipalities. *Energy Policy*, *149*, 112002. https://doi.org/10.1016/j.enpol.2020.112002

Wagemans, D., Schöll, C., & Vasseur, V. (2019). Facilitating the Energy Transition—The governance role of local renewable energy cooperatives. Energies, 12(21), 4171. https://doi.org/10.3390/en12214171

Warbroek, B., Hoppe, T., Bressers, H., & Coenen, F. (2019). Testing the social, organizational, and governance factors for success in local low carbon energy initiatives. Energy Research & Social Science, 58, 101269

Wang, J. J., Zhao, X., & Li, J. J. (2013). Group buying: a strategic form of consumer collective. *Journal of Retailing*, *89*(3), 338–351. https://doi.org/10.1016/j.jretai.2013.03.001

Wierling, A., Schwanitz, V., Zeiß, J., Bout, C., Candelise, C., Gilcrease, W., & Gregg, J. (2018). Statistical evidence on the role of energy cooperatives for the energy transition in European countries. *Sustainability*, *10*(9), 3339. https://doi.org/10.3390/su10093339

Yergin, D. (2022). Bumps in the energy transition. In *International Monetary Fund*. https://www.imf.org/en/Publications/fandd/issues/2022/12/bumps-in-the-energy-transition-yergin

Zuilhof, J., Hekman, A., Meijer, F., Eerland, D., Karskens, J., Spiceminds, Lize Kraan, Energie Samen, LSA bewoners, Buurkracht, HIER, de Natuur en Milieufederaties, & Participatiecoalitie. (2022). De zoektocht naar volwaardig samenwerken in de warmtetransitie - Succesfactoren en uitdagingen van 70 bewonersinitiatieven en hun gemeenten. https://departicipatiecoalitie.nl/wp-content/uploads/2022/04/Participatiecoalitie-De-zoektocht-naar-volwaardig-samenwerken-in-de-warmtetransitie-2022.pdf