Master Thesis

Master Business Informatics (MBI)

Intellectual Property Strategies of University IT Spinoffs

Joep Wegstapel
j.w.g.wegstapel@students.uu.nl
Student no.: 6004202

Supervisors: Prof. dr. Sjaak Brinkkemper & Dr. Slinger Jansen

Master Business Informatics
Department of Information and Computing Sciences

February 2024

Abstract

This research investigates the challenges and strategies surrounding intellectual property (IP) rights in the context of university IT spinoffs (UIS). The following main research question is answered: “What Intellectual Property appropriation strategies exist, and which strategy should University IT Spinoffs apply?”. There is often confusion and disagreement on the ownership and protection of the Intellectual Property developed by University spinoffs. Besides, spinoff founders often have insufficient knowledge concerning what consequences IP related choices might have for the spinoffs’ business model. Because of this, university spinoff founders often face challenges in protecting and successfully commercializing their innovations. This research identifies the gaps in knowledge and policy that hinder these spinoffs and explores how the Universiteiten van Nederland (UNL) Deal Terms can assist in navigating this complexity.

Employing a Wieringa design science approach, including a multi-vocal literature review, expert interviews, and a case study of the Care2Report Research Program and its Verticai spinoff from Utrecht University, this research provides an in-depth analysis of the current challenges in IP appropriation and IP strategy. The IP Appropriation Guideline (IPAG) method is created and presented as a step-by-step guideline designed to assist university IT spinoffs in effectively managing their intellectual property, supported by the UNL Deal Terms. By focussing on assessing the spinoff's needs, stakeholder alignment, risk analysis, IP negotiation strategies, deal closing, and monitoring and adaptation of the IP strategy, this method seeks to navigate spinoff founders across the challenging terrain of IP appropriation successfully, so that they can successfully protect and commercialize their innovative technologies. The method does not only serve as a set of instructions, but as a strategic framework that acknowledges the relationship between IP strategies and the UIS business model.

The findings highlight the importance of clear and fair IP guidelines and strategies for the success of university spinoffs. By applying the IPAG method, spinoffs founders can not only protect and commercialize their IP more effectively, but also contribute to a healthier ecosystem of innovation and entrepreneurship within and beyond academia.

Keywords: Intellectual Property, University (IT) Spinoff, Express License Agreements, UNL Deal Terms, IPAG Method

Table of Contents

1. Introduction **5**

1.1 Problem Statement *5*

1.2 Research Objective *6*

1.3 Research Questions *7*

1.4 Research Context: Care2Report Research Program & Startup *8*

2. Research Method **10**

2.1 Design Science Framework by Wieringa *10*

2.2 Multivocal Literature Review *12*

2.3 Project Milestones *13*

2.4 Ethics and Privacy Quick Scan *13*

3. Related Work on University Spinoffs and Intellectual Property **14**

3.1 Key Concepts *14*

3.2 University Spinoff *15*

3.3 Intellectual Property *17*

3.4 University Spinoffs and Intellectual Property *21*

3.5 UNL Deal Terms *23*

4. Intellectual Property Ownership and Protection **25**

4.1 Brief history of dealing with IP appropriation in University context *25*

4.2 Express License Agreements & Intellectual Property Appropriation Strategies *26*

4.3 Intellectual Property Appropriation Mechanisms *28*

4.4 Differences for University Spinoff Types *34*

4.5 How to make University Spinoffs aware of IP consequences using the SEEM model *35*

5. IP Appropriation Strategies and the UIS Business Model **37**

5.1 Expert Interviews *37*

5.2 Direct influence of IP appropriation on the UIS business model *40*

5.3 Indirect influence of IP appropriation on the UIS business model *41*

6. IP Appropriation Guideline **46**

6.1 IPAG Method *47*

6.2 UIS needs assessment *49*

6.3 Stakeholder alignment *49*

6.4 Risk analysis *50*

6.5 IP Negotiation *51*

6.6 Deal closing *52*

6.7 Monitoring and adaptation *52*

7. Case Study UIS from Care2Report **54**

7.1 The Care2Report Research Program *54*

7.2 Startup Verticai *55*

8. Discussion and Conclusion **57**

Acknowledgements **60**

References **61**

Appendix **65**

Ethics and Privacy Quick Scan *65*

IPAG Method Activity and Concept Tables *69*

1. Introduction

1.1 Problem Statement

Universities have a history of creating spinoff companies based on research conducted at the institution (Gubeli & Doloreux, 2005). Universities provide people with resources and knowledge, which people can use to create a spinoff. At some point the spinoff creator might want to expand the spinoff outside the university; this is called a University Spinoff. Over the last years, more and more University spinoffs have been founded (Mathisen, M. T., & Rasmussen, E. (2019). These spinoffs can focus on different sectors. However, in the context of this research we focus on University Spinoffs focused on IT, referred to as University IT Spinoffs (UIS). There is often confusion and disagreement over the ownership and protection of the intellectual property (IP) developed by these spinoffs, which is also the case for UIS (Gubeli & Doloreux, 2005).

This can lead to legal disputes and hinder the commercialization of valuable technology. There is a lack of clear and fair policy for determining the IP rights of university spinoffs. This lack of policy can lead to a decrease in innovative spinoffs and it may cause disadvantages for university spinoffs when competing in the market. This may lead to decreased profits, slower growth and reduced returns for individual investors and the university itself (Gubeli & Doloreux, 2005).

Also, due to the vagueness concerning its IP rights, spinoffs are not adequately protected against the potential misappropriation of their IP. Spinoff companies often lack the resources and knowledge to protect themselves from infringement, leaving them vulnerable to exploitation by competitors or other parties seeking access to their proprietary information. University spinoffs are increasingly becoming a target of intellectual property theft. Without adequate protection, these start-ups may be unable to capitalize on their innovations and ideas.

To solve part of the issue, the Universiteiten van Nederland (UNL, The Dutch industry- and interest group consisting of the 14 publicly funded Dutch universities) developed the UNL Deal Terms, a comprehensive, standardized framework outlining the deal terms and considerations for accessing Intellectual Property Rights (IPR) in the context of university spin-offs (UNL, Zijlstra, 2023). These Deal Terms concern many different mechanisms, see related literature. However, it is difficult to determine what parameters are applicable to a specific UIS and what their acceptable values could be in the context of different UIS.

So, there is often confusion and disagreement on the ownership and protection of the Intellectual Property developed by university spinoffs, due to a lack of clear policy, making it difficult for them to commercialize and grow their findings. The recent UNL Deal Terms try to solve a part of this by providing a toolset with different mechanisms, but it is still complex to determine their applicability for specific UIS cases. This is caused by the context specificity of and differences between different university spinoffs.

The way of dealing with Intellectual property appropriation also has consequences for the spinoffs' business model (Lucchi, 2005; Mets, Leego, Talpsep & Verbiane, 2007). Different strategies exist for IP appropriation, and these strategies are product/technology and context dependent (Mets et al., 2007). However, university spinoffs have insufficient knowledge concerning the consequences that IP strategy related decisions might have for the business model, which leads to spinoffs making decisions without overseeing the potential results.

This leads to the following problem:
There is often **confusion and disagreement** on the **ownership and protection of the Intellectual Property** developed by **University spinoffs**, and spinoff founders often have **insufficient knowledge** concerning what **consequences IP strategy** and Universiteiten van Nederland **Deal Terms related choices** might have for the **success of the spinoffs' business model**.

The above formulated problem forms great challenges for many startups that originated in a scientific context. This thesis researches university spinoffs in general, in some parts specifically focussing on UIS. There is a knowledge gap which concerns a lack of clear policy as well as missing knowledge on how to react to this policy in terms of available IP strategies and their corresponding consequences for the UIS business model.

1.2 Research Objective

Based on the knowledge gap and problems described in the problem statement, the objective of this research is to explore the challenges that UIS encounter concerning intellectual property appropriation using the UNL Deal Terms, the different strategies that can be applied to tackle these challenges and the consequences that these strategies might have for the UIS business model. The result of this research will be a guideline that must help university spinoff founders, especially UIS founders, to successfully become independent from a university. This is done to enable the UIS founders to further protect and commercialize their innovative technologies and products; in particular that of the Utrecht University Care2Report Research Program (Maas et al., 2020) spinoff called Verticai.

The designing of this roadmap can be identified as the problem driven design problem, which is a problem to design an artifact so that it contributes to the achievement of some goal. The design problem template was used to define the following design problem (Wieringa, 2014):

How to **design a guideline,** that **helps University IT spinoffs tackle challenges concerning Intellectual Property appropriation** with help of the **UNL Deal Terms**, and identifies the **consequences** that different strategies might have for the spinoffs' **business model**, so that UIS can successfully protect and commercialize their innovative technologies?

1.3 Research Questions

To solve the problems described in the problem statement and to accomplish the research objective, the following main research question is defined:

MRQ: What Intellectual Property appropriation strategies exist, and which strategy should University IT Spinoffs apply?

To answer the main research question, several sub research questions have been defined. The first sub-question concerns regulations that have to be taken into account; University regulations, as well as Dutch National regulations and International regulations are investigated here. These regulations are also checked for generalizability.

RQ1: What strategies concerning the ownership of Intellectual Property developed by University IT Spinoffs exist?

The second sub research question concerns Intellectual Property appropriation strategies that are applicable to UIS, and their consequences for the UIS business model. The influence of IP appropriation strategies on the spinoffs investor readiness is also discussed in this section.

RQ2: What are the consequences of IP appropriation strategies for the University IT Spinoff business model?

The third sub research question investigates the required steps for finding the most suitable Intellectual Property appropriation strategy for a specific UIS.

RQ3: What are the steps of an IP appropriation guideline that University IT Spinoffs can apply?

With the fourth and last sub research question, the IP appropriation guideline from RQ3 is validated by doing a case study for Care2Report, a UIS from Utrecht University, to check if the guideline is applicable and valid for this specific UIS.

RQ4: Does the IP appropriation guideline work for the specific Care2Report University IT Spinoff case?

The Research Context, that of UIS and Care2Report in particular, is discussed in section 1.4. Here, Care2Report and its relevance as a case study is discussed in more detail. In chapter 2 the research method is elaborated on, which is the Design Science Framework designed by Wieringa, combined with a multivocal literature review, observations, expert interviews, and a case study for validation.

1.4 Research Context: Care2Report Research Program & Startup

The aim of this research is to solve the design problem stated in the Research Objective section. The general context of this research is that of startup IT companies that are spinoffs from a University, referred to as *University IT Spinoffs (UIS)*. However, for the Design Cycle to be effectively executed it is important to describe a specific instance of this context. The context of this research is that of the Care2Report Research Program, specifically the UIS called Verticai. This research is also part of the Care2Report Research Program.

Care2Report is a Utrecht University research program led by Prof. Sjaak Brinkkemper. Care2Report researches the field of Automated Medical Reporting (AMR). Documenting patient medical information in the electronic medical record is a time-consuming task at the expense of direct patient care. AMR tries to solve this issue. The idea is that a non-intrusive device with camera, microphone and sensor technology is combined with state of the art speech and video analysis and advanced semantic interpretation through knowledge graphs, after which this audio, video and sensor input is combined to create a medical report. Speech recognition transforms medical dialogues to text, action recognition captures examinations and treatments, and results of medical measurements are provided through sensor data. Background information on patient history and medical guidelines can be employed for more accurate interpretation of the data. At the end, the medical professional only has to check the medical report before uploading it to the Electronic Medical Record (EMR) (Maas et al., 2020).

The process followed at Care2Report consists of four phases (Maas et al., 2020):

1. **Phase 1**: Voice dialogue recording, action and treatment recording and measurement recording.
2. **Phase 2**: Formal representation of the recordings and measurements is produced.
3. **Phase 3**: Based on the formal representation, a report is generated.
4. **Phase 4**: The generated report is sent to the Patient EMR.

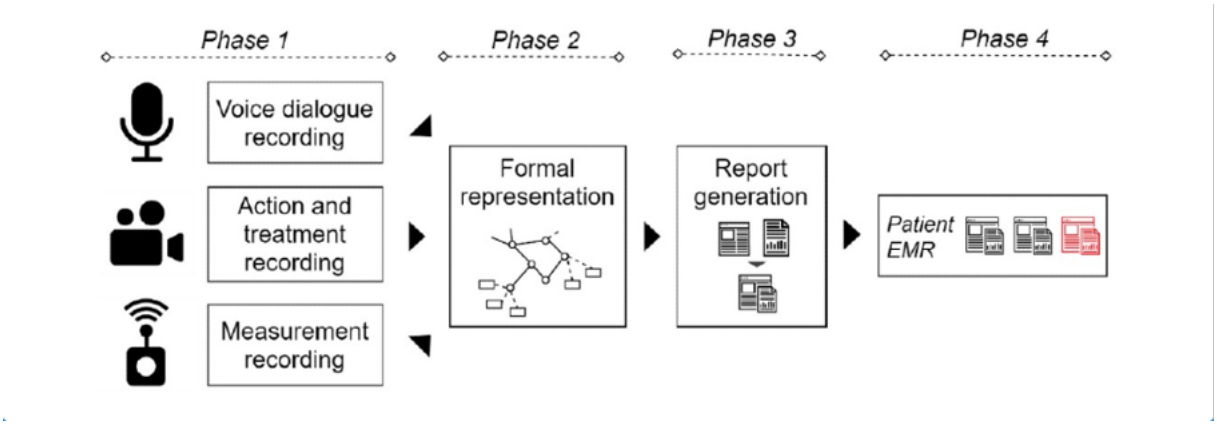

Figure 1.1: The Care2Report Process (Maas et al., 2020).

Verticai is a UIS which is partly based on the research conducted at the Care2Report program, but at the beginning of this research Verticai has not spinned out of university yet, making it a relevant example of a university spinoff. In order to understand how UIS and especially Verticai can protect their IP best, it is important to consider the legal framework this spinoff operates in and to identify any potential weaknesses or gaps that may exist within this legal framework, so that appropriate measures can be taken accordingly (Hargreaves, 2011; Maas et al., 2020).

To get to the point where Care2Report and Verticai are now, a lot of research has been done within the Care2Report Research Program over the past years. The process followed at Verticai is somewhat similar to the process followed at Care2Report, see figure 1.2.

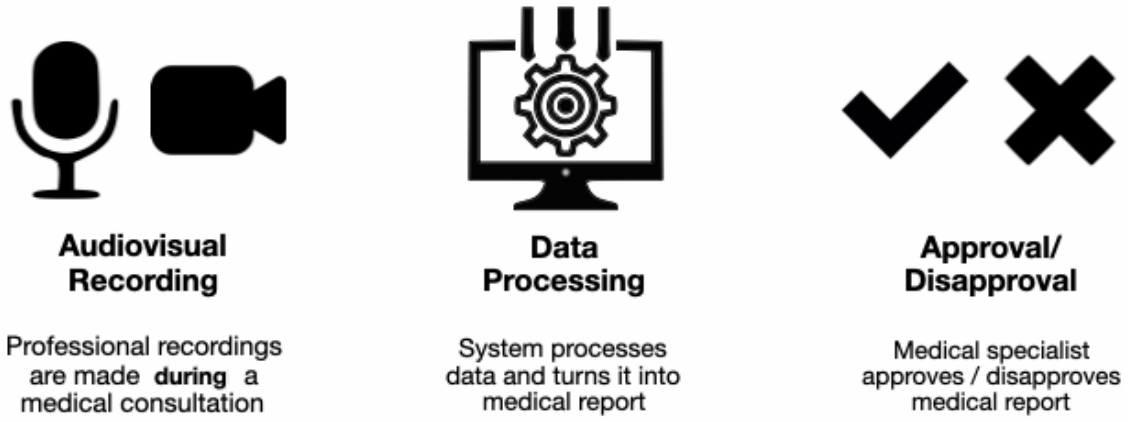

Figure 1.2: The Verticai Process.

Most of the Care2Report research has been carried out by employees and students from Utrecht University. So, it is likely that the university will claim some of the IP in the Verticai spinoff. The UNL Deal Terms provide a framework containing a toolset with different mechanisms (UNL, Zijlstra, 2023), but it is difficult to determine their applicability and acceptable values for specific UIS cases. This will be further discussed in chapter 4.3.

The latter is the reason why Care2Report and Verticai form a relevant context. It is a knowledge intensive UIS, for which research has been done using Utrecht University time and resources. More specifically, Utrecht University is one of the universities making it difficult for spinoffs by being relatively tough in giving away IP rights, neglecting the UNL Deal Terms till date (UNL, Zijlstra, 2023). Taking this university as an example will hopefully result in a guideline that is more extensive than a guideline resulting from universities that deal with IP more easily.

Verticai will be used as a case study for the Treatment Validation phase to illustrate the challenges it encounters in the process of intellectual property appropriation related decisions and the corresponding impact on the business model. During this case study, the treatment is virtually (so not actually) implemented by experts and the virtual implementation process is reported upon.

2. Research Method

2.1 Design Science Framework by Wieringa

To accomplish the research objective and to answer the research questions, the Design Science Framework by Wieringa (2014) is used.
All research in all disciplines is meant to solve problems. As mentioned in the Research Objective section, the goal in this research is to design something useful: a roadmap for university spinoffs to successfully become independent from the university and to further protect and commercialize their innovative technologies and products. This is a so called design problem and therefore the corresponding research method is the Design Cycle, which can be seen in figure 2.1. The Design Cycle consists of three phases: Problem Investigation, Treatment Design and Treatment Validation. Including two more phases of Treatment Implementation and Implementation Evaluation results in the Engineering Cycle (Wieringa, 2014). This can also be seen in figure 2.1 below. The question marks indicate knowledge questions, and the exclamation marks indicate design problems (Wieringa, 2014).

Problem Investigation

The first phase of the Design Cycle is Problem Investigation, where the goal is to prepare for the design of a treatment by learning more about the problem to be treated (Wieringa, 2014). This is done by investigating stakeholders and goals and creating a conceptual problem framework. A conceptual framework is a clear illustration of the relationship between the variables of your study, outlining the findings you anticipate from your investigation. It is a set of definitions of concepts, referred to as constructs. These constructs are used to define the structure of an artifact and its context, to describe phenomena in the artifact and context, and to frame the design problem (Wieringa, 2014). It can help identify stakeholders, state their goals, and specify requirements of a treatment. In this research it is investigated who owns the Intellectual Property in university spinoffs. So in this specific case, the conceptual framework should describe the system of determining Intellectual Property ownership in the context of university spinoffs. This can be investigated in various ways, one of which is doing a scientific and professional literature review, which will be used in this research. The use of a systematic, Multivocal Literature Review is further elaborated on in chapter 2.2. Research Question 1, “What regulations concerning the ownership and protection of Intellectual Property developed by university spinoffs exist?” is part of this problem investigation phase.

Treatment Design

The Treatment Design phase leads to the treatment that is applied to the problem context defined in the Problem Investigation phase. The available treatments are explored, requirements are specified, and new treatments are designed. The specifying of requirements and designing of new treatments are meant to solve the design problem (Wieringa, 2014). In this research the results from the literature review done in the previous phase are used for exploring available treatments and for defining requirements. Then, the existing treatments and the knowledge gained from the literature review are combined in the process of designing the new treatment, which will be a roadmap in this case. RQ2, “What Intellectual Property appropriation strategies exist, and what are their consequences for the spinoffs’ business model?” is part of the treatment design phase.

Treatment Validation

In the last phase of the Design Cycle, the effect of the newly designed treatment on the research context is investigated and it is checked if the treatment meets the requirements specified in the Treatment Design phase. The goal of validation is to predict how an artifact will interact with its context, without actually observing an implemented artifact in a real-world context (which is done later in the Implementation Evaluation phase, which is not part of the Design cycle anymore, see following sub-section) (Wieringa,

2014). In this research, the treatment will be validated by performing a case study: The interaction of the roadmap with the Care2Report research context (see section 4) will be predicted. This case study is discussed in more detail in section 5.3. In this phase, RQ3, "What Intellectual Property appropriation strategy should university spinoffs focused on IT apply, in particular in the case of Care2Report?" is answered.

Treatment Implementation & Implementation Evaluation

If the Treatment Validation phase is followed by the Treatment Implementation & Implementation Evaluation phases, the bigger cycle is called the Engineering Cycle. In the Treatment Implementation phase, the treatment is implemented in a real-world context (Wieringa, 2014). Following the current research, the newly designed treatment will be implemented in the predefined context: in particular that of the Care2Report spinoff. The Care2Report research context is further elaborated on in section 4.

The implementation is then evaluated in the implementation evaluation phase, where the same questions as in the problem investigation phase are asked, but with a different goal. The goal of implementation evaluation is to evaluate a treatment after it has been applied in the original problem context, whereas the goal of problem investigation is to prepare for the design of a treatment by learning more about the problem to be treated in advance (Wieringa, 2014). Both the Treatment Implementation and Implementation Evaluation phases fall outside the scope of this research.

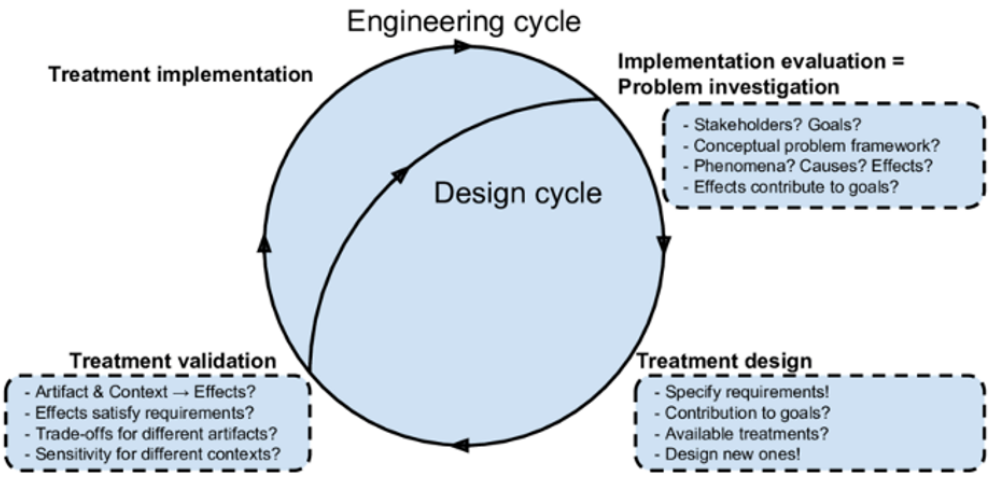

Figure 2.1: Design Cycle & Engineering Cycle by Wieringa (2014).

Design Science Phase	RQ1	RQ2	RQ3	RQ4
Problem Investigation	X	X		
Treatment Design			X	
Treatment Validation				X
Treatment Implementation				

Table 2.1: Wieringa Design Science Phases and their corresponding RQ's in this research.

2.2 Multivocal Literature Review

A literature review is conducted to investigate the problem (in the problem investigation phase) and specify requirements for the treatment design. The reviewed literature includes related research concerning University Spinoffs, Intellectual Property, Intellectual Property Appropriation Strategies, Business Models, Automated Medical Reporting and the relationships between these concepts. A bunch of papers is retrieved using Google Scholar, after which the snowballing technique (Wohlin, 2014; Garousi et al., 2016) is used to find other relevant papers.

The base set of articles that the snowballing technique is used on consists of the following articles:

- Gübeli, M. H., & Doloreux, D. (2005). An empirical study of university spin-off development.
- Hargreaves, I. (2011). Digital opportunity: A review of intellectual property and growth.
- Teixeira, A. A., & Ferreira, C. (2019). Intellectual property rights and the competitiveness of academic spin-offs.
- Kulkov et al. (2020). The importance of financial resources and ownership of intellectual property rights for university spin-offs: the cases of Finland and Sweden.
- Teece, D. J. (2018). Business models and dynamic capabilities.
- Maas et al., 2020 - The Care2Report System; Automated Medical Reporting as an Integrated Solution to Reduce Administrative Burden in Healthcare

The literature review is conducted multi-vocally to also include grey literature, since a lot of relevant literature is not scientific, though very relevant and this information should not be missed (Garousi et al, 2016).

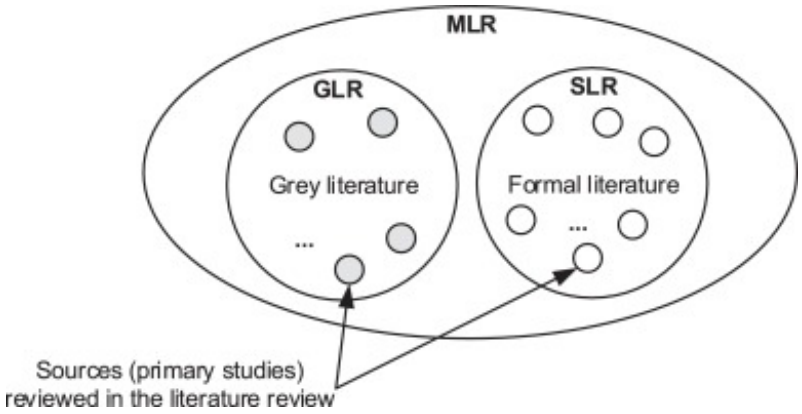

Figure 2.2: Visual representation of Multivocal Literature Review (MLR).

The literature review is used to answer research question 1: “What strategies concerning the ownership of Intellectual Property developed by UIS exist?” and research question 2: “What are the consequences of IP appropriation strategies for the UIS business model?”.

2.3 Project Milestones

The project milestones go hand in hand with the different phases of the Wieringa Design Cycle and answering the research questions that are part of these phases.

The first milestone is achieved after rounding off the Problem Investigation Phase. and answering Research Question 1, “What strategies concerning the ownership and protection of Intellectual Property developed by UIS exist?” and Research Question 2, “What are the consequences of IP appropriation strategies for the UIS business model?”. These question are answered by executing the Literature Review described in more detail in section 5.2, by using personal observations and by performing Expert Interviews.

To achieve the second milestone the second phase of the Wieringa Design Cycle, Treatment Design, must be rounded off. Research Question 3, “What are the steps of an IP appropriation guideline that UIS can apply?” is part of the treatment design phase and will be answered by then. This is done based on the Literature Review as well as on the Expert Interviews.

The forth and last research question, “Does the IP appropriation guideline work for the specific Care2Report UIS case?” forms the basis of the Treatment Validation phase, which is the last phase of the Wieringa Design Cycle. This research question will be answered and therefore this phase will be rounded off by doing the case study described in chapter 7 and based on expert interviews.

Research Method	Problem Investigation	Treatment Design	Treatment Validation
Literature Review	X	X	
Observations	X		X
Expert Interviews	X	X	X
Case Study	X		X

Table 2.2: Research methods used within the Wieringa Design Science Framework.

2.4 Ethics and Privacy Quick Scan

To make sure that all ethical and privacy related issues are taken care of in a correct manner, the Ethics and Privacy Quick Scan was conducted (see Annex A). This Quick Scan was developed by the Utrecht University Research Institute of Information and Computing Sciences. It classified this research as low-risk with no fuller ethics review or privacy assessment required, since no people are involved in any other way than having discussions with them.

3. Related Work on University Spinoffs and Intellectual Property

To provide some context on the current state of the art on University Spinoffs and Intellectual Property, this chapter discusses the relevant key concepts in this area, more information on (recent) University Spinoff as well as Intellectual Property developments, and the relationship between these two concepts is described.

3.1 Key Concepts

The most important concepts in this research are University Spinoff, Intellectual Property, UNL Deal Terms and Business Model. These concepts are briefly described below.

University Spinoff
A *university spinoff*, also known as a university startup or a university spin-out, is defined as *a company that is founded based on technology, knowledge, or intellectual property (IP) developed within a university or research institution* (Teixeira & Ferreira, 2019). It involves commercializing research outcomes or innovative ideas generated by faculty, students, or researchers affiliated with the university (Teixeira & Ferreira, 2019; Kulkov et al., 2020). University spinoffs typically arise when individuals associated with the university recognize the potential market value and application of their research findings or inventions. They establish a separate entity, often a startup company, to further develop, protect, and bring their intellectual property to the market (Kulkov et al., 2020).

In this research, the focus is on university spinoffs focused on IT, referred to as ***University IT Spinoffs (UIS)***. Different types of IT spinoffs exist; there is a difference between spinoffs selling an IT product and spinoffs selling an IT-enabled product. The context of this research is the Care2Report Software platform, which sells an IT product. More information on University Spinoffs is given in chapter 3.2.

Intellectual Property
Intellectual property (IP) refers to *a legal concept that encompasses intangible creations of the human mind*. It represents a set of exclusive rights granted to individuals or entities over their original works or inventions, providing them with control and ownership over the use and exploitation of these creations. IP has received relatively little explicit attention compared to other forms of property. Intellectual property rights involve abstract objects such as algorithms, software code and formulas. These objects are important in modern society and create interdependent relationships. However, extending property rights to abstract objects raises concerns about the growth of private power and potential threats to an individuals' liberty (Drahos, 1996; Hargreaves, 2011). Different forms of protecting Intellectual Property are described in section 3.3. Intellectual Property Rights are generally referred to as IPR.

UNL Deal Terms
The Universiteiten van Nederland (UNL, The Dutch industry- and interest group consisting of the 14 publicly funded Dutch universities) developed the UNL Deal Terms; a comprehensive, standardized framework outlining the deal terms and considerations for accessing Intellectual Property Rights (IPR) in the context of university spin-offs. The UNL Deal Terms allow for an equity deal, royalty deal or a hybrid deal to be made; these are called deal templates. When an equity deal is made, the university gets a certain amount of shares in the company, a royalty deal concerns the spinoff paying royalties to the university for using the IP for a pre-set period of time, and a hybrid deal is a combination of the two (UNL, Zijlstra, 2023).

Business Model
A *business model* is *a framework that describes how an organization creates, delivers, and captures value. It outlines the fundamental elements and components of a business's operations, revenue generation, and profitability strategy* (Teece, 2018). A business model encompasses various aspects, including the target

market, value proposition, revenue streams, cost structure, and key activities required to sustain the business. A well-defined and well-executed business model aligns all these components and ensures that the organization can effectively create, deliver, and capture value in the marketplace. It serves as a blueprint for the business's overall strategy and guides decision-making processes related to growth, innovation, sustainability (Lucchi, 2005; Mets, et al., 2007; Teece, 2018). A well known and structured way of mapping a business model is the Business Model Canvas by Osterwalder (Osterwalder et al., 2011; Verrue, 2014).

3.2 University Spinoff

In the context of this research we define a university spinoff, also known as a university startup or spin-out, as a company or venture that is established based on intellectual property or technology developed within a university or research institution. It involves the process of commercializing academic research, discoveries, or inventions by creating a separate entity or company that can bring those innovations to the market. University spinoffs typically aim to capitalize on the knowledge, expertise, and inventions generated by the faculty, researchers, or students and translate them into products, services, or technologies that have commercial value. These spinoff companies often receive support, resources, and guidance from the university or research institution to help them navigate the challenges of entrepreneurship and successfully bring their innovations to market. University spinoffs play a vital role in fostering technology transfer, driving economic growth, and bridging the gap between academia and industry (Shane, 2004; Jansen et al., 2015; Savva & Taneri, 2015).

University spinoffs have gained significant attention as a means of commercializing research and fostering innovation. The emergence of university spinoffs as a prominent form of academic entrepreneurship reflects the growing recognition of universities as engines of innovation and economic development. University spinoffs are a form of science-based entrepreneurship. However, it is difficult to design efficient institutions for science-based entrepreneurship to be encouraged (Shane, 2004; Henrekson & Rosenberg, 2001; Jansen et al., 2015).

Many European Deep Tech startups' successes have their roots in academia. Among the most notable examples of spinouts are: BionTech from Johannes Gutenberg University Mainz, Celonis from TU Munich, ClimeWorks from ETH Zurich, DarkTrace from Cambridge, Oxford Nanopore from Oxford and Mindmaze from EPFL (Lausanne). Universities in the UK created the most spinout value, followed by Switzerland and Germany. ETH, Oxford and Cambridge are the top universities overall by spinout value creation. As can be seen in figure 3.1, universities from the United Kingdom created 2904 spinouts in total, Switzerland universities had 1173 spinouts, and German universities created 858 spinouts (Doe, 2022).

According to the 2001 research by Henrekson and Rosenberg, individuals face some key decision points after they finish High School, see the figure below (Henrekson & Rosenberg, 2001). This starts with choosing between entering the labor market or pursuing Tertiary Education at a university. Upon enrolling in university, individuals must decide between science and technology-based disciplines or other areas, notably the social sciences. After graduation, natural science graduates face the choice between employment and pursuing graduate studies to obtain a Ph.D. Subsequently, there is a decision to be made between a university career and employment elsewhere.

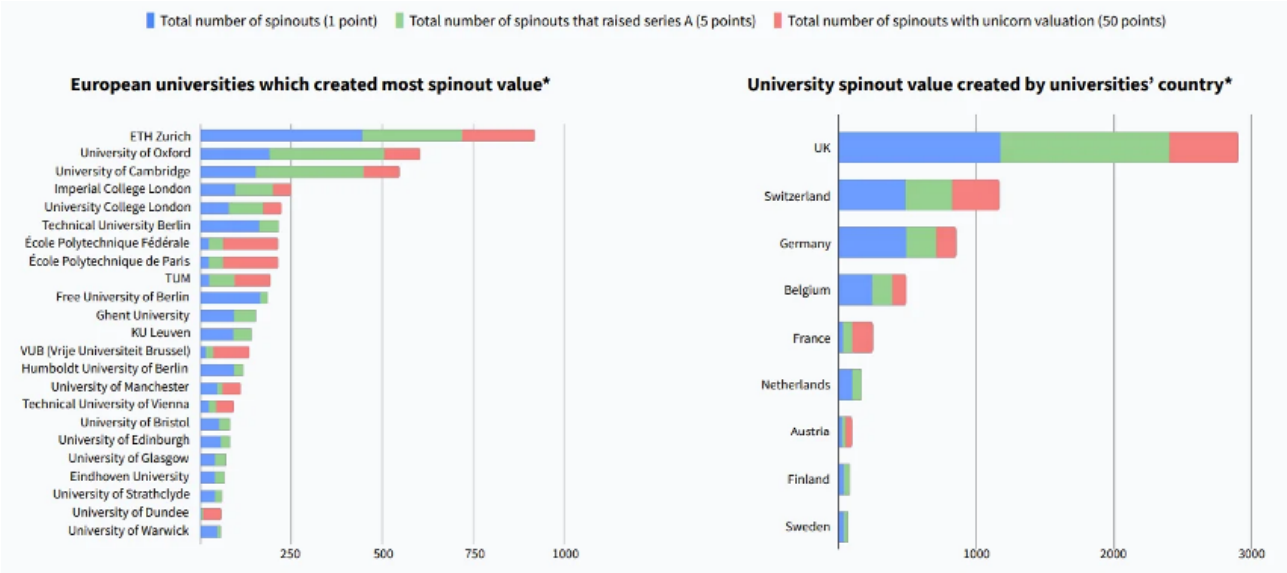

Figure 3.1: Number of tech spinouts per university and per country (Doe, 2022).

Science-based entrepreneurial ventures heavily rely on academically trained and motivated individuals, primarily from university faculties, but also individuals with relevant educational backgrounds from other firms. Efficient functioning of several important links is necessary for a thriving environment of science-based entrepreneurship, including incentives for investing in human capital at the university level, incentives for involvement in entrepreneurial ventures, and incentives within the university system to align study programs with industry demand and facilitate the transition from academia to entrepreneurship (Henrekson & Rosenberg, 2001). In the same 2001 research, Henrekson & Rosenberg examined the significance of these incentives by analyzing the impact of science-based entrepreneurship in Sweden and the US, considering economic performance, resources allocated to research and development, and government initiatives to bridge the gap between academia and the commercial sector.

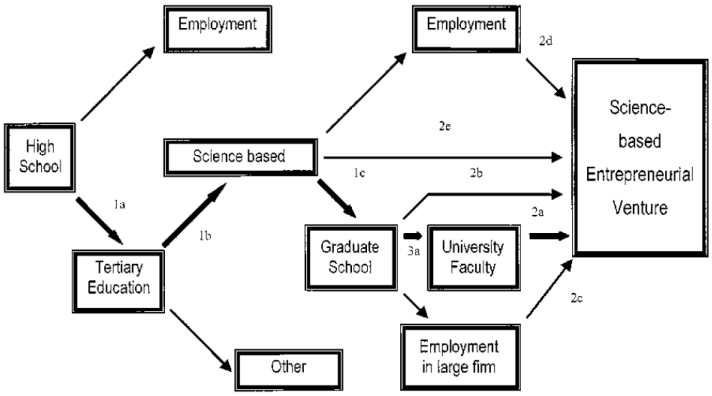

Figure 3.2: From educational choice to science-based entrepreneurship (Henrekson & Rosenberg, 2001).

The 2015 research by Jansen et al. investigated ways to encourage entrepreneurship within universities, and addresses the research question concerning which entrepreneurship encouragement offerings contribute to students' decision to pursue a career as (science-based) entrepreneurs. The three stage Student Entrepreneurship Encouragement Model (SEEM) is developed and presented, consisting of an education stage, a stimulation stage, and an incubation stage. The education stage aims to create awareness of entrepreneurship as a career option, utilizing supportive faculty, role models, success stories, and introductory courses. The stimulation stage focuses on supporting students with business ideas, including

support for team formation, idea validation, pitching, business plan development, and prototype realization. Finally, the incubation stage aims to launch actual companies, providing shared working spaces, access to professional office space, mentoring, networking, business plan competitions, and accelerator programs. The importance of (seed) funding is found to be relatively less crucial during the incubation stage for software companies based on the case studies conducted (Jansen et al., 2015).

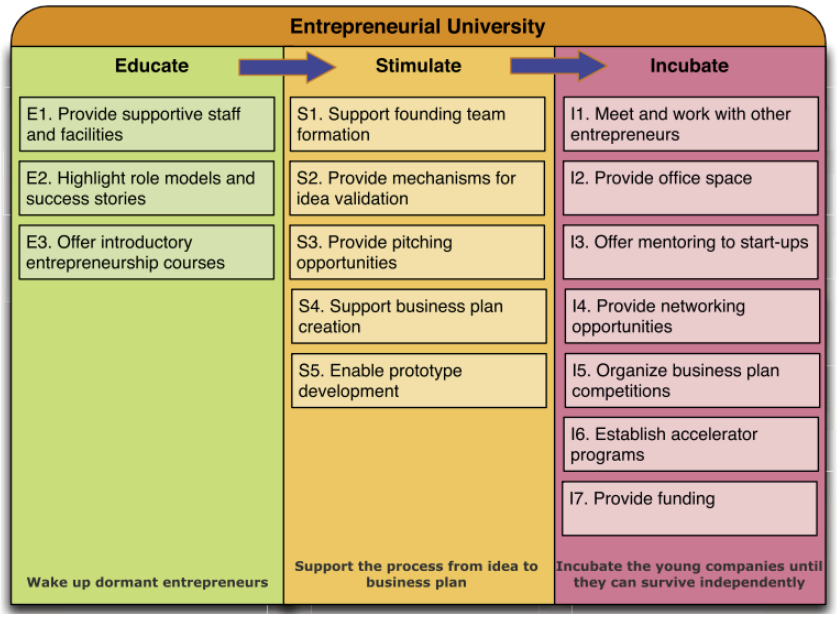

Figure 3.3: Three-stage Student Entrepreneurship Encouragement Model to contribute to becoming an entrepreneurial university (Jansen et al., 2015).

Assuming that efficient institutions for Science-Based Entrepreneurship succeed in encouraging academic people to become entrepreneurial and found their own University Spinoff, one of the first things that has to be dealt with is the Intellectual Property (IP). It is often unclear if this IP belongs to the university or to the startup and its founders (Savva & Taneri, 2015). Ways of using the SEEM model for making founders more aware of the IP related aspects of their spinoff are described in section 4.5.

3.3 Intellectual Property

A lot has been written about the theory of property. Property has been and remains one of the bedrock subjects of social science theorizing. Property continues to be a key target for philosophical analysis. While the literature on property is vast, relatively little of it has explicitly dealt with intellectual property. It may be that the assumption has been that any general theory of property illuminates all property forms, including intellectual property. Perhaps this assumption is correct and perhaps not. Like other property rights, intellectual property rights concern relations between individuals. Unlike real property law, intellectual property law concerns rights in abstract objects. An algorithm and the formulae for penicillin and its derivatives are examples of abstract objects. Other examples are algorithms, software code and formulas. These objects are important in modern society and create interdependent relationships. Many people need, use and depend on such objects. There is a lot at stake when property extends its reach to abstract objects. It seems worth asking whether we can accommodate intellectual property within one or more of the existing general accounts of property or whether we should develop a distinctive theory of intellectual property (Hargreaves, 2011; Teixeira & Ferreira, 2019).

The 1996 research by Drahos explores the writings of Locke, Hegel, and Marx in understanding intellectual property but does not propose a comprehensive theory. Instead, it suggests adopting an instrumentalist approach and using the language of privilege rather than property rights to develop interdisciplinary theories of intellectual property, with privilege-bearing duties forming the core of such a theory (Drahos, 1996; Hargreaves, 2011).

To prevent IP being used by another party without permission of the rightful owner, one's intellectual property can be protected in various ways, including patents, copyrights, trademarks, trade secrets, and industrial designs. Each form of IP protection grants specific rights and safeguards, tailored to different types of intellectual creations. Patents protect inventions and technological innovations, copyrights safeguard literary, artistic, and creative works, trademarks identify and distinguish goods or services in the market, trade secrets guard valuable confidential information, and industrial designs protect the aesthetic and functional aspects of products. The primary purpose of intellectual property is to incentivize innovation and creativity by granting creators and inventors exclusive rights to their creations, thus fostering economic growth, encouraging further innovation, and ensuring the fair recognition and reward for their contributions. By balancing the interests of creators and society, intellectual property plays a crucial role in promoting and protecting the fruits of human intellectual endeavor (Drahos, 1996; Teixeira & Ferreira, 2019).

The same abstract object may be protected under more than one type of intellectual property protection. Algorithms are potentially protectable under patent, copyright and trade secret law. A sign may be a trade mark and an artistic work. The choice of protection for an object is a matter of business strategy, all having advantages as well as disadvantages. A product that is easy to reverse engineer (like a machine) is better protected by patent than by trade secret law since the latter does not offer rights against the independent rebuilder (Drahos, 1996; Hargreaves, 2011). On the other hand, A patent is only useful if you can afford to protect it by taking legal actions in case someone neglects it.

In his 2011 research, Hargreaves emphasizes the importance of innovation for today's advanced economies and their long-term growth. He states that the UK's competitive edge lies in its capacity to innovate, particularly in knowledge-intensive businesses across all sectors. The paper aims to examine how the country's Intellectual Property (IP) framework can best encourage innovation and growth. Intellectual Property Rights (IPRs) are highlighted as supporting growth by offering temporary monopolies to creators and inventors, but they can also impede growth when transaction costs are high or rights are fragmented. Poorly designed IP rules may hinder new players' access to technology and content. A well-designed and dynamic IP system can complement competition and spur follow-on innovation (Hargreaves, 2011).

The research highlights the importance of productivity and innovation for long-term economic growth. It states that small and young firms drive most of the productivity growth and job creation through innovation. Innovative firms grow faster and contribute to the UK's economic growth. Competition acts as a strong incentive for firms to innovate and gain an advantage. However, innovation involves private costs and risks, which can be a disincentive. To counter these risks, intellectual property rights (IPRs) incentivize innovation by offering time-limited returns on investment, reducing the risks associated with creating new products. Some kinds of IPRs, like patents, also encourage follow-on innovation by disseminating information about technology. However, an overly rigid IP framework can act as a barrier to innovation by constraining access to protected knowledge and content. IP systems impose transaction costs on creators, innovators, and society, offsetting the incentives of exclusivity. Finding the optimal balance between strengthening rights and reducing transaction costs varies by industry and technology. IP systems also have wider costs to society, including limiting competition and sustaining higher prices. Extending the duration of copyright, for example, benefits rights holders but increases costs for consumers (Hargreaves, 2011; Teixeira & Ferreira, 2019).

As advanced economies increasingly rely on knowledge-intensive activities, the significance of intellectual property (IP) is on the rise. Profound economic and technological transformations underscore the need for a well-designed and supportive IP framework as a crucial prerequisite for prosperity. In developed nations, expenditures related to IP now dominate firms' investments, particularly as services take precedence in their economies. In 2008, for instance, UK firms allocated £137 billion to intangible investments, primarily in IP, surpassing the £104 billion spent on fixed assets (see figure 3.4). This IP investment accounts for 13% of market gross value added (GVA), with nearly half of it protected by intellectual property rights. The global trade in patent and creative industry licenses alone has exceeded £600 billion annually, constituting over five percent of the entire world trade and demonstrating a continuous upward trend (Hargreaves, 2011).

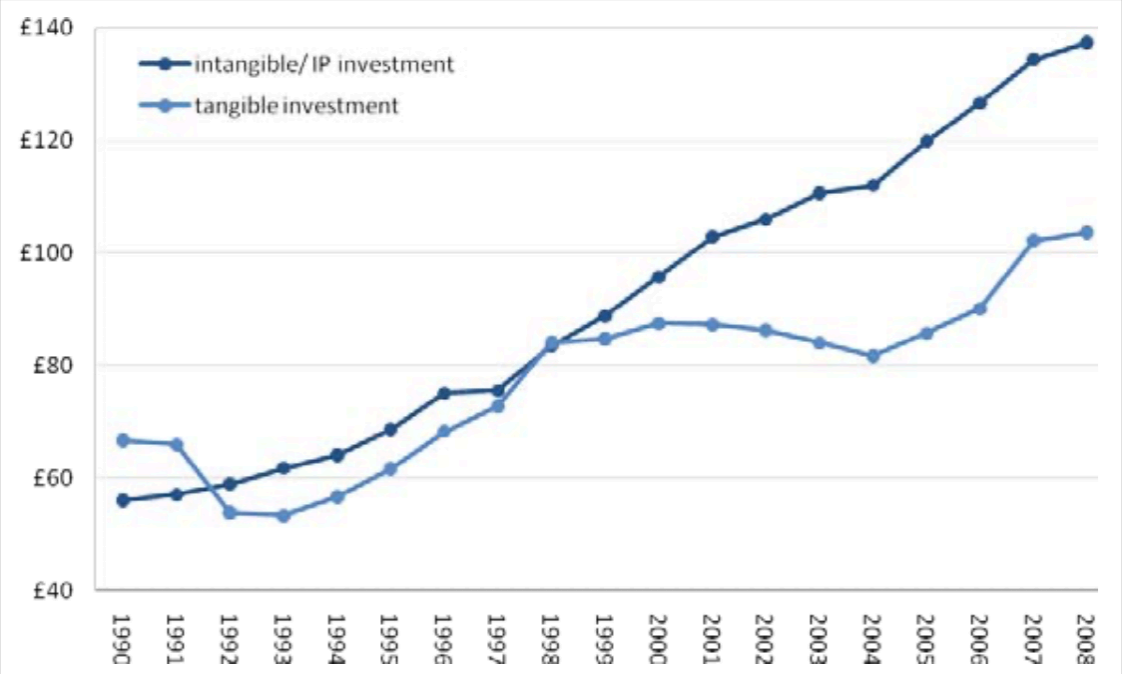

Figure 3.4: UK Business investments, in billion pounds (Hargreaves, 2011).

It is widely accepted that enhanced productivity is the foremost catalyst for long-term economic growth. Over the past decade, the primary sources of productivity growth and job generation have been innovations, particularly emanating from small and young enterprises. These innovative firms exhibit a remarkable growth rate, doubling both in employment and sales compared to their non-innovative counterparts. The level of market competition further amplifies the pace of productivity growth in these markets (Hargreaves, 2011).

Simultaneously, innovation not only fosters growth within existing markets but also creates and expands new markets for unprecedented products and services. In instances where innovation is challenging to replicate or where significant rewards accompany being the first to introduce a product to the market, the competitive drive for innovation proves effective. However, under different circumstances, the inherent risks and costs may act as deterrents to innovation, necessitating the presence of intellectual property rights (Hargreaves, 2011; Teixeira & Ferreira, 2019).

IPRs, encompassing major rights such as patents, copyright, design rights, and trademarks, serve as incentives for innovation by offering a time-limited return on investment in innovation. This mechanism reduces the risks associated with inventing and creating new products, thereby stimulating innovation, fostering competition, and contributing to more robust economic growth. See figure 3.5 for numbers on how many percent of large firms and Small to Medium sized Enterprises (SME’s) make use of different types of IP protection. Additionally, the IPR system, by necessitating the disclosure of the complete technical details

of any patented invention, promotes follow-on innovation as technological information is disseminated (Hargreaves, 2011).

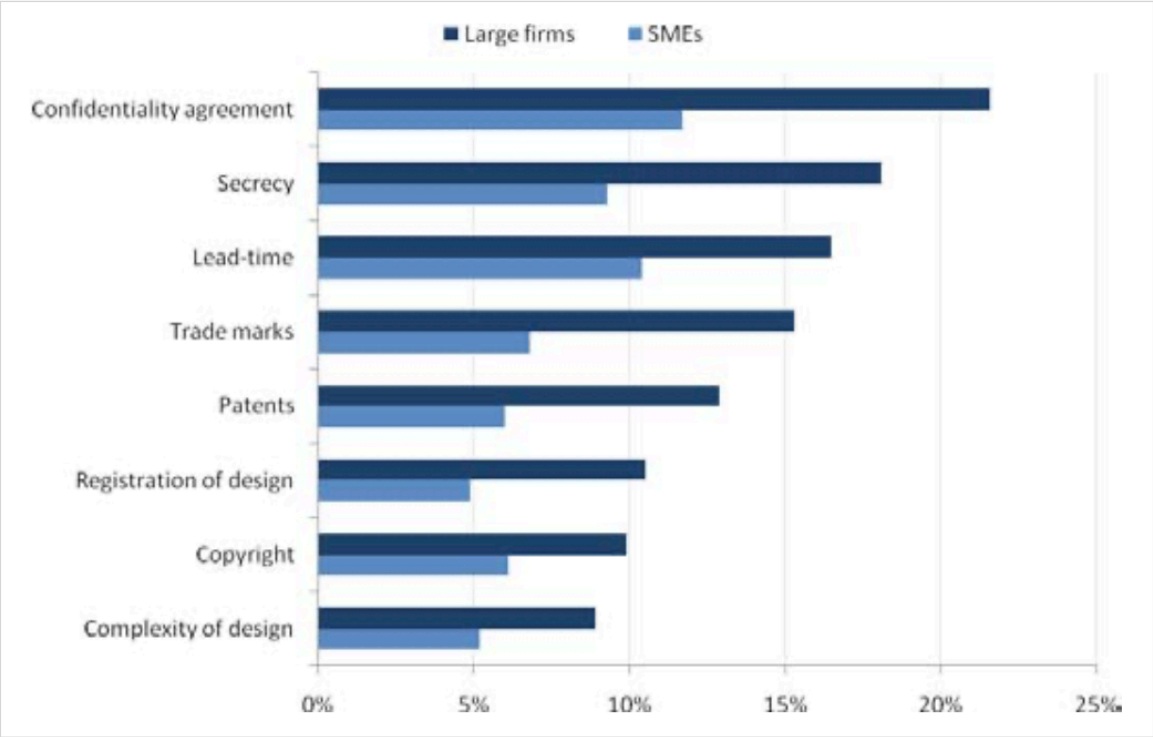

Figure 3.5: Techniques preferred by UK firms for protection innovation (Hargreaves, 2011).

The different ways of protecting IP are further elaborated on below. Each form of IP protection grants specific rights and safeguards, tailored to different types of intellectual creations. It is very important to always carefully assess the costs, benefits, evidence, and economic theory in shaping IP policy, while also considering non-economic factors like moral rights of authors (Hargreaves, 2011). People are often unaware of IP rights of their own and the ones of others. It is important to raise this awareness (Silva et al., 2009).

Copyright

Copyright is *a legal concept that grants the creator of an original work exclusive rights to its use and distribution, usually for a limited time, with the intention of enabling the creator to receive compensation for their intellectual investment* (Drahos, 1996). Copyright concerns the rights of authors in traditional cultural works like literary and artistic works. Authors gain the right to reproduce work and perform the work in public. Copyright protection has been progressively extended through an expansion of traditional rights (e.g. computer software is protected as a literary work) (Drahos, 1996; Hargreaves, 2011).

Patent

A *patent* is *a legal document granted by a government to an inventor or assignee, giving them the exclusive right to make, use, and sell their invention for a specified period, usually 20 years from the filing date* (Drahos, 1996). With patents, protection is conditional upon satisfying criteria like novelty and inventiveness. It is of limited duration. Patents protect inventions and technological innovations (Drahos, 1996; Hargreaves, 2011; Teixeira & Ferreira, 2019).

Design Registration

Design registration refers to *the process of obtaining legal protection for the ornamental or aesthetic aspects of a product's design* (Drahos, 1996). Design Registration deals with the appearance of articles in the industrial sphere. The appearance of a toilet bowl can be the subject of design registration, whereas the shape of a statue is a matter of copyright protection (Drahos, 1996; Hargreaves, 2011; Teixeira & Ferreira, 2019).

Trademark
A trademark is a *distinctive sign, symbol, logo, word, or combination of these elements that is used by businesses or individuals to identify and distinguish their goods or services from those of others* (Drahos, 1996). A Trademark protects signs that traders use to distinguish their goods or services from other traders (includes even smells and sounds). Trademarks identify and distinguish goods or services in the market. A trademark is of unlimited duration (Drahos, 1996; Hargreaves, 2011; Teixeira & Ferreira, 2019).

Trade Secret Law
Trade secret law pertains to the *legal protection of confidential business information and practices that provide a competitive advantage to a business* (Drahos, 1996). Trade Secret Law provides protection for commercially valuable technical information which a person has chosen not to disclose; it guards valuable confidential information (Drahos, 1996; Hargreaves, 2011; Teixeira & Ferreira, 2019).

The previously mentioned forms of IP protection give an idea of how spinoff founders can protect their spinoff's IP, which is crucial for spinoffs to protect themselves from IP infringement by third parties, potentially leaving them vulnerable to exploitation by competitors. University spinoffs are increasingly becoming a target of intellectual property theft; without adequate protection, these startups may be unable to capitalize on their innovations and ideas. Each form of IP protection grants specific rights and safeguards, tailored to different types of intellectual creations. It is always important to carefully assess the costs and benefits for each protection form. When founders are not aware of the pros and cons of each protection form, it will most likely be useless to start negotiating with the University's Technology Transfer Office; see chapter 3.4 for more information on this negotiation process (Hargreaves, 2011).

3.4 University Spinoffs and Intellectual Property

Imagine being a university employee doing research on a certain topic that you want to bring to the market. If a university employee makes a scientific discovery or has an idea that he/she wants to contribute to a company, IP related questions arise immediately. Since universities are publicly funded organizations, funded by tax money, they cannot give the time and resources, invested to come to the idea or discovery, to the university employee for free. Once the employee commercializes the idea or discovery and protects the IP, the university will not be able to claim anything in return for their invested time and resources. To secure something in return, the university can claim and protect the IP for itself, and then license that IP to the spinoff. The question is then how the spinoff will pay for the IP license. In some cases, the university can claim equity in the to be founded company, they can ask for royalty payments, milestone payments, or a combination. Apart from that several other terms need to be negiotiated. Chapter 4 elaborates more on this topic.

Effective protection of technology and knowledge is often crucial for the success of a business, enabling it to stay ahead of competition and attract external investors. The latter is applicable to startups and companies in general, so also to UIS. In fact, a UIS cannot officially be founded before IP discussions with the Technology Transfer Office (TTO) have been held and a deal has been made (Hargreaves, 2011; Teixeira & Ferreira, 2019; Y Combinator, 2023).

A *Technology Transfer Office (TTO)*, also known as a Technology Licensing Office or Office of Technology Commercialization, is *a specialized department or administrative unit within a university, research institution, or organization that facilitates the transfer of technology, knowledge, and intellectual property from academic or research settings to the commercial sector* (Y Combinator, 2023). The primary role of a Technology Transfer Office is to manage and commercialize innovations, inventions, and intellectual property developed by researchers, faculty, and students within the institution. The goal of a Technology Transfer Office is to bridge the gap between academic research and the practical application of innovations in the commercial world. By doing so, they contribute to economic development, encourage

entrepreneurship, and maximize the societal impact of research and innovation. These offices play a crucial role in transferring knowledge, technologies, and discoveries into products, services, and solutions that benefit the broader community (Hargreaves, 2011; Teixeira & Ferreira, 2019).

The TTO might state that the University should claim intellectual property or equity in a UIS. This is often done as a way for the university to retain some ownership or control over the technology or intellectual property, and to potentially benefit from the commercialization of the research or technology. However, the specific terms of these arrangements can vary widely and may depend on a number of factors, such as the nature of the technology or intellectual property, the stage of development of the spin-off company, and the terms of any funding or other support provided by the university (Hargreaves, 2011; Teixeira & Ferreira, 2019; Y Combinator, 2023).

In some cases, universities may take ownership of the intellectual property. First they decide whether or not to claim ownership of the IP at all. If they don't do this, the spinoff owns all the IP. In case they do claim ownership of (some) IP, universities can do this by means of taking equity in the spin-off company. In other cases they may license the intellectual property to the spin-off company, asking for royalties or milestone payments in return. Both parties can also enter into other types of arrangements. Ultimately, the specific terms of the relationship between a university and a spin-off company will depend on the specific circumstances and the negotiations between the parties involved (Shane, 2004; Gübeli, 2005). To decide the terms on which a UIS can be founded, a certain general process is followed, see figure 3.6 (Reem, 2023c).

First, the TTO will assess the IP protection, as well as the feasibility and desirability of a patent application. If the IP has been developed in collaboration with another party, the Legal Department may also be involved in the process. For inventions of a more technical nature, this is frequently achieved by securing the idea/ invention through for example a patent application. In the case of software (digital innovations), patents play a less significant role in commercialization, but attention must be given to IP protection in the form of copyright and know-how (Shane, 2004; Gübeli, 2005).

To initiate the process, an Invention Disclosure Form (IDF) must be completed. This can be done together with the Research Support Office (RSO), and the TTO can provide further support if needed. In most cases, prior to filing a patent application, a patent analysis is conducted. This analysis helps assess the novelty of the invention, identify similar existing inventions, and determines the level of activity in a specific field. It also considers whether a patent application, which often involves significant investment of tens of thousands of euros and a lengthy process, is worthwhile and contributes to the successful commercialization of the invention. If a patent application is filed, the TTO and the faculty share the costs of the application until the patent is licensed or otherwise acquired by a third party. The income generated from the patent is then distributed among the rightful parties in accordance with the "Fair Compensation for Intellectual Property Rights" regulation. In the case of copyright (e.g., for texts, questionnaires, methods, and software), no further steps are required to obtain IP protection. Unlike patent rights that need to be applied for, copyright protection is automatically granted upon the creation of the work (Gübeli, 2005; Teixeira & Ferreira, 2019; Y Combinator, 2023).

Then, secondly and lastly, negotiations between the UIS and the TTO follow, which are based on the IDF.
The choice of protection for an object is a matter of business strategy, all having advantages as well as disadvantages. As mentioned in section 3.3, a product that is easy to reverse engineer (like a machine) is better protected by patent than by trade secret law since the latter does not offer rights against the independent rebuilder (Drahos, 1996; Hargreaves, 2011). On the other hand, A patent is only useful if you can afford to protect it by taking legal actions in case someone neglects it (Drahos, 1996; Hargreaves, 2011). To help structure the negotiation process between university spinoffs and TTO's in the Netherlands, the UNL Deal Terms were created. See chapter 3.5 for more information on this topic.

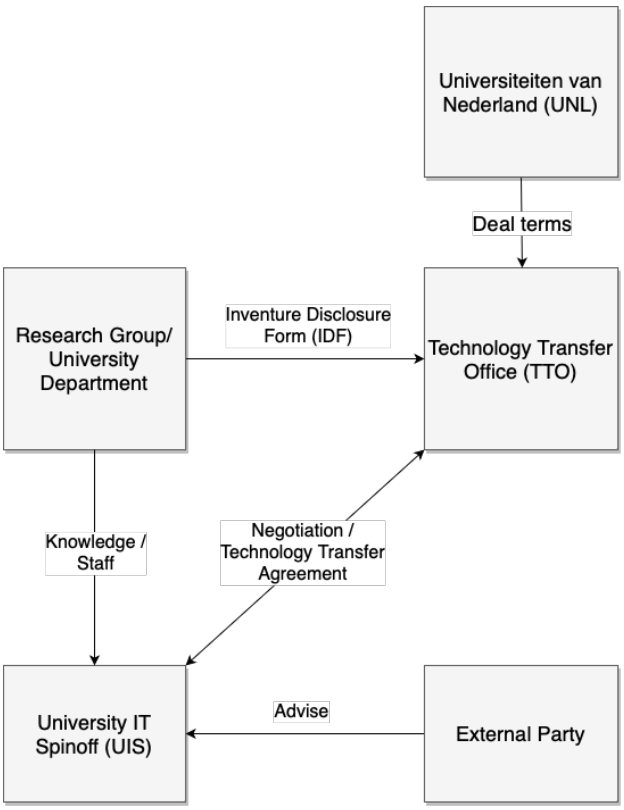

Figure 3.6: IP appropriation deal making process between TTO and UIS

3.5 UNL Deal Terms

In the realm of technology transfer and the commercialization of university research, negotiations with technology transfer offices (TTOs) have historically posed challenges for researchers and startups. These offices, responsible for managing intellectual property rights, have often been criticized for their bureaucracy and stringent terms. However, positive changes have been observed, especially in renowned startup hubs like Harvard, MIT, and Stanford, where TTOs now offer more favorable terms (Y Combinator, 2023; Kulkov et al., 2020; Henrekson & Rosenberg, 2001; Lucchi, 2005).

To address previous issues of prolonged negotiations and enhance efficiency, some universities and institutions have embraced express license agreements. These standardized contracts simplify the licensing process by providing a clear framework of terms, expediting the transfer of intellectual property (DeSimone & Mitchell, 2010). In the context of express license agreements, four critical terms require meticulous consideration: equity, royalties, milestone payments, and exclusivity. Thorough evaluation of these key terms is essential to ensure a fair and mutually beneficial technology transfer agreement between the university and the startup (DeSimone & Mitchell, 2010; Savva & Taneri, 2015; Y Combinator, 2023).

- **Equity Stakes:** Universities often acquire equity stakes in spinoffs arising from their intellectual property, with UNL Deal Terms offering the option for equity-based agreements. UNL Deal Terms specify fully dilutive shares, with no special rights for the university or holding, except for common protection clauses. Inventors maintain their rights on the inventor's fee (octrooiregeling).
- **Royalty Structures:** UNL Deal Terms provide flexibility for royalty-based agreements, with royalty rates depending on the sector/market. Sublicense fees are also considered, along with optional milestone payments and minimum annual royalty payments. These royalty agreements remain in force upon completing milestones and at exit, with an option to buy off the obligations.

- **Hybrid Agreements:** UNL Deal Terms introduce hybrid deals, combining both equity and royalty elements. These hybrid royalty deals come with softer conditions compared to full royalty agreements.

The Dutch version of express license agreements are called the UNL (Universiteiten van Nederland) Deal Terms. The UNL Deal Terms were published in February 2023 (UNL, Zijlstra, 2023). There terms have been developed and signed by the Dutch consortium of 13 publicly funded universities: Erasmus MC, Leiden UMC, Leiden University, VU Amsterdam, Radboud UMC, Radboud University, Tilburg University, University of Groningen, Wageningen University & Research, TU Delft, TU Eindhoven, University of Twente and TNO. Utrecht University has unfortunately not signed these terms till date. They offer a comprehensive, standardized framework for technology transfer in university spin-offs. These terms facilitate equity, royalty, or hybrid deals, based on established express license agreement principles (DeSimone & Mitchell, 2010; Savva & Taneri, 2015). As technology, business, and legal landscapes continue to evolve, strategies for intellectual property appropriation and commercialization will adapt accordingly. The UNL Deal Terms are used for making technology transfer agreements with most types of university spinoffs; it is not only focused on UIS (UNL, Zijlstra, 2023).

4. Intellectual Property Ownership and Protection

“There is often confusion and disagreement on the ownership and protection of the Intellectual Property developed by university spinoffs, due to a lack of clear policy, making it difficult for them to commercialize and grow their findings.” The latter is stated in the problem statement chapter; this is a huge problem for university spinoffs. To solve this specific part of the problem statement, this chapter, which is part of the problem investigation phase of the Wieringa Design Cycle (Wieringa, 2014), answers the following Research Question:

RQ1: What strategies concerning the ownership of Intellectual Property developed by UIS exist?

This question is answered based on the systematic literature review as well as expert interviews that have been performed. These strategies are based on certain IP appropriation *mechanisms*, which are s*ub IP appropriation topics that require an assigned value nuancing the overall value of the high-level topic.* IP appropriation strategies are based on the different values that these mechanisms can have and possible value combinations. In this chapter we elaborate further on the different mechanisms that exist in the UNL Deal Terms, what their acceptable values are and how it can be determined what mechanisms are applicable to certain specific university spinoff types. Since the aforementioned topics can be different for diverse University spinoff types, discrepancies between them are revealed. To close off, different ways for raising awareness among University Spinoff founders about the aforementioned topics using the SEEM model are described. To provide some context on the topic, a brief history of dealing with IP appropriation is presented first.

4.1 Brief history of dealing with IP appropriation in University context

The history of dealing with intellectual property appropriation by university spinoffs is a journey that has evolved in response to the dynamic interplay between academia and the business world. Historically, universities have been breeding grounds of innovation and research, generating loads of intellectual property through the work of university employees, researchers and students. However, the question of how to navigate the ownership and commercialization of these innovations in terms of IP became more important than ever before, especially in today's digital age. With the rise of technology and the internet, it's easier than ever for people to copy and distribute creative works without permission (Schulenburg, 2023).

In the early stages, universities often struggled to balance the interests of fostering innovation in an academic context and ensuring that the broader society reaped the benefits of these advancements. The emergence of university spinoffs, introduced a new dimension to this challenge. Initially, there was a lack of standardized practices, and negotiations between technology transfer offices and spinoff founders often took a very long time. This period was marked by concerns over the potential vanishing of entrepreneurial spirit of university employees due to overly restrictive IP policies. Dealing with IP appropriation by university spinoffs underwent a significant shift when universities started recognizing the potential economic and societal impact these ventures can have, and was partly driven by the realization that growing successful spinoffs required a delicate balance between protecting the university's interests and at the same time providing an appealing environment for entrepreneurial endeavors (Hargreaves, 2011; Teixeira & Ferreira, 2019; Schulenburg, 2023).

Over time, universities began adopting more flexible and entrepreneur-friendly approaches. Many institutions re-evaluated their IP policies, moving away from rigid, one-size-fits-all models. Policies were increasingly adapted to specific spinoff cases, taking into account their commercial context and other spinoff-specific factors (Kulkov et al., 2020).

In recent years, best practices have started to emerge. Some universities have implemented express license agreements, which are streamlined processes that reduce negotiation times and provide clearer terms for founders (see section 4.4 for more information). Equity stakes, royalties, potential milestone payments, and exclusivity clauses have become key elements in these agreements, each subject to careful negotiation (UNL, Zijlstra, 2023; Y Combinator, 2023). Furthermore, the entrepreneurial ecosystem and legal frameworks have adapted to support fair and efficient dealings. Networking, mentorship, and the sharing of experiences among founders have played a crucial role in establishing benchmarks for fair agreements (DeSimone & Mitchell, 2010; Savva & Taneri, 2015).

As of now, the process of dealing with IP appropriation by university spinoffs is still undergoing an ongoing process of refinement. Universities keep on searching for a balance between protecting their intellectual assets while also fostering a culture of innovation and entrepreneurship. In this ever-evolving landscape, the goal remains clear: to create an environment where university spinoffs can thrive, translating academic discoveries into real-world solutions while ensuring the equitable distribution of benefits (DeSimone & Mitchell, 2010; Savva & Taneri, 2015; UNL, Zijlstra, 2023).

This thesis seeks to contribute to this proces of refinement by constructing an IP appropriation guideline for university IT spinoffs. However, in constructing the guideline, priority is given to crucial elements for the spinoff companies instead of emphasizing on factors significant to universities. The guideline can be found in chapter 6.

4.2 Express License Agreements & Intellectual Property Appropriation Strategies

In previous sections, it has been described how prior developments in IP have led to the current state of the art, the fact that this thesis focuses on software products developed by University IT Spinoffs and various available methods for protecting IP in various contexts have been set out. It is important not to confuse IP protection methods with IP appropriation strategies.

IP appropriation strategies refer to the *different ways of using and combining available IP protection methods and TTO negotiation themes with the goal of protecting and dividing IP as strong and fair as possible*. Each protection method and appropriation option has its own advantages and disadvantages, which is why spinoff founders must carefully assess all options and decide which methods suit their specific context best. Choices made in terms of IP appropriation strategy can have influence on and serious consequences for a spinoffs business model (Teece, 2018). Chapter 5 elaborates further on this topic. IP protection methods have been described in chapter 3.3, and the TTO negotiation themes, based on express license agreements are discussed below.

IP appropriation strategies have evolved over time, reflecting the complex interplay between universities, innovation, business, and legal considerations. In the contemporary landscape, several strategies exist to navigate the ownership, protection, and commercialization of intellectual assets (Kulkov et al., 2020). These can be divided into two categories.

The first category covers cases where the university has no right to claim any IP in a spinoff and so the spinoff founders are free to do what they want with their privately owned IP. However, founders should always carefully assess and decide what to do with their IP. For example, it can be wise to enter into a **strategic partnership or joint venture**, which are ways for (startup) companies and (research) institutions to collaborate and potentially enable shared access to IP. These partnerships can leverage complementary strengths, resources and expertise (Czechowska, 2013). Another option can be to choose for **open source or collaborative models**. In contrast to traditional proprietary strategies, some entities embrace open-source models, fostering collaboration and shared development. This approach allows wider dissemination of innovations but requires careful management to prevent unintended consequences (Aberdour, 2007).

The second category concerns cases where the university has the right to claim (part of) the IP. As described in chapter 3.4, the spinoff founders will then have to negotiate with the university's Technology Transfer Office. Negotiating with technology transfer offices is a crucial step for researchers and startups seeking to commercialize university research. These offices, responsible for managing intellectual property (IP) rights, have historically faced criticism for being slow, bureaucratic, and imposing burdensome terms on startups. However, improvements have been made, especially in major startup hubs like Harvard, MIT, and Stanford, where TTO's offer more reasonable terms (Y Combinator, 2023; Kulkov et al., 2020; Henrekson & Rosenberg, 2001; Lucchi, 2005).

Responding to past challenges of prolonged negotiations and in order to streamline negotiations, some universities and institutions have adopted express license agreements (DeSimone & Mitchell, 2010). These standardized contracts streamline the licensing process, providing clearer terms and expediting the transfer of intellectual property (DeSimone & Mitchell, 2010). In the context of technology transfer agreements, the four key terms that require careful consideration are **equity, royalties, milestone payments**, and **exclusivity**. Careful assessment of these key terms are crucial to ensure a fair and mutually beneficial technology transfer agreement between the university and the spinoff, which is why they are the 4 main themes for negotiation (DeSimone & Mitchell, 2010; Savva & Taneri, 2015; Y Combinator, 2023).

1. **Equity Stakes**: Universities and research institutions often acquire equity stakes in startups spawned from their intellectual property. This provides a direct financial interest in the success of the venture, aligning the goals of both parties. It is typical for the university to acquire equity in the startup. However, it is essential to strike a balance, ensuring that the equity stake is not excessive. Typically, a range of 3-5% is considered reasonable, while an equity stake above 10% may lead to complications (Y Combinator, 2023). The rest of the equity is divided over the founders. More information and guidelines on dividing equity can be found in chapter 4.3 and chapter 5.
2. **Royalty Structures**: Royalties refers to the percentage of revenue or profits that the spinoff must pay to the university, in return for using the university owned IP for the spinoffs products or services. These are arrangements where these institutions consistently receive a share of the revenue generated by the sale of products and services that make use of the licensed technology (Reem, 2023c). This reduces the amount that a spinoff will have to pay upfront and divides the risk between the spinoff and the university. If things go well, the university will receive a consistent share of revenue, but if things go badly, both parties will lose money. This arrangement is attractive for universities because it reduces their risk. Excessive royalty rates can negatively impact the company's ability to raise funds and operate effectively. Ideally, it would be preferable to negotiate a zero royalty rate. If that is not possible, keeping the royalty rate below 5% is advisable, with provisions for termination after a specified duration or upon reaching a certain level of payments or milestones (Y Combinator, 2023).
3. **Milestone Payments**: Milestone payments is something else that requires careful consideration. To address the financial challenges faced by startups, agreements may include milestone payments tied to specific achievements or milestones, such as reaching a funding threshold or completing a critical phase in product development like reaching a particular stage in clinical trials. Given the scarcity of funds in the early stages of a startup, it is important to minimize the financial burden associated with milestone payments, just like with royalty payments. Ideally, these payments should not exceed a few percent of the raised capital (Y Combinator, 2023).
4. **Exclusivity**. The last key term is exclusivity. Exclusivity rights entail that the university does not license the same intellectual property (IP) to competing entities. While this may initially seem like a concern, in practice, it may not pose significant challenges. Often, other companies may not comprehend how to utilize the IP or recognize its value until substantial development efforts have been undertaken by the spinoff. It may be wise to consider non-exclusive licenses initially, with the option to upgrade to exclusivity later or include a right of first refusal clause (Teixeira & Ferreira, 2019; Y Combinator, 2023).

(i) *Exclusive Licenses*: Companies may secure exclusive licenses, granting them sole rights to use, produce, and commercialize the intellectual property. This strategy ensures a competitive advantage but demands a higher level of commitment.
(ii) *Non-exclusive Licenses*: Some opt for a more open approach, allowing multiple entities to license and use the IP. While reducing exclusivity, this strategy can broaden market reach.

These four themes highlight the diverse approaches to IP appropriation in the modern era. The choice of strategy depends on factors such as the nature of the intellectual property, market dynamics, and the overarching goals of the parties involved. The different themes can also be combined. When the University Holding receives an equity stake, the conditions on minimum royalty payment can be offered on more favourable terms to the spin-off compared to a full royalty deal (UNL, Zijlstra, 2023). To negotiate effectively, founders should gather information from other companies that have dealt with the same office and seek advice from investors, lawyers, and advisors. Engaging the support of the supervising professor and aligning interests can also be valuable. Founders should be cautious of well-intentioned but potentially biased advice from university entrepreneurship offices. Initiating discussions early, before forming the company, is recommended, as securing an agreement can be a lengthy process. Funding can be obtained even without a finalized agreement, and progress made by the startup enhances negotiation leverage (Teixeira & Ferreira, 2019; Y Combinator, 2023).

In the context of express license agreements, the Universiteiten van Nederland (UNL), the Dutch industry- and interest group consisting of the 14 publicly funded Dutch universities, developed the **UNL Deal Terms**; a comprehensive, standardized framework outlining the deal terms and considerations for accessing Intellectual Property Rights (IPR) in the context of university spin-offs (UNL, Zijlstra, 2023). The UNL Deal Terms allow for an equity deal, royalty deal or a hybrid deal to be made; these Deal Terms are based on other express license agreements (DeSimone & Mitchell, 2010; Savva & Taneri, 2015). See chapter 3.5 for more information on the UNL Deal Terms. As technology, business, and legal landscapes continue to evolve, the strategies for the appropriation and commercialization of intellectual property will do so too.

4.3 Intellectual Property Appropriation Mechanisms

The UNL Deal Terms were created to offer a versatile toolkit with diverse mechanisms designed to facilitate Intellectual Property express license agreements for Dutch universities (UNL, Zijlstra, 2023). However, a challenge emerged in navigating the intricacies of these UNL Deal Terms, specifically in deciphering mechanism applicability and establishing their acceptable values within the context of UIS cases. Whereas these deal terms are meant for negotiating technology transfer effectively, the complexity arises in tailoring them to the unique requirements of specific university spinoff scenarios. Stakeholders engaged in spinoff initiatives face the task of understanding the nuanced features of the UNL Deal Terms and aligning them with their specific context, that of UIS in the context of this research. A comprehensive solution demands the development of clear guidelines that demystify the application of UNL Deal Terms, ensuring they are optimally utilized and streamlined for the challenges faced by UIS cases. The UNL Deal Terms are already a step forward, but by addressing the complexity that is still present, the negotiation process between TTO's and UIS can become more efficient and mutually beneficial.

Different mechanisms in UNL Deal Terms

As described in the previous section, express license agreements, in this case we focus on the UNL Deal Terms, typically concern 4 main topics: equity, royalties, milestone payments and exclusivity (DeSimone & Mitchell, 2010; Savva & Taneri, 2015; UNL, Zijlstra, 2023). We leave exclusivity for now; the rest of the topics all have have certain *mechanisms* attached to them, which represent *sub IP appropriation topics that require an assigned value nuancing the overall value of the high-level topic*. In this case, milestone payments is a mechanism of the topic Additional mechanisms.

The topic Equity can be divided into 4 mechanisms, like fully dilutive shares or non-dilutive shares, Royalties have 5 mechanisms attached to them, like royalty on total turnover of spin-off, and the topic general exists of 7 mechanisms, like milestone payments (UNL, Zijlstra, 2023). The exact mechanisms can be found in table 4.1 below.

Equity	Royalties	Additional mechanisms
• Fully dilutive shares • Non-dilutive shares • Non-dilutive shares till x million euros investment or valuation • Special (voting) rights for Technology Transfer Office	• Royalty on total turnover of spin-off • Royalty on turnover related to IP • Cap on maximum amount of payable royalties • Option to pay off royalty obligations • Exit fee	• In case of patents: spin-off has to pay-back historical patent costs incurred by University • Signing fee • Milestone payments • Success fee • Transfer of patent (application) ownership • Improvements of IP included in the deal • Institution takes equity for non-IP related contributions?

Table 4.1: Mechanisms used in dealmaking (UNL, Zijlstra, 2023)

These mechanisms can be assigned a value of yes or no, but can also be more nuanced. For example, in terms of equity, part of the shares can be fully dilutive and another part can be non-dilutive, and the amount of each type of shares must also be specified. In terms of royalties, apart from a value of yes or no assigned to a cap on a maximum amount of payable royalties, this mechanism also needs a value for the specified maximum amount. Benchmarks have been roughly specified for the amount of shares, the maximum amount of payable royalties and for some other mechanisms. In this research we refer to them as acceptable values; more on this later. Before diving more deeply into the acceptable values of the mechanisms, tables 4.2, 4.3 and 4.4 below show for each mechanism how many of the UNL universities (13 in total; see chapter 3.5 for more information) use that mechanisms always, often, sometimes or never, including the respective percentage of the total of 13 universities (UNL, Zijlstra, 2023).

Equity	Always	Often	Sometimes	Never
Fully dilutive shares	2 (15%)	8 (62%)	1 (8%)	2 (15%)
Non-dilutive shares	0 (0%)	0 (0%)	7 (54%)	6 (46%)
Non-dilutive shares till x million euros investment or valuation	1 (8%)	0 (0%)	0 (0%)	12 (92%)
Special (voting) rights for Technology Transfer Office	1 (8%)	1 (8%)	5 (38%)	6 (46%)

Table 4.2: Equity and the respective mechanisms from UNL Deal Terms, showing that fully dilutive shares are mostly applied in equity deals and non-dilutive shares and special voting rights are seldomly applied (UNL, Zijlstra, 2023)

Royalties	Always	Often	Sometimes	Never
Royalty on total turnover of spinoff	1 (8%)	1 (8%)	7 (54%)	4 (31%)
Royalty on turnover related to IP	2 (15%)	4 (31%)	6 (46%)	1 (8%)
Cap on maximum amount of payable royalties	0 (0%)	1 (8%)	7 (54%)	5 (38%)
Option to pay off royalty obligations (redeem sum)	0 (0%)	1 (8%)	5 (38%)	7 (54%)
Exit fee	0 (0%)	2 (15%)	6 (46%)	5 (38%)

Table 4.3: Royalties and the respective mechanisms from UNL Deal Terms, showing that Royalty on turnover related to IP is the most popular mechanism to be applied in royalty deals (UNL, Zijlstra, 2023)

Additional mechanisms	Always	Often	Sometimes	Never
In case of patents: spinoff has to pay back historical patent costs incurred by University	7 (54%)	1 (8%)	2 (15%)	3 (23%)
Signing fee	0 (0%)	0 (0%)	4 (31%)	9 (69%)
Milestone payments	0 (0%)	3 (23%)	7 (54%)	3 (23%)
Success fee	0 (0%)	1 (8%)	6 (46%)	6 (46%)
Transfer of patent (application) ownership	2 (15%)	5 (38%)	5 (38%)	1 (8%)
Improvements of IP included in the deal	1 (8%)	8 (62%)	4 (31%)	0 (0%)
Institution takes equity for non-IP related contributions?	2 (15%)	2 (15%)	7 (54%)	2 (15%)

Table 4.4: Additional mechanisms from UNL Deal Terms, showing that the mechanisms “Spinoff has to pay back historical patent costs”, “Transfer of patent ownership” and “Improvements of IP included in the deal” are the most popular mechanisms to be applied in dealmaking (UNL, Zijlstra, 2023)

This gives an idea of how often UNL universities apply certain mechanisms, but it does not provide information on the applicable mechanism values, and what values are acceptable.

Acceptable mechanism values

For spinoff founders, it can be interesting to see how many Dutch universities adapt certain mechanisms, but they do not choose which university they are attached to, and thus have to deal with the mechanisms that their university applies. That makes the acceptable mechanism values more relevant, since they can give founders ideas on what to expect and what to aim for during TTO negotiations. First it is important to understand how universities decide how much equity they will claim in a spinoff, see figure 4.1 . In case there is no IP to be claimed, they claim 0% equity. When they can claim IP on a part of the solution or business that can be circumvented or recreated, universities generally ask for 10% equity, which becomes 15% when the core of the solution or business can be circumvented. If the university owned IP rights (IPR) within the company concern a part of the solution or business that is protectable, they will aim for 20% equity, which might even become 25% equity when the IPR concern the core of the solution or business offering broad protection (UNL, Zijlstra, 2023).

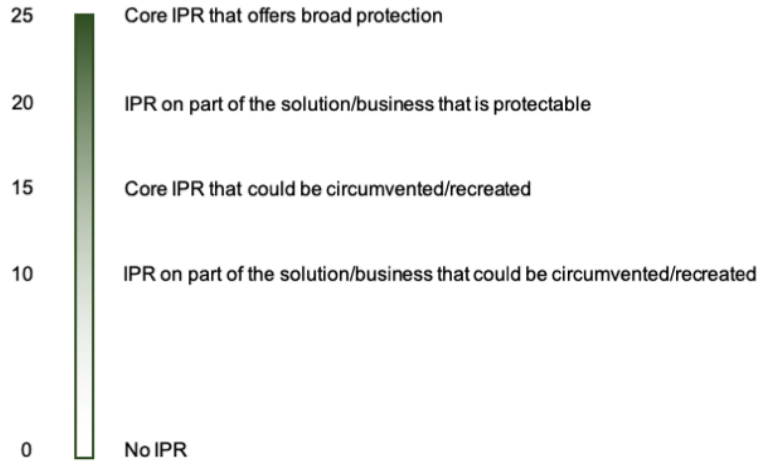

Figure 4.1: How universities determine their desired equity stake (UNL, Zijlstra, 2023)

Examples of the available options include (UNL, Zijlstra, 2023):

- **No IPR**
  - There is no IPR for the university to claim
- **IPR on part of solution/business that could be circumvented/recreated**:
  - Similar to the aforementioned, requiring a combination with IPR from other sources to establish a unique competitive advantage or limited to a single product or service, while the spin-off's business encompasses more.
- **Core IPR that could be circumvented/recreated**:
  - Challenging or impossible to replicate, offering a head-start advantage but limited long-term benefits if competitors allocate sufficient resources.
  - Copyright protection for software, susceptible to inference and rewriting based on observable features by competitors.
  - University-owned databases not publicly accessible but replicable with effort.
  - A design under protection that, with certain modifications, may be vulnerable to imitation.
- **IPR on part of a solution/business that is protectable**:
  - A patent contributing to a distinctive competitive advantage when combined with IPR from other origins.
  - A patent that exclusively covers a single product, while the spin-off's business encompasses multiple products.
- **Core IPR that offers broad protection**:
  - A patent covering an enabling technology that distinguishes the solution and business proposition from existing alternatives.
  - Know-how related to a unique, transferable process for manufacturing a product, potentially kept secret for a lasting advantage.

Now that it is clear how the claimed equity stake is determined by the university, let’s look at the acceptable values that the Universiteiten van Nederland have determined, based on international benchmarks from publicly available sources in February 2023 (UNL, Zijlstra, 2023). In figure 4.2, these acceptable values and benchmarks have been divided over the mechanism topics of Equity, Dilution, License, Exit Fee, and the Possibility of assignment of a patent to the spin-off. Acceptable values for these mechanism topics are divided over 3 potential UNL Deal outcomes: Equity deal, Royalty deal or a Hybrid deal, which is a combination of the two (UNL, Zijlstra, 2023).

	NL-HYBRID	NL-ROYALTY	NL-EQUITY
Equity	Max 12,5%		Max 25%
Dilution	Fully dilutive		Fully dilutive
License	Royalty	Royalty	
Exit Fee			
Possibility of assignment of patent to spin-off	Yes	Yes	Yes

Figure 4.2: NL Dealterms acceptable values

The data presented in figure 4.2 gives insight into the way that Dutch universities deal with the various mechanism topics, their specific mechanisms and what values are considered acceptable. To prevent the data from being ethnocentric, it is important to compare the ways in which different countries apply these mechanisms with each other (Lucchi, 2005), see figure 4.3.

	US MODELS [1,2]	SWISS MODELS [3]	NL-HYBRID	QUICK LINCENSE [4]	NL-ROYALTY	UK [5]	NL-EQUITY
Equity	< 10% 'single digit'	Max 12% (max 9% non dilutive)	Max 12,5%			Up to 50% (Median 33%)	Max 25%
Dilution	Non-dilutive till X M$ valuation	Fully dilutive	Fully dilutive			Fully dilutive	Fully dilutive
License	Royalty	Royalty	Royalty	Royalty	Royalty		
Exit Fee				Fixed exit Fee			
Possibility of assignment of patent to spin-off	No	No	Yes	No	Yes	Yes	Yes

Figure 4.3: NL Dealterms with international benchmark as reference (UNL, Zijlstra, 2023; publicly available sources, 2023)

Figure 4.3 compares the acceptable mechanism (topic) values determined by the Universiteiten van Nederland with those determined by universities from the United States (US), Switzerland and the United Kingdom (UK). The key takeaways are that the equity percentages claimed by universities in the Netherlands are average: 25% compared to up to 50% in the UK, 12% in Switzerland and <. 10% in the US. However, a side-note to the relatively low US percentage is that it is non-dilutive till a certain (high) company valuation, meaning that the equity stake owned by the university will not dilute when other shareholders stakes will, at least until the specified company valuation is reached. Furthermore, American universities tend to aim for pretty low amounts/percentages to be able to act quickly. In all other countries universities choose for dilutive shares, which is better for the spinoff's investor readiness (Hargreaves, 2011). In terms of License, universities in all countries use Royalty licenses, except for the UK. In cases where the University Holding is receiving an equity stake, the conditions on minimum royalty payment can be offered on more favorable terms to the spin-off compared to a full royalty deal. On the other hand, universities from the US and

Switzerland will never assign the patent to the spinoff, even not after a certain period of time or after reaching certain milestones. Dutch and UK universities do most of the time assign the patent to the spinoff at some point.

Determining mechanisms applicability

It is hard to determine the applicability of a mechanism to a specific university spinoff type. That is what we can conclude after various expert interviews that have been performed (see chapter 5.1 for more information on the expert interviews). We have spoken to various experts on this topic (E1, E2, E3, E7, E11, E12, E13 and E14), and they confirmed that it is practically impossible to make general statements and conclusions about mechanism applicability. This is mainly because every spinoff is different, and the value and protectability of their IP is very spinoff specific. It is all vague and mechanism applicability is only established based on years of professional experiences.

However, we wanted to try and give spinoff founders some idea of different scenarios that exist. Roughly speaking, together with the experts we spoke to, we have been able to identify 4 main scenarios to which mechanisms can roughly be linked, see figure 4.4. The first category, which contains 2 of the 4 main scenarios, concerns software based university spinoffs that use different types of IP protection. Depending on their specific sector and product, they have to deal with low or high go-to-market costs. In case of low go-to-market costs, spinoffs often try a bootstrapping method, which entails self financing by service projects. Sometimes they also search for an angel investor to cover their first expenses. This often leads to a hybrid deal, concerning equity as well as royalty payments. On the other hand, in case of high go-to-market costs, venture capital is often required to reach market introduction. This scenario also generally leads to a hybrid deal.

The second category concerns spinoffs developing and selling medical devices and medicine, which are mostly protected by patents to protect their IPR. The first scenario in this category concerns spinoffs selling medication. To get to the point of producing and selling medicine at a larger scale, high production costs and long, expensive medical trials are part of the deal, for which big investments are needed. To leave sufficient space on the cap table for investors, these spinoffs generally make royalty deals. Spinoffs producing medical devices, which involves high production and certification costs, also require big investments and generally make royalty deals for the same reason as medication focused spinoffs.

E14 mentioned that life sciences and medicine spinoffs make the most money for Utrecht University; software spinoffs are mostly loss-making within their spinoff portfolio. This could be due to the fact that software is very hard to patent, whereas medical devices and medicine are almost always protected by patents.

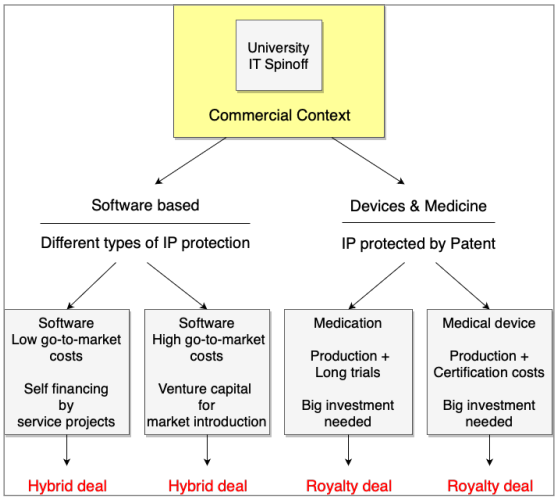

Figure 4.4: Basic IP Appropriation Strategies

This figure and its scenarios with their respective categories needs to be further investigated in future research.

4.4 Differences for University Spinoff Types

The landscape of university spinoffs is diverse, with distinct types emerging from various faculties and departments, each contributing to the practical application of the institution's research and knowledge. The nature of these spinoffs plays a pivotal role in shaping their Intellectual Property (IP) context, necessitating tailored IP appropriation strategies. Differences in sectors and industries introduce unique challenges and opportunities, further emphasizing the need for specialized IP strategies aligned with the specific characteristics of the technology or innovation involved.

Considerations for IT spinoffs differ significantly from those in law-related fields for example. The IT sector, marked by rapid technological changes, demands strategies that safeguard existing IP while allowing for continuous adaptation to new technologies. Dealing with software, algorithms, and digital innovations, IT spinoffs may employ a combination of patenting key algorithms, copyright protection for software, and trade secret protection for proprietary code. Additionally, the culture of open-source collaboration in the IT industry asks for spinoffs to decide on the extent to which they open up their innovations.

Robotics and artificial intelligence (AI) spinoffs deal with complex algorithms, autonomous systems, machine learning, and ethical considerations, necessitating strategies to protect these assets while navigating the evolving legal landscape for AI technologies. This can be done through software or algorithm patents and especially through trade secrets. Potential ethical considerations regarding the use of AI also need to be addressed, including bias and accountability. What makes Robotics and AI spinoffs even more complex, is the fact that their products can be applied in many different industries like healthcare, manufacturing or autonomous vehicles, all with their own regulations and standards.

In contrast, law-related spinoffs focus on legal processes, methodologies, or proprietary databases as part of their intellectual property. Strategies in this context may involve protecting these assets through trade secrets or proprietary databases. Establishing a strong brand in the legal industry becomes crucial, requiring trademark strategies for identity and reputation protection. Negotiating complex regulatory environments is also inherent in law-related innovations, necessitating an IP strategy that considers compliance requirements and ethical considerations.

Biotechnology spinoffs engage in the development of new drugs, diagnostic methods, therapeutic agents, medical treatments and biotechnological processes based on advancements in molecular biology, genetic engineering, genomics and proteomics. This presents unique challenges in protecting biological entities such as genes, proteins or genetically modified organisms and it involves navigating complex regulatory pathways for approval of these biotechnological products. Strategies involve patents, material transfer agreements, and confidentiality agreements, while balancing the need for (patent) protection and the potential ethical concerns.

Environmental technology spinoffs, focusing on sustainable energy, waste management, pollution control, water purification and other solutions to address environmental challenges, encounter IP protection challenges concerning the protection of technologies often related to complex (environmental) processes and systems, requiring patents and environmental certifications. This must be done while adhering to environmental standards and navigating global and local regulations pertaining to environmental protection.

Medical spinoffs, targeting medical devices, diagnostic tools, digital health platforms and technologies and personalized medicine, face strict healthcare regulations and standards as well as addressing privacy concerns related to patient data. Software algorithms, hardware designs and medical process may all need to

be protected. Strategies involve protection through patents and compliance with regulations, while balancing patient data privacy concerns with the need for innovation.

Engineering spinoffs, centered on technical innovations such as new materials, construction methods and manufacturing processes, combined with advancements in robotics and automation, must protect technical know-how, industrial designs, and manufacturing processes, facing risks associated with reverse engineering. This can be done using patents for new inventions and the possible use of trade secrets.

Educational technology (EdTech) spinoffs, engaged in the development of innovative educational tools and e-learning platforms as well as the integration of technology to enhance teaching and learning experiences, face IP challenges in protecting software through copyrights, trademarks for (platform) brand recognition and patents for unique algorithms. They also need to address privacy concerns related to the use of student data. There products are mostly sold using licensing agreements for their education content.

In conclusion, the nature of intellectual property is intricately linked to the specific characteristics of technologies developed by university spinoffs. A nuanced understanding of the industry, market, and legal requirements is essential for an effective protection strategy. Each type of spinoff presents unique opportunities and challenges, highlighting the importance of managing IP assets effectively for their success, market competitiveness, and contribution to technological advancements.

4.5 How to make University Spinoffs aware of IP consequences using the SEEM model

In the problem statement section, the following is stated: “University spinoffs often have insufficient knowledge concerning what consequences IP strategy and Universiteiten van Nederland Deal Terms related choices might have for the success of the spinoffs’ business model.” The fact that university spinoff founders do not have enough knowledge on this topic can do the spinoff a lot of harm, which is a problem that needs solving. Since in this case the founders come from the university, an important role in solving the problem lies with the university itself (Jansen et al., 2015).

In 2015, Jansen et al. Investigated ways to encourage entrepreneurship within universities. The three stage Student Entrepreneurship Encouragement Model (SEEM) is presented here, which consists of the stages Educate, Stimulate and Incubate, see figure 3.3. The Educate stage mainly aims to “wake up dormant entrepreneurs”, the Stimulate stage aims to “Support the process from idea to business plan” and the Incubate stage has the goal to “incubate the young companies until they can survive independently” (Jansen et al., 2015).

We suggest that incorporating sessions on the consequences that IP strategy and the UNL Deal Terms related choices can have on the success of the spinoffs’ business model into the SEEM model can be a perfect solution to the problem. In this way, spinoff founders will be made aware of the consequences and they will receive guidance on making the right choices throughout the different stages of the SEEM model, ensuring that spinoff founders have the knowledge they need right when they need it the most.

1. The first session should be integrated with step E3: Offer introductory entrepreneurship courses. Here, the fact that IP strategy and the UNL Deal Terms have consequences for the spinoff business model must be briefly mentioned, but not discussed in too much detail not to scare potential entrepreneurs away.
2. The second session should become part of step S4: Support business plan creation. Since the business plan is created here, it is important to discuss IP and UNL Deal Terms implications right away, so the business model can be adjusted to these implications right from the start.
3. Once the Incubate stage of the SEEM model is reached, it is of utmost importance to organize comprehensive knowledge sessions on the topic. This can be done during the mentoring of step I3: Offer

mentoring to start-ups, where mentors should provide founders with the right knowledge and coach them throughout the process.

4. Once funding comes into play in step I7: Provide funding, the role of IP must be emphasized for the last time as part of the SEEM model.

If these recommendations are followed, it is expected that spinoff founders can deal with IP and the UNL Deal Terms in a more conscious way. To see if the solution presented actually achieves its goal, it must be implemented and thereafter evaluated in future research.

5. IP Appropriation Strategies and the UIS Business Model

In this chapter, the problem is investigated, so we are in the problem investigation phase of the Wieringa Design Cycle (Wieringa, 2014). The problem investigation specifically focuses on University Spinoffs focusing on IT (UIS). In chapter 1 the problem statement has been defined as follows: "University spinoffs often have insufficient knowledge concerning what consequences IP strategy and Universiteiten van Nederland Deal Terms related choices might have for the success of the spinoffs' business model." This resulted in the following research question:

RQ2: What are the consequences of IP appropriation strategies for the UIS business model?

That is also the question that will be answered in this chapter and it will be answered using literature and expert interviews. To answer the question, this chapter is divided in two topics: Direct influence of IP appropriation on the UIS business model and indirect influence of IP appropriation on the UIS business model. The direct influence part elaborates on how IP value is calculated and the fact that protecting IP the right way can lead to competitive advantages. The indirect influence part concerns the indirect influence IP has on the UIS business model through its influence on investments and through its influence on potential collaboration. First, the expert interviews that this chapter is mainly based on are described.

5.1 Expert Interviews

As mentioned before, expert interviews have been performed to establish and validate this chapter. Tables 5.1 and 5.2 give a summarized overview of all involved experts. The interviews, concerning IP appropriation in general and its influence on the UIS business model, have been performed in the period between March 31st 2023 and January 19th 2024. All interviews took place in the Netherlands, in different provinces and cities. We chose for this since the Dutch situation is complicated enough, and broadening the scope outside the Netherlands would diminish the overall quality of the research. All interviews have been performed by the author of this research. When performing the interviews, he was a Utrecht University Master Business Informatics student with working experience at a few IT departments, seeking to start his first own startup company together with his co-founders. Since it concerns his first company, he had no prior experience with IP appropriation. The interviewees are mostly linked to either universities or to a startup incubator and they were invited in person or via email. We used interview snowballing, a process similar to snowballing in systematic literature reviews (Wohlin, 2014): we explicitly asked interviewees for further references. The interviewees were not compensated for their cooperation.

Our direct and indirect invitations resulted in interviews with 17 experts. These experts work for universities, startup incubators, health innovation accelerators, technology transfer offices, entrepreneurship initiatives, hospitals, a marketing firm and law firms (specialized in IP). Some of them operate as external advisers. Table … lists the experts, including their role, organisation type and location. Some of the experts worked for the same organisation and were interviewed together. We conducted 15 distinct interviews with the 17 experts. Two interviews were conducted with two experts at the same time, since they worked for the same organisation; this is the case for E5 and E6, just like for E7 and E8. We refer to the experts by the number given to them in Table 5.1.

The interviews took between 20 and 120 minutes, either in person or using video conferencing software. During the unstructured interviews we asked open-ended questions, and the answers given by the interviewees guided the interviews. The only thing that was structured was the start and end of each interview. We started with a short personal introduction, with both parties telling each other about the company they work for, their job description and the years of experience they have. We ended by asking if the interviewees had anything else they wanted to mention and asking for potential further references.

A summary of each interview was written by the author of this research. When all interviews had been performed, the author performed codification and categorization. The coding and categorization process was both organic and methodical. First, high level codes were assigned to each interview, referring to the general topics discussed. These codes were then turned into two categories: *Direct* and i*ndirect influence of IP appropriation on the UIS business model*. After that, we looked at the interviews again per category, while assigning more detailed codes to them, addressing specializations of the general topics (categories) discussed. Direct influence of IP appropriation is sub-divided in the codes *IP value calculation, IP terms & conditions* and *Competitive advantages obtained by IP protection.* Indirect influence of IP appropriation is sub-divided in the codes *Cap tables, Royalty payments* and *Influence on collaboration.* The experts and the corresponding categories and codes that were discussed during the interviews are presented in Table 5.1 and Table 5.2.

Expert	Role	Organisation type	Location
E1	Startup Incubation Lead	Startup Incubator	NL
E2	Business Coach	Startup Incubator	NL
E3	Business Coach	Startup Incubator	NL
E4	Business Coach / Investor	Startup Incubator	NL
E5	Business Coach / Investor	Startup Incubator	NL
E6	Business Coach / Investor	Startup Incubator	NL
E7	Business Coach	Consultancy	NL
E8	Business Coach	Consultancy	NL
E9	Business Coach / Investor	Consultancy	NL
E10	Business Coach / Investor	Consultancy	NL
E11	IP Expert	RVO (Dutch government)	NL
E12	IP Lawyer	Law Firm	NL
E13	IP Lawyer	Law Firm	NL
E14	IP Expert	University	NL
E15	IP Expert	University	NL
E16	IT Lead	Hospital	NL
E17	Marketing Specialist	Public Relations (PR)	NL

Table 5.1: Summary of the interviewed experts, their role, organisation type and location, sorted based on organisation type.

We cannot claim that saturation has been reached. The nature of this research is exploratory, with broad research questions that were formulated that way on purpose. To reach saturation on such a broad topic, an impractical number of interviews would have to be performed. However, we are confident that the results presented represent the overall sentiment among the experts.

Category	Codes	Experts interviewed per topic																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
Direct influence of IP appropriation on the UIS business model	IP value calculation	✓	✓		✓	✓	✓	✓	✓	✓	✓				✓				10
	IP terms & conditions	✓	✓		✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		13
	Competitive advantages obtained by IP protection			✓	✓	✓	✓	✓	✓			✓			✓			✓	9
Indirect influence of IP appropriation on the UIS business model	Cap tables	✓		✓	✓	✓	✓	✓		✓	✓					✓			9
	Royalty payments	✓		✓	✓	✓	✓	✓	✓	✓	✓				✓	✓			11
	Influence on collaboration			✓				✓							✓		✓		4

Table 5.2: Discussed topics, categorized in two categories, their corresponding codes and interviewed expert per code.

Since we required more information about IP appropriation of a university spinoff in general, the first interview was held with a startup incubation lead (E1) at a startup incubator Science-based validation programme, where the Verticai startup (see chapter 1.4 and chapter 7 for more information on this UIS example) participated. As startup incubation lead, the interviewee has guided many (university) startups through the IP appropriation process, which has provided him with a lot of knowledge on this subject. He and the incubator also opened up their network, which led to most of the interviews described in this chapter. The main topics included what the IP appropriation process with a TTO looks like, the UNL Deal Terms and the influence IP appropriation can have on investor readiness. Different investment types were also discussed.

The incubator collaborates with the Dutch RVO, the Netherlands Enterprise Agency. To get to know more about IP in general, in the next interview an IP expert (E11) from RVO talked about ways in which various types of inventions can be protected by different types of IPR. He provided a lot of information on patents and trademarks, and gave more information on potential competitive advantages that can be gained if IP is protected the right way.

Then we had the first meeting with Utrecht Holdings, the Technology Transfer Office of Utrecht University (E15). They explained the various sections of the IDF that had to be filled out, provided more information terms and conditions and we talked about the relation between IP and investment.

Furthermore, we interviewed business coaches and consultants from different startup incubators and consultancy firms (E2, E3, E4, E5, E6, E7, E8, E9, E10). Experts E4, E5 and E6 were interested to invest in the Verticai university spinoff together, just like experts E9 and E10. With them, we talked a lot about IP value calculation, IP terms & conditions, investment types and investor readiness.

The IP lawyers we spoke to (E12 and E13) offered their services to some of the startup incubators and they were willing to talk to us about IP terms & conditions, in this case from a legal perspective. IP Expert E14 is a university employee that also owns a university startup. This expert went through a tough negotiation process with the TTO, so he told us about his own experiences. Expert E16 works as an IT lead for a hospital, and told us about how she deals with IP terms and conditions from her perspective. We also talked about the influence that IP has on potential collaboration. Lastly, marketing specialist E17 told us more about competitive advantages that can be obtained by IP protection from a marketing perspective.

5.2 Direct influence of IP appropriation on the UIS business model

There are several ways in which IP appropriation can have a direct influence on the UIS business model. This can be related to the value of the IP that a spinoff possesses, to other IP related terms and conditions and to potential competitive advantages that the right ways of protecting IP can cause.

IP value calculation

First of all it is very important to determine the value of the IP that a spinoff possesses. The value has effect on a lot of numbers, like on the amount of royalties to be paid, a potential redeem sum or the amount of shares that a university might claim. In that way, the IP value determination has a direct influence on the spinoff business model. It also influences future (investor) negotiations, which is an indirect influence that is further elaborated on in the next section. It is important to note that value does not equal price (Hagelin, 2002). Price is the euro or dollar amount at which an asset trades in a market. Value is the worth (utility) of the asset to the buyer and seller (Hagelin, 2002). The distinction between value and price is the basis for asset exchanges, and the two concepts are closely related. Price is an expression of the perceived value of an asset to the respective parties, it is the concrete number at which the parties commit to an asset exchange (Hagelin, 2002).

The value can be calculated in several ways. According to IP expert E14 and other experts E1, E2, E5, E9 and E10, there are mainly two options (Geraerts, 2024a; Geraerts, 2024b).

1. **Budget put into the research** by the university related to the creation of the IP. In most cases, the experts say, this is not the right way to determine the value, since the costs that have been made by university often exceed the fair market value at that point in time (Loyarte et al., 2018). The 2002 article by Hagelin supports this by stating that the cost of developing an intellectual property asset, such as the cost of research and development, has no relationship to the market economics which determine the demand for the products or processes that embody the intellectual property asset. According to them, empirical studies, which generally conclude that only a very few patents yield high returns while the rest are relatively worthless, confirm the disconnect between the cost of creating an IP asset and its (market) value (Hagelin, 2002; Stiroh & Rapp, 1998).
2. **Fair market value**, which is determined by, amongst other things, the products a UIS makes, the revenue, clients and project portfolio. Hagelin (2002) adds to this that the income method values an asset based upon the present value of the net economic benefit expected to be received over the life of the asset. However, Hagelin and Loyarte also mention that because of the incomparability of IP asset transactions, it is more difficult to calculate the net income expected from an IP asset not currently generating income (Hagelin, 2002; Loyarte et al., 2018). Still, all the mentioned experts agree that the fair market value is generally what founders must aim for.

Other IP terms & conditions

We spoke with many experts about IP terms and conditions; we did this with E1, E2, E4, E5, E6, E9, E10, E11, E12, E13, E14, E15 and E16. IP Expert E14 came up with the following questions to be taken into account when negotiating an IP deal with a university, bases on (Geraerts, 2024a).

1. **How is the value of a spinoff and its IP determined?**
    - Most experts (E1, E2, E5, E9, E10, E11, E12 and E14) agreed that the value of a spinoff's IP must be determined based on fair market value, this is also discussed in the previous section.
2. Does **IP that is added later** on also count for university IPR and the potential royalty or milestone payments? After signing the deal, more IPR will be developed by the spinoff; some universities also want to earn money on that.
    - Experts did not reach consensus on this topic. Some said no (E1, E2, E4, E5, E6, E12 and E14) and some said yes, under the condition that the university keeps on adding value and providing

resources (E9, E10, E11 and E15). Experts E13 and E16 did not want to give a yes or no answer to this question.

3. **When does the UIS (founder) obtain full IP ownership**? When all royalties have been paid and/or all milestones have been met, or after a certain specified period?
    - This must be subject to negotiation, some experts said (E1, E2, E5, E10 and E15). Others (E4, E6 and E14) said that this must happen as soon as possible.
4. **Is it desirable to separate protection of IP and 'know how' over different clauses?**
    - All experts agreed that this is indeed desirable, since it is more fair for all parties involved.
5. **What is the contract duration?**
    - All interviewed experts agreed that a shorter contract duration makes negotiations with investors more favorable, and that since software changes at a high rate, the percentage of used software in the license drops dramatically over the years.

Competitive advantages gained by IP protection

Investors strongly prefer exclusive licenses (see chapter 4.2 for more information). It reduces competition and creates a clear competitive advantage over the competition. With an exclusive license, a licensee has the potential to be first on the market with new technology, an attractive option for any investor (Reem, 2023c). Important to note is that even in exclusive license agreements, the university always retains the right to do further research on the basis of the existing know-how. The results of such further research as well as the confidentiality obligations of the university, including specific provisions on scientific publications, should be clearly addressed in the licensing agreement (Reem, 2023c).

5.3 Indirect influence of IP appropriation on the UIS business model

There are also several ways in which IP appropriation can have an indirect influence on the UIS business model. The most important ones in case of university spinoffs turn out to be the influence IP has on investor readiness and the influence it can have on potential collaboration with other companies.

A startup company always needs money in order to grow. To acquire this money, the startup can either attract external funding or try to finance itself without external funding by using a bootstrapping approach. This concerns keeping costs as low as possible and paying bills by self-financing through personal savings or service projects (see figure 4.4 in chapter 4.3). Bootstrapping is a strategy often used in markets where go-to-market costs are low. If these costs are high, startups are forced to search for external funding. Various options for external funding and investments are available, each with their own characteristics, costs, benefits, and considerations:

- **Grants and Subsidies**: Government may offer grants and subsidies to support specific industries, research or development projects. This is a type of non-dilutive funding that does not involve giving up equity or IP, but grants and subsidies often specify specific eligibility criteria. Companies that are not aligned with government priorities generally do not qualify for this type of funding.
- **Loan:** When spinoff founders do not want to give up any equity, at least not right away, they can also search for a loan, for example from a bank. This can concern either a normal loan or a convertible loan, which could be converted to equity in a later stage. Convertible loans provide a flexible way for startups to secure funding without an immediate valuation. Apart from the fact that the startup will have to pay back the loan at some point, founders will also need to pay interest over the loan, which can be expensive for a startup.
- **Friends & Family:** When looking for external funding, startup founder can try to get friends and family financing, from friends and family members who believe in the founders and the business idea. This can be informal and may involve personal loans or equity investments.
- **Angels Investors:** Angel investors are individuals who invest their personal funds into startups or small businesses in exchange for equity. Apart from capital they often also provide industry

expertise and valuable connections. Angel investors are very suitable for early-stage startups, including UIS, in need of initial seed funding.

- **Venture capital:** The most common way for a startup to grow is through venture capital or angel investors. Venture capital involves investment from professional investors called venture capitalists into early-stage or high-growth companies in exchange for equity. They often seek significant returns and may provide not just funding but also mentorship and strategic guidance. Venture capital is specifically common for technology startups like UIS and high-growth businesses.
- **Seed accelerators and incubators:** An alternative to venture capital or angel investment can be Seed accelerators and incubators. Startups can join accelerator or incubator programs which provide mentorship, resources and funding in exchange for equity. Apart from making money, seed accelerators and incubators often have a broader focus on nurturing and developing the startup ecosystem.

However, before searching for external funding, another key step needs to be taken first. As described in chapter 3.4, before founders are allowed to bring IP that was invented in publicly funded universities and institutions to the market, a university spinoff founder needs to negotiate who owns the IP with the university's technology transfer office, and sign a so called technology transfer agreement. This is a key part of developing any product based on university research or technology, but it remains almost undiscussed (Reem, 2023c).

The way a university spinoff deals with IP can have a lot of consequences for the investor readiness of the startup. The IP appropriation mechanisms described in chapter 4.3 and their values can lead to a few scenarios: an equity deal, a royalty deal, potential milestone payments and whether or not the IP license is exclusive. In chapter 4.3 acceptable mechanism values are described; these are determined from a university or TTO perspective, only partly taking into account the consequences that these values might have for the spinoffs investor readiness. However, before investing in a university spinoff, investors will check the values attributed to these applicable mechanisms. Therefore, in this chapter we look at technology transfer agreements from an investor perspective.

For investors, the first thing to look at is whether or not an IP license is exclusive. Exclusive licenses mean that only one licensee (your university spinoff) is allowed to use the IP, whereas non-exclusive licenses mean that multiple licensees can use the licensed IP. Partially-exclusive licenses also exist, where licensees are limited to a particular geographical area or branch of technology (Reem, 2023c).

Of all the transfer agreement terms, the most important one for investors is how a spinoff pays for the license. As described in chapter 4.2 and 4.3 many different payment structures exist, but the most common ones are an equity stake in the spinoff company and/or royalties; see these chapter 4.2 and 4.3 for more information; acceptable values for each of the applicable mechanisms are also provided there.

Influence of cap tables on the UIS business model

Since universities are funded by public money, they need to get something in return when an employee wants to use university owned IP for commercial purposes. To pay the university for the IP license, founders can give the university shares in a spinoff. When a university owns shares in a spinoff, it makes them one of the parties present on the company's *capitalization table*, generally referred to as *cap table*. In that way, a university spinoff's IP appropriation approach influences the spinoff's cap table. A cap table may seem like a simple spreadsheet outlining who owns the equity in a startup, but it can dramatically influence a company's potential for success or acquiring external funding from investors. It is not only about numbers; it is about aligning a company toward growth through motivating executives and enabling high-quality decision-making (Reem, 2023d). Like this, by influencing the spinoff's cap table, IP appropriation can have an

indirect influence on the spinoff's business model. We will explain in what way the cap table has consequences for the spinoff's business model.

Startups can have a great product and a great team that is tackling a big and important problem, but a cap table that is not aligned with their future success. This can result in potential investors being scared off, or they require impossible terms, limiting the potential of the company. The company needs to be built by the people running the company, so they need to be motivated. Since startups cannot afford high salaries, a key aspect of motivation, retention and renumeration is ownership in terms of shares in the company. Most investors look for the executive team to own at least 50% of the equity after the Series A round, to ensure their motivation even after the dilution that will take place in later rounds (Reem, 2023d). Trouble generally arises when due to early made deals too much company shares are left in the hands of (long term) passive shareholders, which is called *dead equity*. Equity can better be spend on attracting active shareholders instead of passive ones. Dead equity makes a startup less interesting to investors (Reem, 2023d). Universities are also often seen as passive shareholders. Every investor's share of equity should be a balance between how they have contributed up to now and how they will contribute in the future, with a priority for the latter (Reem, 2023d). Figures 5.1 and 5.2 give examples of uninvestable cap tables.

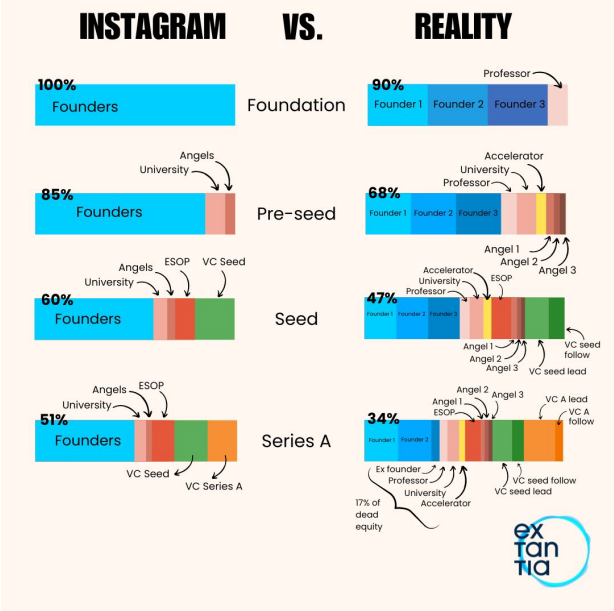

Figure 5.1: What people think cap tables are like vs. reality (Reem, 2023b).

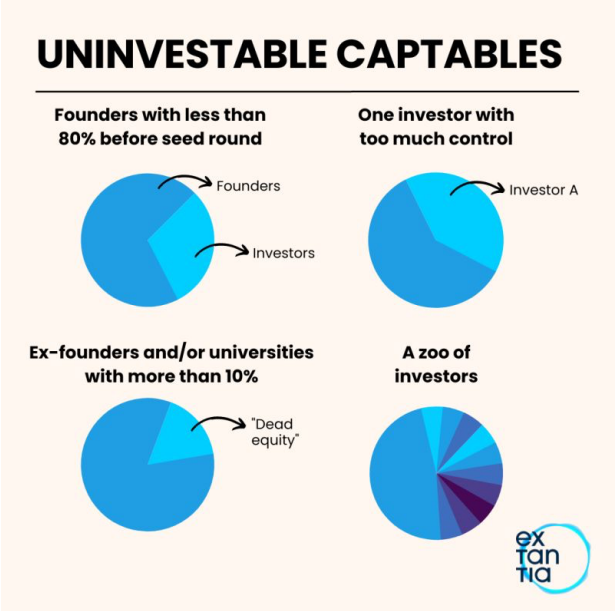

Figure 5.2: Examples of uninvestable cap tables (Reem, 2023a).

Just like in other companies, startup shareholders get a say in the way the startup is run. Every shareholders has a potential voice in decision making, so it is crucial to ensure that the voices together can contribute positively to the company's future. In a clean cap table, the majority of equity is owned by people driving the company forward: the executive team and active investors. If a company has may small and passive shareholders, it can be difficult to get the level of consensus needed to pass a resolution. Think of three venture capitalists each owning about 10-15% of the company, each at a different stage in their fund's lifecycle trying to agree on whether or not to accept an exit offer. It is important to have someone in the lead (Reem, 2023d). At the same time, if the startup has sold a significant stake (like more than 20%) to a single more passive investor, then new investors may be concerned if their voice will be heard.

When the university has a big share in the company, investors are less likely to invest their money in the spinoff. Spinoff founders often lack the information and knowledge to negotiate a good deal. This situation is improving over the last years, mostly because of founders sharing their stories from reality, but there is still a big gap in knowledge, especially when working with first time, still in university founders (Reem, 2023a, 2023b). Ironically, the organization that is in the best position to educate these founders (the university) is still very likely to take a big cut out of the cap table (Reem, 2023a, 2023b).

If a startup ended up with a complex cap table, cleaning it up may be a difficult and time consuming task, but it is not impossible. It may involve difficult conversations and negotiations, but it is in every shareholder's best interest to ensure the company is in a position to succeed. First start a dialogue with the relevant parties, like dormant shareholders and in this case especially with universities. Explore options such as buyback or stock dilution. In some cases, complete recapitalization may be the best way to fix a messy cap table. It can be a complex process, but it can be the best way to reset the cap table so that it aligns with the future success of the company. Figure 5.3 gives examples of messy cap tables and their corresponding ways of solving them. It is always best to aim for a clean and healthy cap table right from the start (Reem, 2023a, 2023b, 2023c, 2023d).

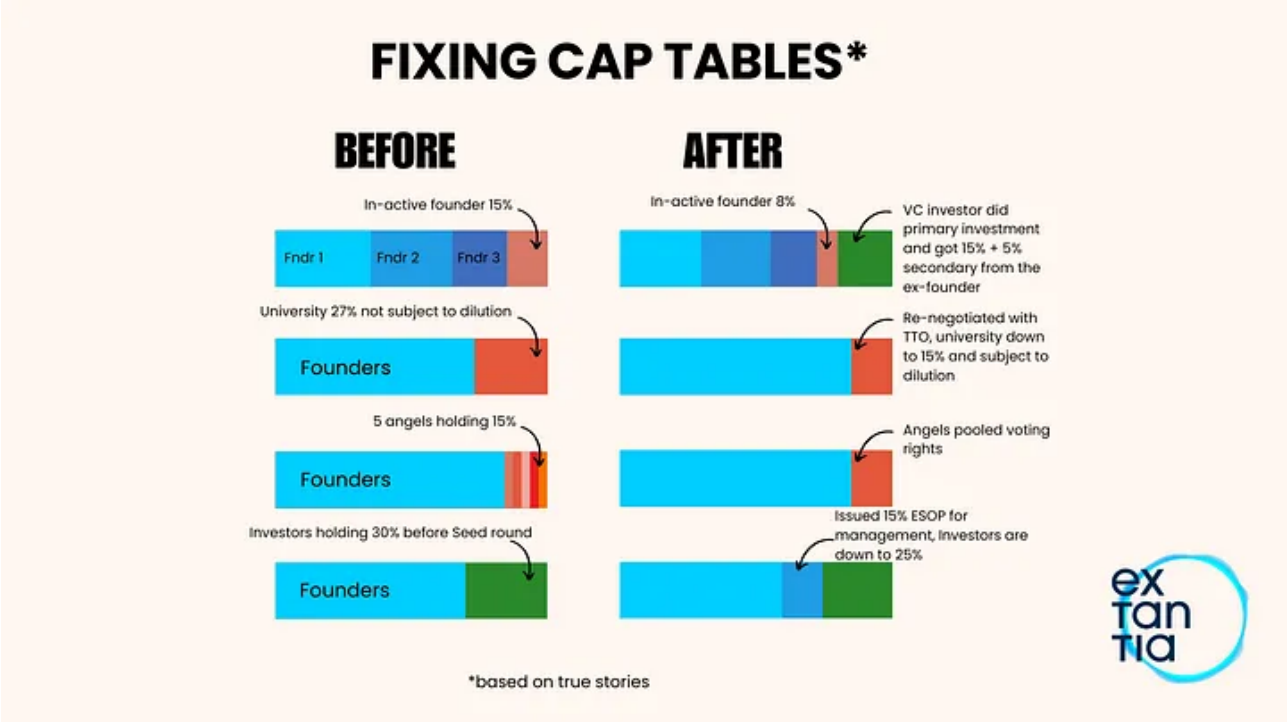

Figure 5.3: Ways to fix complex cap tables, showing the complex version and the solution, based on true stories (Reem, 2023d).

Influence of royalty payments on the UIS business model

Another way for university spinoffs to pay for their IP license, is by using royalty payments. As explained in chapter 4.2, royalties are arrangements where an institution, in this case a university, consistently receives a part of the revenue generated by the sale of products and services that make use of the licensed technology. This reduces the amount that spinoffs will have to pay upfront and divides the risk between the spinoff and the university. If things go well, the university receives a consistent share of revenue, but if things go badly, both parties will lose money. When a spinoff has to pay the university a lot of royalties for the IP that they are using, this also has indirect consequences for the spinoffs business model, mainly by influencing the investor readiness and potential future success, just like with cap tables.

Advantages of royalty payments are that the payments are predictable and that it keeps the spinoff's cap table simple. Predictable payments make it easier to prepare a business plan and cost structure to account for the known royalty expenditures. In terms of a simple cap table: public institutions are notorious to be slow and hard to work with. It is not easy for spinoffs to deal with such a shareholder on its cap table.

Royalty payments also have disadvantages. Royalties lower a spinoff's profit, which might result in investors and potential buyers losing interest in the spinoff. Royalties also impact a startup's cash flow, which is especially tough in the startup's early years. Paying royalties generally exacerbate the cash flow situation; in early years spinoffs may generate revenue, but the business often still makes a loss.

Best practices for royalty payments, making sure that potential investors stay interested, are to pay the university anywhere between 1% and 5% of net sales. Spinoff founders must strive to cap the absolute amount of royalties they pay and to reduce the percentage as net sales grow, like 3% to 20 million in sales, 2% between 20 and 40 million sales, and 1% above 40 million sales (Reem, 2023c). A fixed amount per unit sold can also be a good option for the spinoff, which should also decrease as sales go up. IP Expert E14 described that a bad IP deal concerning high royalty payments to a university is like "Damocles sword hanging above your head all the time, especially when doing investment rounds."

Influence of IP appropriation on business collaborations

The 2000 article by Gans, Hsu and Stern evaluates the conditions under which start-up innovators earn their returns on innovation through product market competition with more established firms (happens often in the electronics industry), as opposed to cooperation with these incumbents. Cooperation can be done either through licensing, strategic alliances or outright acquisition. Whereas the competition option challenges the incumbent's market power, the cooperation option tends to reinforce current market structure. The research shows that the extent to which startups have control over their IP have influence on the choice of whether or not to collaborate as a startup (Gans et al., 2000). This is another way in which IP influences a spinoff's business model.

Whether or not to cooperate with other parties is an important question for university spinoffs. Benefits of cooperation include forestalling the costs of competition in the product market and avoiding duplicative investment in sunk assets, while imperfections in the "market for ideas" may lead to competitive behavior in the product market. Results showed that that firms who control IP themselves or are associated with venture capital financing are more likely to pursue a cooperative strategy (Gans et al., 2000). These results suggest that the role of IP or venture capital on the competitiveness in product markets is somewhat more nuanced than assumed in many theoretical treatments. Increases in the strength of intellectual property increase the relative returns to cooperation by facilitating the market for ideas (Gans et al., 2000).

6. IP Appropriation Guideline

In this chapter, the treatment is designed, so we are in the treatment design phase of the Wieringa Design Cycle (Wieringa, 2014). The research objective in section 1.2 is formulated as follows: “How to design a guideline, that helps UIS tackle challenges concerning Intellectual Property appropriation with help of the UNL Deal Terms, and identifies the consequences that different strategies might have for the spinoffs’ business model, so that UIS can successfully protect and commercialize their innovative technologies?” The treatment has been specifically designed for UIS, and aims to guide spinoff founders in their IP appropriation process, while also identifying the consequences that different choices might have for the spinoff’s business model.

In chapter 1 the problem statement has been defined as follows: “There is often confusion and disagreement on the ownership and protection of the Intellectual Property developed by University spinoffs, and spinoff founders often have insufficient knowledge concerning what consequences IP strategy and Universiteiten van Nederland Deal Terms related choices might have for the success of the spinoffs’ business model.” The Current chapter tries to partly solve this problem by presenting the newly designed IPAG Method for answering the following research question:

RQ3: What are the steps of an IP appropriation guideline that UIS can apply?

Intellectual Property (IP) stands as the linchpin for the success of University IT Spinoffs (UIS), serving as both a shield for innovative technologies and a key to commercialization. As the contemporary business landscape becomes increasingly reliant on cutting-edge advancements, UIS struggle with the challenge of protecting their intellectual creations while at the same time capitalizing on their market potential (Hargreaves, 2011). IP negotiations with the universities Technology Transfer Office (TTO) are generally hard en take much time (DeSimone & Mitchell, 2010; Savva & Taneri, 2015; Geraerts, 2024a, 2024c). See chapter 3.4 for more information on the process of technology transfer. The guideline presented in this chapter is designed to be a compass through this journey, offering UIS a structured and more efficient approach to Intellectual Property appropriation.

In the context of UIS, where technology is often the most important part of the business, the stakes are high. This guideline addresses the need for UIS to not only protect their intellectual property but also to do so in a way that aligns with their unique circumstances (Hargreaves, 2011; Kulkov et al., 2020). UIS in the Netherlands can use the UNL Deal Terms as a powerful toolset, offering a diverse bundle of mechanisms for IP appropriation (UNL, Zijlstra, 2023). However, the complexity of these terms often leave UIS at a crossroad, uncertain of the most suitable route for their specific case.

It is always important to determine whether or not a university has the right to claim IP at all. When it is determined that the university does not have this right, it is important that both parties agree to this on paper, which might need convincing. In case the university rightfully claims IP, startups should aim to strike a balance in these terms, ensuring the university's equity stake is reasonable, keeping royalty payments and milestone payments low to preserve scarce early-stage capital, and considering the need for exclusivity (UNL, Zijlstra, 2023; DeSimone & Mitchell, 2010; Savva & Taneri, 2015; Y Combinator, 2023).

For designing the guideline, the objective is twofold: to lay out a step-by-step blueprint that UIS can follow and to unravel the intricacies of the UNL Deal Terms. By doing so, the aim is to empower UIS to navigate the challenging terrain of IP appropriation successfully. This guideline does not only serve as a set of instructions but as a strategic framework that acknowledges the relationship between IP strategies and the UIS business model. Through a systematic approach, UIS can ensure that their innovative technologies are both protected well and ready for effective commercialization.

Before following the steps of the IP appropriation guideline, it's crucial for UIS to dive into the nuances of the UNL Deal Terms and the different mechanisms, including their applicability and acceptable values. They are important for effective IP management, but their diversity and complexity can be overwhelming. See chapter 4.3 for more information on this topic. It also helps for founders to have gone through the different phases of the Student Entrepreneurship Encouragement Model (SEEM). By going through the phases of Educate, Stimulate and Incubate, founders are provided with the minimal required knowledge on entrepreneurship in general (Jansen et al., 2015). See chapter 4.5 for more information.

6.1 IPAG Method

The guideline is in the form of a Process Deliverable Diagram (PDD), which is an assembly-based method engineering approach for constructing situational analysis and design methods. The approach is supported by a meta-modeling technique based on UML activity and class diagrams (van de Weerd & Brinkkemper, 2009).

The guideline PDD in this case exists of 6 interconnected subsequents phases:

1. **UIS needs assessment**: The first phase of the PDD involves a meticulous assessment of UIS objectives and the related UIS needs;
2. **Stakeholder alignment**: This phase emphasizes the importance of aligning all stakeholders and minimizing the amount of alignment problems;
3. **Risk analysis**: The potential consequences for the spinoffs business model are assessed here;
4. **IP Negotiation**: IP negotiation strategies are defined, tailored to different scenarios from the UNL Deal terms;
5. **IP Deal closing**: In the deal closing phase the deal between the UIS and the TTO is made;
6. **Monitoring and adaptation**: The guideline proposes an ongoing monitoring and adaptation protocol, ensuring that the UIS remains flexible in responding to changes in the technological, market, or regulatory landscape.

The phases are executed respectively and the guideline allows going back and forth between the Risk analysis and Monitoring and adaptation phases, see figure 6.1.

A more extensive version of the PDD is shown on the next page, explaining what happens within each of the phases. More information is given on the activities, sub-activities and concepts of the process deliverable diagram by means of an activity and concept table, and a guideline description is also provided.

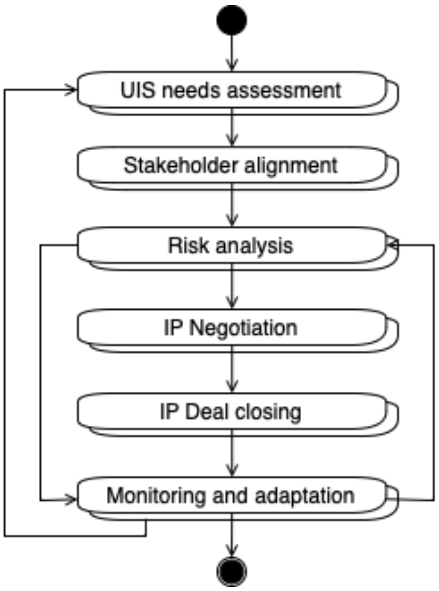

Figure 6.1 : IPAG Method High Level Model

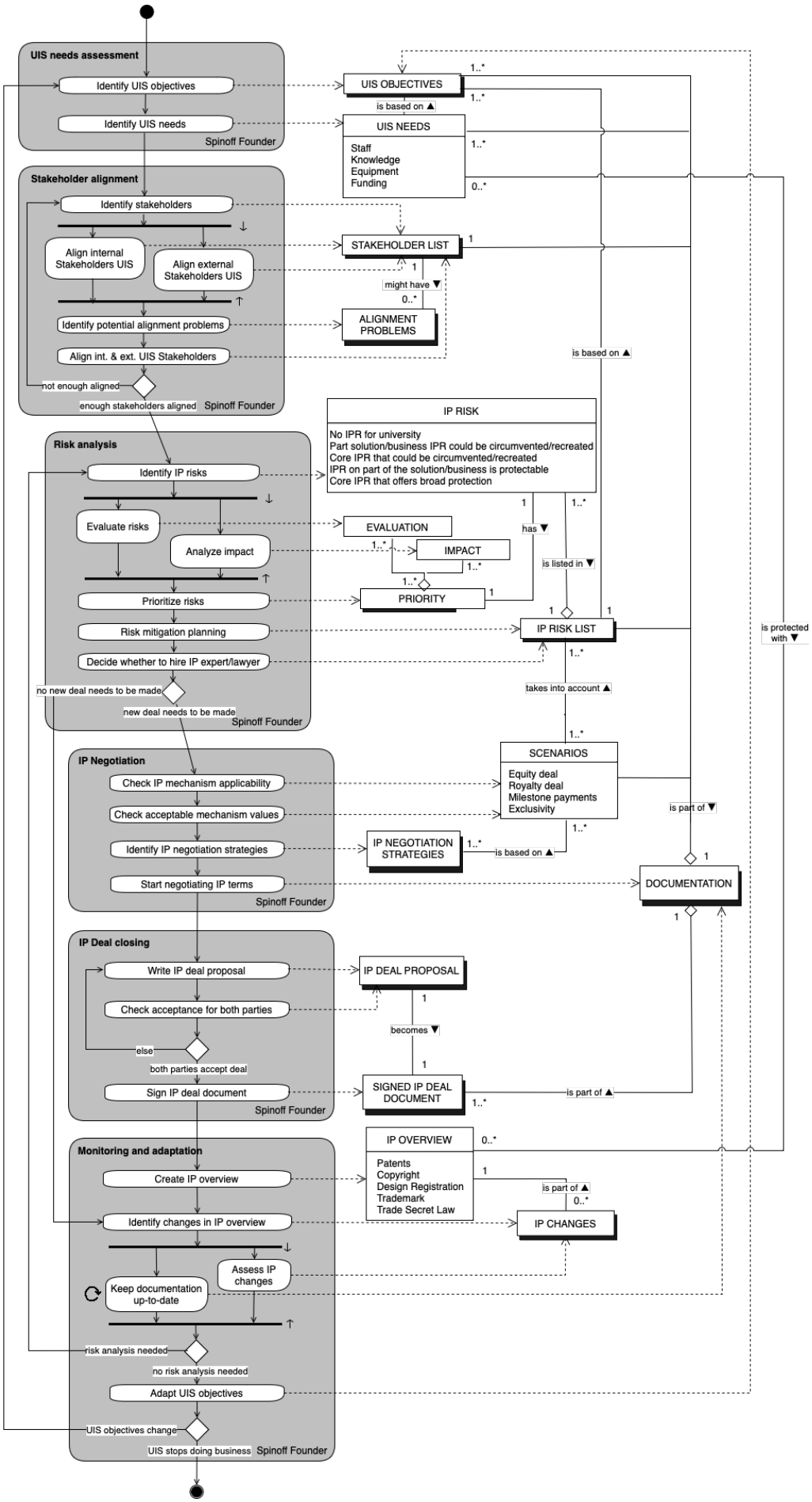

Figure 6.2: IPAG Method

The activity table and concept table provide more information on the activities, sub-activities and concepts of the process deliverable diagram and the connections between them. These tables can be found in the Appendix. Apart from the activity and concept table, a more extensive description of the IP Appropriation Guideline is provided below.

6.2 UIS needs assessment

The first phase of the PDD involves a meticulous assessment of UIS OBJECTIVES and the related UIS NEEDS. First the objectives are identified, like gain a product, gain customers, gain market share, gain funding. These objectives generally come down to 3P's: People Plan and Profit. Subsequently the UIS NEEDS are identified based on the UIS OBJECTIVES. The needs can concern anything related to staff, knowledge, equipment or funding. The guideline advocates for a comprehensive needs assessment to tailor the subsequent IP strategy. The needs have influence on the required type of IP protection, including patents, copyrights, design registration, trademark or trade secret law.

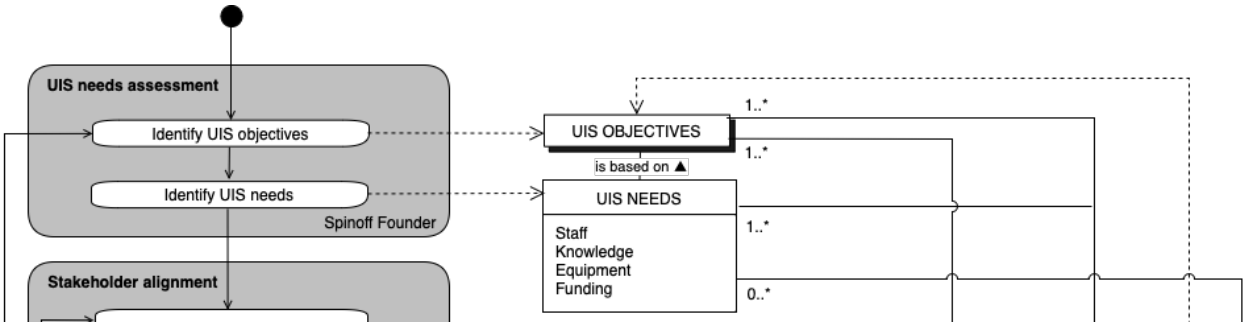

Figure 6.3: IPAG Phase 1: UIS needs assessment.

6.3 Stakeholder alignment

UIS operate in a collaborative ecosystem involving academia, advisors, investors, and the UIS team. This phase emphasizes the importance of aligning all stakeholders and minimizing the amount of alignment problems. Stakeholders are aligned when they all agree on the UIS OBJECTIVES and their corresponding UIS NEEDS. It is important to keep all stakeholders aligned throughout the whole IP appropriation process, since this makes the process take less long (Van Riel, 2012; Hambrick & Wowak, 2021).

Internal stakeholders include everyone working at the UIS on a managerial level, like founders and other managers, whereas external stakeholders include advisors and potential investors. TTO personnel and other university stakeholders are not part of the external stakeholders in this case, however keeping close contact with them and keeping them aligned also smoothens the IP appropriation process. (Van Riel, 2012; Hambrick & Wowak, 2021). However, this might be difficult in practice. All internal and external stakeholders are listed in a STAKEHOLDER LIST and if these stakeholders have any ALIGNMENT PROBLEMS these are listed as well. The Stakeholder alignment model developed by Hambrick and Wowak in 2021 can help spinoff founders align the stakeholders involved.

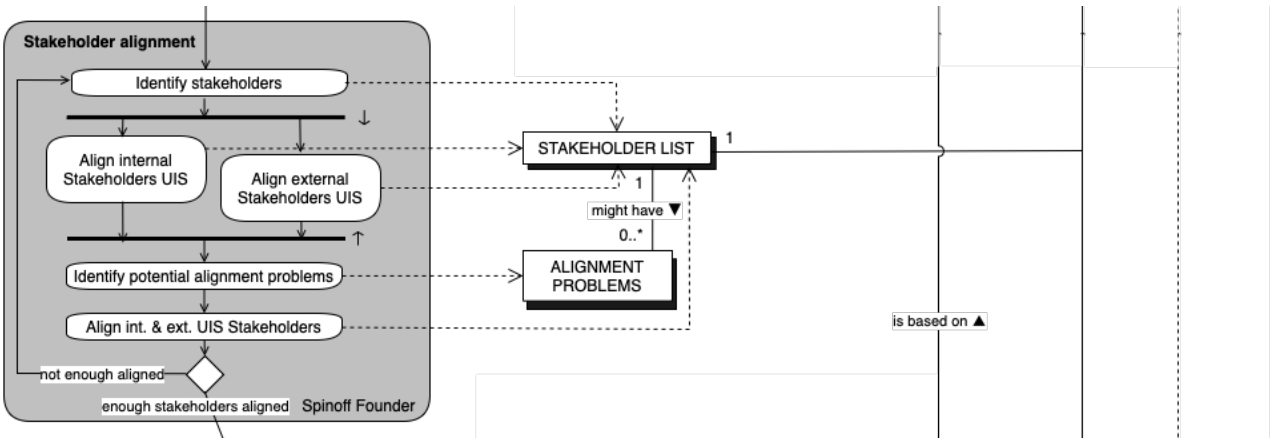

Figure 6.4: IPAG Phase 2: Stakeholder alignment.

6.4 Risk analysis

Intellectual Property appropriation and management is fraught with IP risks. The guideline outlines a structured approach to identify and mitigate risks effectively. UIS need to conduct a detailed risk analysis, considering factors like the probability that a certain part or the core of the solution or business could be circumvented or recreated, or the probability of being able to protect the IP Rights (IPR) of that same solution or business good enough. To estimate the aforementioned, spinoff founders should assess market competition and potential legal challenges. The potential consequences for the spinoffs business model must also be assessed; see chapter 5 for more information on this topic.

The Risk analysis phase starts with identifying IP RISKs. As mentioned before, IP RISKs can include the potential circumventing of IPR or recreating the products the IPR protects, or the extent to which the solution or business is IPR protectable. When IP RISKs have been identified, each risk is evaluated and its IMPACT is analyzed. Based on the EVALUATION and IMPACT analysis, each risk is given a certain PRIORITY. Then all risks are listed based on their assigned PRIORITY in the IP RISK LIST. It is crucial for a company to mitigate its risks, especially in innovative companies projects (Ahmed, 2017; Shahzad & Safvi, 2008). During the activity of risk mitigation planning, potential solutions to mitigate risks effectively are discussed and documented. In the IP Appropriation Guideline, risk mitigation planning is executed based on the IP RISK LIST. Based on the same list, it is then decided whether or not to hire an IP expert or lawyer.

The happy flow of the guideline would now lead to the IP Negotiation phase. However, it is possible that the “Identify IP risks” activity has the outcome that there is no IPR for the university. This can be the case when it can be substantiated with arguments that the IPR were created without university resources, or when it was created in the founders’ own time without an underlying agreement stating that the IPR from creations in a persons own time is owned by the university, like in the Verticai case (see chapter 7). When the university cannot claim any IPR, no new deal needs to be made and the founders can directly go to the “Monitoring and adaptation” phase. See chapter 4.2 for more information on what founders can do if the university cannot claim any IP, like getting into a strategic partnership or using an open source model. In the situation that a deal has already been made and there is no new deal to be made, founders can also jump to the last phase immediately.

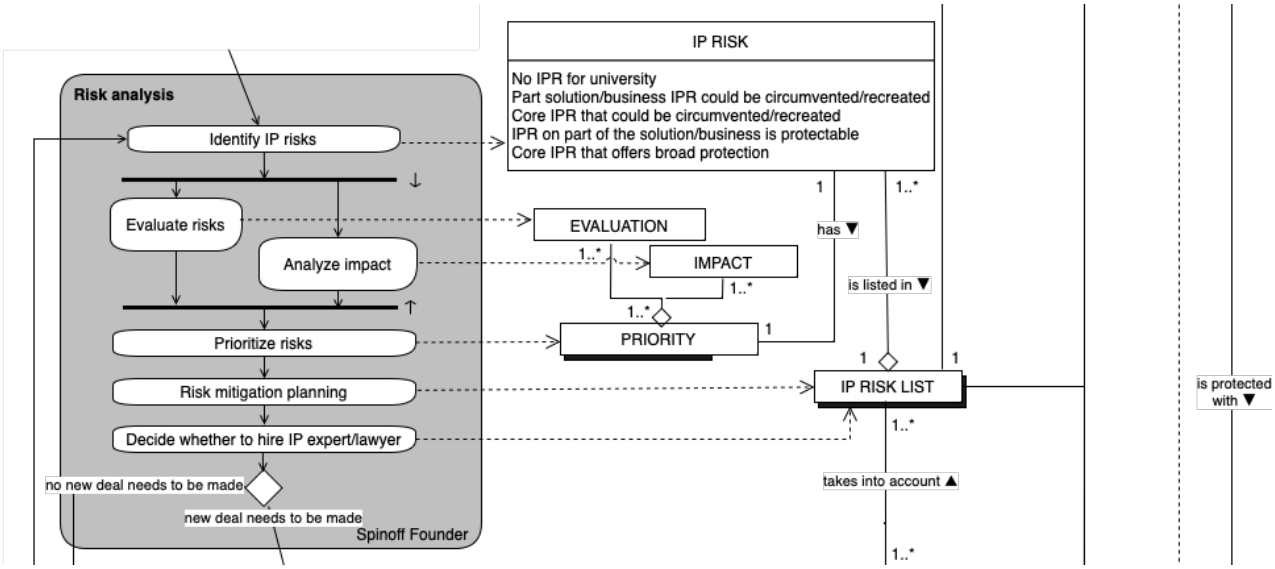

Figure 6.5: IPAG Phase 3: Risk analysis.

6.5 IP Negotiation

Armed with a strong understanding of UNL Deal Terms, the UIS founders must now get ready to negotiate. In the IP Negotiation phase, IP NEGOTIATION STRATEGIES are defined by the founders. These negotiation strategies are tailored to different SCENARIOS – be it an Equity deal, Royalty deal, Milestone payments, or a combination, including the topic of Exclusivity.

First, the IP mechanism applicability is checked for all available mechanisms, based on what has been described in chapter 4.3. For each of the applicable mechanisms, acceptable mechanism values are checked. The selected mechanisms and their acceptable values result in potential SCENARIOS. Based on these SCENARIOS, several IP NEGOTIATION STRATEGIES are identified. When determining these strategies, it is important for founders to think about the following negotiation topics, and to think about their desired outcome (see chapter 5.2 for more information on how the interviewed experts think about these topics) (Geraerts, 2024a):

1. **How is the value of a spinoff and its IP determined?** This has effect on a lot of numbers, like on the amount of royalties to be paid, a potential redeem sum, etc., which influences future (investor) negotiations. There are mainly two options: License options and budget put into research by the university, or the fair Market value, determined by the products UIS makes, revenue, clients and project portfolio, etc. The latter is what founders must aim for.
2. Does **IP that is added later** on also count for university IPR and the potential royalty or milestone payments? After signing the deal, more IPR will be developed by the spinoff; some universities also want to earn money on that.
3. **When does the UIS (founder) obtain full IP ownership**? When all royalties have been paid and/or all milestones have been met, or after a certain specified period?
4. **Is it desirable to separate protection of IP and 'know how' over different clauses?** -> Yes
5. **What is the contract duration?** A shorter duration makes negotiations with investors and buyers more favorable. Also, software changes at a high rate, so the percentage of used software in the license drops dramatically over the years.

When the strategies have been identified and all other topics have been thought about, it is time for UIS founders to start negotiating IP terms. This is all based on express license agreements and the UNL Deal Terms (DeSimone & Mitchell, 2010; Savva & Taneri, 2015; Y Combinator, 2023; UNL, Zijlstra, 2023).

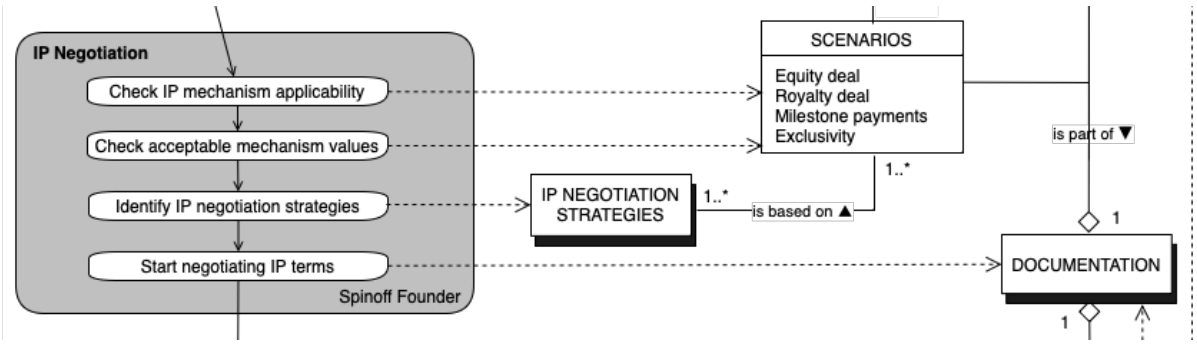

Figure 6.6: IPAG Phase 4: IP Negotiation.

6.6 Deal closing

In the deal closing phase the deal between the UIS and the TTO is made. It starts with writing an IP DEAL PROPOSAL. Then the acceptance of the proposal is checked with both parties. When both parties accept the IP DEAL PROPOSAL, they both sign the IP deal document, which turns the IP DEAL PROPOSAL into a SIGNED IP DEAL DOCUMENT. This document outlines the deal that has been made, including the decisions that have been made concerning the equity division, potential royalty or milestone payments, and what has been decided in terms of exclusivity. All IP mechanisms from chapter 4.3 and their values must be listed in this document. In case one of the parties did not accept the proposal the proposal is changed, after which acceptance for both parties is checked again.

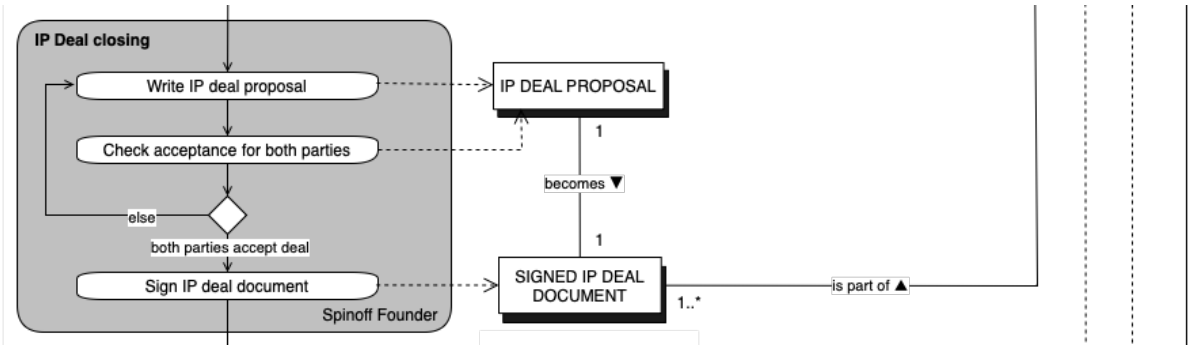

Figure 6.7: IPAG Phase 5: IP Deal closing.

6.7 Monitoring and adaptation

The last phase of the IP Appropriation Guideline is the Monitoring and adaptation phase. An IP landscape is dynamic. The guideline proposes an ongoing monitoring and adaptation protocol, ensuring that the UIS remains flexible in responding to changes in the technological, market, or regulatory landscape. This adaptability is crucial for sustained success.

This phase is an ongoing process. Thorough documentation is the backbone of effective IP management; the guideline underlines the significance of maintaining detailed records of negotiations, agreements, and any modifications. Clear and comprehensive documentation serves as a shield in potential disputes and audits.

First, an IP OVERVIEW is created, which is an overview of how the spinoff and its products are protected in terms of IPR. The overview contains all the company's patents, copyrights, design registrations, trademarks and trade secret law. Subsequently, potential IP CHANGES to the IP OVERVIEW are identified, and these changes become part of the IP OVERVIEW.

There are several things that can change in terms of IP. For example, over time IP protection can change for existing as well as for newly added products, or new kinds of IPR can be claimed by the spinoff. Other examples include things like: what if the university starts doing research and makes discoveries on IPR protected topics, what if the intended market turns out to be less suitable, if certain milestones are not reached, etc.

The next step of the guideline involves assessing the IP CHANGES and determining their potential impact, while keeping documentation up-to-date at the same time. The circular arrow at the left side of the 'keep documentation up-to-date' activity indicates that this activity is continuously repeated. If the assessment of IP CHANGES determines that new risk analysis is needed, founders should go back to the beginning of the risk analysis phase. In case no new risk analysis is needed, the UIS OBJECTIVES are possibly adapted to the new IP portfolio. When this potential adaptation has taken place, founders must wait until the UIS OBJECTIVES change, in that case leading them back to the start of the guideline. When the UIS OBJECTIVES never change anymore, at some point the UIS stops doing business, leading to the end of the guideline.

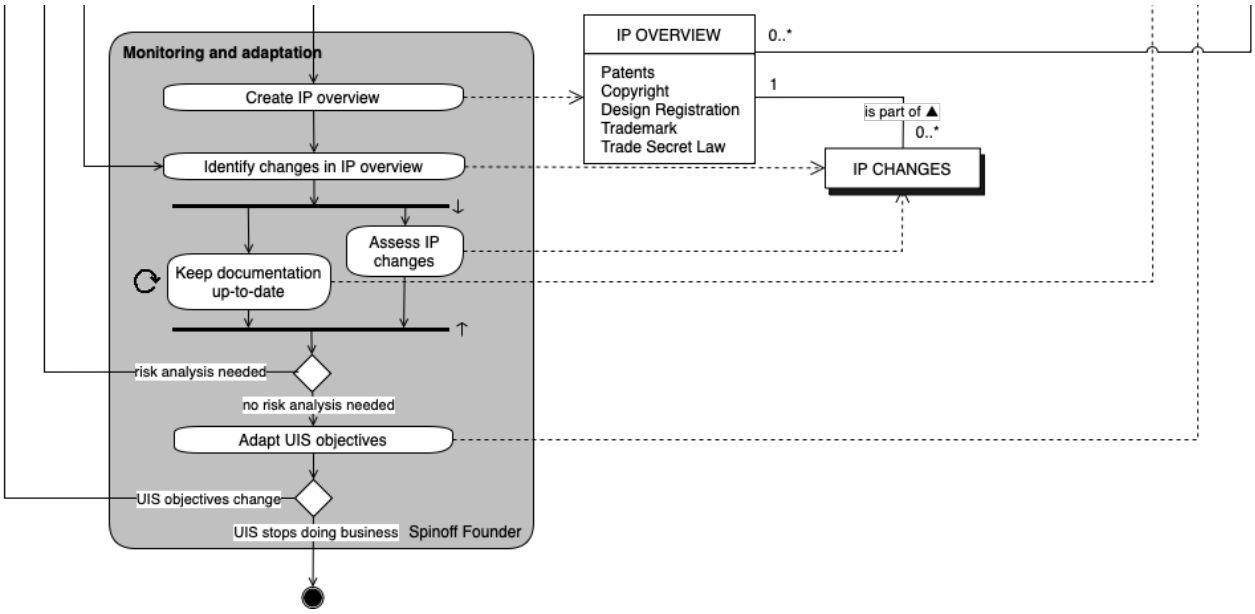

Figure 6.8: IPAG Phase 6: Monitoring and adaptation.

7. Case Study UIS from Care2Report

In this chapter, the aim was to validate the treatment, in this case the IPAG Method (IP appropriation guideline), so we are in the treatment validation phase of the Wieringa Design Cycle (Wieringa, 2014). We wanted to validate the method by checking if the guideline works for the Care2Report Research Program and Verticai university spinoff case, by answering the following research question:

RQ4: Does the IP appropriation guideline work for the specific Care2Report UIS case?

However, things turned out different than what we expected with this case study. We expected the Care2Report/Verticai IP appropriation process to be complex, but in the end the TTO from Utrecht University did not claim any IP in the startup.

7.1 The Care2Report Research Program

When setting up this research, the Care2Report startup was about to embark on the IP appropriation journey, which was expected to be a tough one. Starting in 2018, the Utrecht University Care2Report Research Program had already done a lot of research, which had mainly been carried out by employees and students from Utrecht University. The research program was led by Prof. dr. S. Brinkkemper. When the idea came to build a startup based on this research, it was likely that the university would claim some of the IP. Care2Report seemed a relevant research context since it concerns a knowledge intensive UIS, for which research has been done using Utrecht University time and resources. Additionally, Utrecht University neglected the UNL Deal Terms till date, thereby loosening the boundaries of the IP negotiations.

In 2023, 8 papers were published by the research program, almost all of them having something to do with automated (medical) reporting. In February 2023, Wegstapel et al. published a paper on Automated Identification of Yellow Flags and Their Signal Terms in Physiotherapeutic Consultation Transcripts, focused on automated medical reporting for physiotherapists. In the same month, Kwint et al. published a paper titled How Different Elements of Audio Affect the Word Error Rate of Transcripts in Automated Medical Reporting, looking into how audio can be improved to reduce the word error rate of transcripts. In April 2023 Spijkman et al. investigated the topic of Summarization of Elicitation Conversations to Locate Requirements-Relevant Information, not necessarily researching inside the healthcare domain, but looking into using automated reporting technology for requirement elicitation. Another Automated Medical Reporting paper was published by van Zandvoort et al. in November 2023; a paper titled “Enhancing Summarization Performance through Transformer-Based Prompt Engineering in Automated Medical Reporting”. Since the introduction of GPT 3.0 in November 2022, research showed that Large Language Models can play a crucial role in automated summarization and report generation. However, it turns out to be important to apply the right prompt engineering techniques for optimal results (Van Zandvoort et al., 2023).
The last paper till date is the paper titled Comparative Experimentation of Accuracy Metrics in Automated Medical Reporting: The Case of Otitis Consultations, written by Faber et al. in November 2023. This paper looks into the influence of accuracy metrics in Automated Medical Reporting.

The first Care2Report paper contained the software architecture in figure 7.1. After this, the software was developed further in 3 tranches, by 3 corresponding software projects. These projects were executed using Utrecht University employees, students and other resources. In November 2022, 3 students were added to the Care2Report team; they would write their Master Business Informatics Thesis on the Care2Report topic; this thesis is one of them. Simultaneously they would start to commercialize the developed software and build a university spinoff; the Care2Report spinoff is a perfect example of a UIS. At the same time in November 2022, OpenAI launched Chat GPT 3.0. In March the year after, one of the students built a product demo

based on this technology, using a completely different approach and a different software architecture than the one shown in figure 7.1.

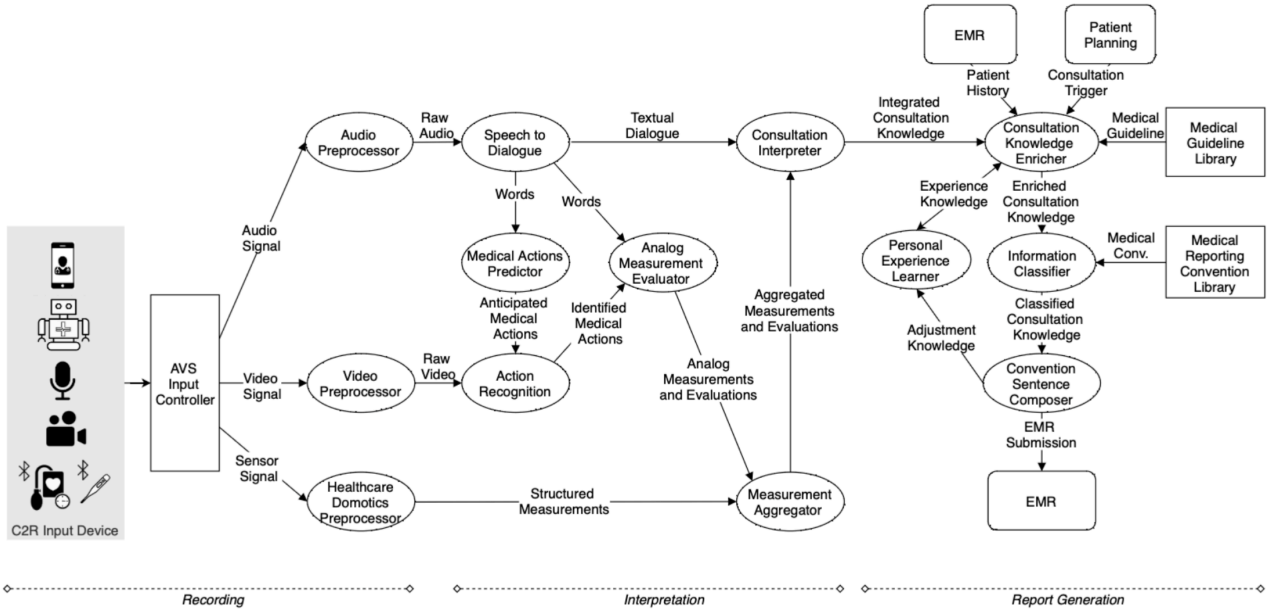

Figure 7.1: Functional architecture of the Care2Report system with components based on microservices (Maas, 2020).

7.2 Startup Verticai

While one of the students was working on the product demo, the other two were starting to develop the business side of the UIS. After a few months of business and product development, based on a different architecture and with a different approach thus not using any prior university owned knowledge or IP, the students and their professor wanted to found the official startup entity. Before the, by that time, still to be officially founded university spinoff called Verticai could found an official startup, the founders had to talk to Utrecht Holdings, which is the Technology Transfer Office (TTO) of Utrecht University. After introductory meetings, the previously mentioned facts were included in the Invention Disclosure Form (IDF) received by the TTO. The information entered into the IDF is elaborated on below.

The working title of the invention was filled in as “Automated Reporting”. The description of the invention was “The software platform is designed to connect audio input with transcription technology, and also incorporates fine-tuning for the targeted domain. The analysis and transformation of transcripts into reports, following the right domain guidelines, is performed using a large language model. A software platform is being developed around this to allow us to easily expand to various domains: each domain may have specific requirements, and therefore, our platform is designed to be customizable to be able to meet these requirements.” Furthermore, the following questions were also answered (Utrecht Holdings Invention Disclosure Form):

- “If you would consider your invention as a solution, what technical or other problem where you trying to solve?”
- “How have others tried to solve this problem in the past? Describe for each closely related prior art solution the functional and/or structural differences with your solution.”
- “Describe the advantage of your solution over the prior solutions.”
- “Does your invention possess disadvantages or limitations? Indicate how they might be overcome.”
- “Describe the development status (concept only, laboratory tested, prototype, in vitro, in vivo, etc.). Indicate what further development may be necessary.”

- "Does your invention include or exist of ICT or software technology such as software source code, database, user interface, e-learning, game, app, portal or website? Please give a short description."

The IDF also required additional information to be filled out, like date of conception of the invention, first disclosure of the invention, first written record of the invention, first experiment demonstrating the invention (proof of concept), different types of publication or disclosure of the invention, prior art etc. Subsequently personal details of the inventors were requested, where we entered the details of our co-founder who built the demo in March 2023. Lastly, questions concerning the use of university resources and funding and the commercialization potential were answered.

The IDF was then sent back to Utrecht Holdings. During a follow-up meeting concerning the IDF, it was decided that the university, in this case the Care2Report Research Group, only owns know-how; for the rest Verticai was granted freedom to operate. The following argumentation was given by the TTO: "Graduation project on structuring the Care2Report Platform, which is well documented. During a graduation project ChatGPT got accessible, on which the solution was then based. The student made a prototype in his own time, resulting in no IP that can be claimed by the university. Some students are working on Care2Report, but the core of "anthological compensation interpretation using knowledge graphs" as earlier described in a publication in 2022 and the analyzing of sentences to make a knowledge graph are replaced by the student by using GPT technology. Conclusion: Idea for the application comes from the University (Prof. Brinkkemper), but the solution does not."

This gave the Verticai spinoff the opportunity to carry on with it commercial plans unhindered, while the Care2Report Research Program could also continue its course of doing scientific research, publishing papers and planning follow-up projects. Care2Report also performs a lot of scientific experiments and needs software for which practical experience and technical knowledge is required, which Verticai possesses. Therefore the Care2Report Research Program and the Verticai spinoff entered into a kind of partnership, allowing Verticai to execute the scientific experiments for the research program, while at the same time learning a lot from it.

Where we first thought to be building linguistic software, this changed into building software using OpenAI's Large Language Model (LLM). Whereas some things, like the general idea, remained the same, the algorithmic core of the software changed completely, therefore changing the IP composition and corresponding discussions completely. The process with the TTO depicted in figure 3.6 was expected to take a long time and to involve tough negotiations, but in the end a decision was quickly made without a lot of negotiating.

The freedom to operate allowed Verticai to continue their plans, but to build up a company, budget is needed. Verticai is an example of the first option from figure 4.4: a software based company with different types of IP protection, in the software industry with relatively low go-to market costs. Although this specific case did not concern a Hybrid deal, Verticai does make us of the 'self financing by service projects' strategy. Apart from self financing, an angel investor also invested some money to cover early stage expenses.

Important to note is that Verticai's IP appropriation journey would have been different when the Verticai founders would have been working with some other Dutch universities. At Utrecht University, the IP of a students' work is by default owned by the student itself, unless explicitly stated otherwise. This means that, unless explicitly stated otherwise, students also own the IP of their own work when this work was created during university courses. However, at other universities, like Eindhoven University of Technology, the IP is generally owned by the university, unless explicitly agreed otherwise, which is an exact opposite approach. Nevertheless, in this case the IP would still be owned by the student, since the software was developed in his own time. In any case, it is always important to check your legal position, that you make sure you write agreements down on paper, and get help where needed (Geraerts, 2024a, 2024b).

8. Discussion and Conclusion

This research investigates the challenges and strategies surrounding intellectual property (IP) rights in the context of university IT spinoffs. In the beginning of this investigation, the problem is stated as follows: "*There is often confusion and disagreement on the ownership and protection of the Intellectual Property developed by University spinoffs, and spinoff founders often have insufficient knowledge concerning what consequences IP strategy and Universiteiten van Nederland Deal Terms related choices might have for the success of the spinoffs' business model.*" Because of this, university spinoff founders often face challenges in protecting and successfully commercializing their innovations. To solve this problem, the research aims to design a guideline that helps University IT spinoffs tackle challenges concerning Intellectual Property appropriation with help of the UNL Deal Terms, while also identifying the consequences that different strategies might have for the spinoffs' business model. This is done so that UIS can successfully protect and commercialize their innovative technologies. Gaps in knowledge and policy that hinder these spinoffs are identified and we explore how the Universiteiten van Nederland (UNL) Deal Terms can assist in navigating the complexity. The following main research question is answered: "*What Intellectual Property appropriation strategies exist, and which strategy should University IT Spinoffs apply?*".

Through the comprehensive investigation, encapsulated by the research questions, this study provides insights into the multifaceted relationship between IP strategies and the operational context of the specific UIS. We dive deeper into the complex domain of IP appropriation strategies for University IT Spinoffs, investigating IP appropriation in general, its influence on the UIS business model, the use of express license agreements and the intricacies of UNL Deal Terms and their applicability. We will now answer the Research Questions (RQs) one by one.

RQ1: What Intellectual Property appropriation strategies exist, and which strategy should University IT Spinoffs apply?
The research reveals a variety of IP appropriation strategies, emphasizing the importance for UIS to tailor their IP approach based on the unique characteristics of their technological innovations and the applicable market conditions. The study underscores the significance of adopting a strategy that not only safeguards the intellectual assets but also harmonizes with the UIS business model, its growth trajectory and market aspirations. The UNL Deal Terms concern a variety of IP Appropriation mechanisms. Based on their applicability and potential values, IP appropriation strategies are defined. More information on this topic can be found in chapter 4. To help founders decide what strategy fits the UIS best, the IP Appropriation Guideline (IPAG) Method is introduced, and proves the study's commitment to providing UIS with a strategic compass for navigating the complexities of IP management. More information on the IPAG method can be found in chapter 6.

RQ2: What are the consequences of IP appropriation strategies for the UIS business model?
Delving into the implications of IP strategies, the research indicates the profound impact IP related decisions can have on the UIS business model. This impact can be either direct or indirect. Examples of direct consequences of IP related decisions on the UIS business model can be the way the IP value is calculated, competitive advantages gained by IP protection and other terms and conditions. More information information on this topic can be found in chapter 5.2. Examples of indirect consequences are mostly related to how attractive a spinoff is to potential investors. IP can have an influence on the spinoff's cap table, influencing the investor attractiveness, influencing the business model, with IP in that way indirectly influencing the spinoff's business model. The amount of royalty payments caused by the not (complete) ownership of IP also influences the business model. Lastly, the IP status of a spinoff can also influence ways in which the spinoff will (not) collaborate with other businesses. More information on indirect consequences of IP appropriation strategies on the UIS business model can be found in chapter 5.3. The findings advocate for a well considered selection of IP strategies, highlighting the potential for such choices to either propel the UIS towards commercial success or hinder its market penetration.

RQ3: What are the steps of an IP appropriation guideline that UIS can apply?
To guide spinoff founders through the complex world of IP appropriation, and to assist them in effectively managing their intellectual property, supported by the UNL Deal Terms, the IPAG Method is proposed. The IPAG method is created and presented as a step-by-step guideline, focussing on assessing the spinoff's needs, stakeholder alignment, risk analysis, IP negotiation strategies, deal closing, and monitoring and adaptation of the IP strategy. The method does not only serve as a set of instructions, but as a strategic framework that acknowledges the relationship between IP strategies and the UIS business model. The development and validation of the IPAG Method as a comprehensive guideline for UIS founders marks a significant contribution of this research. This methodological contribution is meant to serve as a critical resource for UIS, empowering them to navigate the IP landscape with greater confidence and strategic insights.

RQ4: Does the IP appropriation guideline work for the specific Care2Report UIS case?
Things turned out different than what we expected with the case study. We expected the Care2Report/Verticai IP appropriation process to be complex and therefore a perfect example to validate the IPAG method, but in the end the TTO from Utrecht University did not claim any IP in the startup. As a consequence, no IP deal had to be signed whatsoever and no real IP negotiations took place. Because of that the IPAG method could not be validated by the Care2Report/Verticai case study, limiting the method's validity. However, we still proved the method to be valid; see the next section for more information.

Validity Threats and Limitations
The performed research, though comprehensive, encounters validity threats and limitations. The identified IP appropriation strategies based on the UNL Deal Terms are extensively analyzed. Since the UNL Deal Terms are Dutch, we also investigated express license agreements to improve the scientific backing and generalizability of the research.

It was difficult to find a way to determine IP strategy applicability. We decided to use the UNL Deal Terms mechanisms for this. Based on the mechanisms and expert interviews we came up with the diagram depicted in figure 4.4. However, since the mechanisms as well as the experts are Dutch, the mechanism applicability section of this research is not generalizable to other countries. Though, we expect this to be more or less similar across other countries.

The direct consequences of IP appropriation strategies on the UIS business model that we found, like the influence of IP value calculation, competitive advantage gained by IP and other terms and conditions, are partially based on international scientific literature, which are reliable sources, and partially based on the expert interviews, which supported the information derived from literature. Since the interviews were held with Dutch people only, the generalizability is reduced. However, the used scientific literature drastically improves the validity and generalizability of this section.

The indirect consequences on the UIS business model were mainly based on the Dutch expert interviews and partially supported by literature. Some of this literature was internationally oriented scientific literature, whereas it mostly concerned grey literature. Therefore, the indirect consequences can be seen as valid and partially generalizable, but they must be further investigated in future research.

We did our best to make the IPAG method valid and generalizable. The focus on the Dutch context, particularly within Utrecht, while providing depth, restricts the generalizability of the findings. The primary focus on Dutch university spinoffs and the development of the IPAG Method specifically for this demographic area might limit the applicability of findings to UIS in other countries, with differing IP laws and market dynamics. According to the Wieringa Design Cycle (2014), it is important to critically perform the treatment validation phase. The idea was to validate the newly developed IPAG method using the Care2Report/Verticai case study, but the case study turned out to be not very useful in this case. However, to still prove that the method is valid, we asked some of the experts to review the method. We made sure that

the method was developed using input from other experts than the experts that validated the method. We are aware of the fact that for full method validation, it is important to apply the method in a relevant context and analyse the outcomes in future research. We think that the method can safely be adopted by UIS, but the adoptability for other types of university spinoffs must also be investigated in future research.

Lastly, we must take into account stakeholder bias and/or response bias. The insights derived from interviews and case studies may reflect the subjective experiences and biases of the participants, potentially skewing the research outcomes towards more positive or negative interpretations of the IP appropriation process. The rapid evolution of technology sectors, especially IT, poses a challenge to the long-term relevance of the IPAG Method, as emerging technologies could introduce new IP challenges not accounted for in the current research. While this research acknowledges the significance of IP in protecting innovations, the evolving landscape of data privacy and cybersecurity may present unforeseen challenges to UIS, necessitating continuous adaptation of IP strategies. That is the reason why we included the monitoring and adaptation phase in the IPAG Method.

Future Work

Several future research directions can be derived from this research, in some cases suggesting an expansion beyond the initial scope. An in-depth elaboration on the IPAG Method for UIS and exploration into its applicability across different domains present promising routes. These future directions not only aim to refine the IPAG Method but also to contribute to a broader understanding of IP management's role in fostering innovation and entrepreneurship within the UIS- and other landscapes. Extending the research to encompass sectors beyond UIS would enrich the understanding of IP appropriation's universal principles and challenges, although we think that further generalizing the theory will be tough. Investigating the scenarios of mechanism applicability further could unveil nuanced strategies tailored to diverse startup contexts. Implementing and evaluating the proposed additions to the Student Entrepreneurship Encouragement Model (SEEM) in practice would provide empirical evidence of its effectiveness.

Conclusion

In conclusion, this research investigates the nuanced terrain of IP appropriation for UIS, uncovering the layered complexities of legal, experiential, and contextual factors that influence strategic decisions and the UIS business model. While offering a foundational exploration, it calls for further research to cover more of the evolving IP landscape, advocating for a balanced approach that considers the diverse needs of both universities and spinoffs. Developing comprehensive training programs for UIS founders while also investigating the integration of emerging technology aspects are identified as critical steps toward bridging the knowledge gap highlighted in this study.

Addressing the main research question revealed the complexity of providing a universal solution to IP appropriation strategies. The exploration underscored the significance of context, highlighting the diversity across startups, sectors, and situations. The importance and added value of using Express License Agreements, like the UNL Deal Terms, emerged as a focal point. The research advocates for Utrecht University's quick acceptance of the UNL Deal Terms, while at the same time acknowledging the challenges in offering universally applicable advice.

The research underlines the tailored approach required in IP strategy formulation, reflecting the unique landscape of each UIS or other kind of university spinoff. The findings highlight the importance of clear and fair IP guidelines and -strategies for the survival and success of university spinoffs. By applying the IPAG method, spinoffs founders can not only protect and commercialize their IP more effectively, but also contribute to a healthier ecosystem of innovation and entrepreneurship within and beyond academia.

Acknowledgements

I want to thank my supervisors Prof. dr. Sjaak Brinkkemper and Dr. Slinger Jansen from Utrecht University's Department of Information and Computing Sciences very much for their clear and committed guidance throughout the research project. I also want to thank my fellow students from the Care2Report Research Program for their feedback and useful input. They have helped me a lot.

References

Aberdour, M. (2007). Achieving quality in open-source software. *IEEE software, 24(1)*, 58-64.

Ahmed, R. (2017). Risk mitigation strategies in innovative projects. In *Key Issues for Management of Innovative Projects.* IntechOpen.

Alba Betancourt, A. G., Bonadio, E., & McDonagh, L. (2020). Social innovation and university intellectual property: insights from the UK and Mexico. European Intellectual Property Review, 42(5), 293-304.

Boldrin, M., & Levine, D. (2002). The case against intellectual property. American Economic Review, 92(2), 209-212.

Czechowska, L. (2013). The concept of strategic partnership as an input in the modern alliance theory.

De Coster, R., & Butler, C. (2005). Assessment of proposals for new technology ventures in the UK: characteristics of university spin-off companies. Technovation, 25(5), 535-543.

DeSimone, J. M., & Mitchell, L. (2010). Facilitating the commercialization of university innovation: The Carolina express license agreement. *Ewing Marion Kauffman Foundation Research Paper.*

Doe, J. (2022). *Tech Startups in Europe*. Dealroom.co. https://dealroom.co/guides/deep-tech-europe.

Drahos, P. (2016). A philosophy of intellectual property. Routledge.

El Assy, O., de Vendt, R., Dalpiaz, F., & Brinkkemper, S. (2022, May). A Semi-automated Method for Domain-Specific Ontology Creation from Medical Guidelines. In Enterprise, Business-Process and Information Systems Modeling: 23rd International Conference, Proceedings (pp. 295-309). Cham: Springer International Publishing.

Faber, W., Bootsma, R. E., Huibers, T., van Dulmen, S., & Brinkkemper, S. (2023). Comparative Experimentation of Accuracy Metrics in Automated Medical Reporting: The Case of Otitis Consultations. *arXiv preprint arXiv*:2311.13273.

Garousi, V., Felderer, M., & Mäntylä, M. V. (2016, June). The need for multivocal literature reviews in software engineering: complementing systematic literature reviews with grey literature. In Proceedings of the 20th international conference on evaluation and assessment in software engineering (pp. 1-6).

Geraerts, R. (2024a): My experience with Intellectual property. UCrowds internal presentation.

Geraerts, R. (2024b): A value chain from fundamental research to societal impact. UCrowds internal presentation.

Geraerts, R. (2024c): Retrospectie van een academische startup. UCrowds internal presentation.

Gübeli, M. H., & Doloreux, D. (2005). An empirical study of university spin-off development. European Journal of Innovation Management, 8(3), 269-282.

Hagelin, T. (2002). A new method to value intellectual property. *AIPLA QJ*, 30, 353.

Hambrick, D. C., & Wowak, A. J. (2021). CEO sociopolitical activism: A stakeholder alignment model. *Academy of Management Review*, 46(1), 33-59.

Hargreaves, I. (2011). Digital opportunity: A review of intellectual property and growth.

Henrekson, M., & Rosenberg, N. (2001). Designing Efficient Institutions for Science-Based Entrepreneurship: Lesson from the US and Sweden. Journal of Technology Transfer, 26, 207–231.

Jansen, S., Van De Zande, T., Brinkkemper, S., Stam, E., & Varma, V. (2015). How education, stimulation, and incubation encourage student entrepreneurship: Observations from MIT, IIIT, and Utrecht University. The International Journal of Management Education, 13(2), 170-181.

Kulkov, I., Berggren, B., Eriksson, K., Hellström, M., & Wikstrom, K. (2020). The importance of financial resources and ownership of intellectual property rights for university spin-offs: the cases of Finland and Sweden. Journal of Small Business and Enterprise Development, 27(7), 1125-1147.

Kumarapeli P, de Lusignan S. J Am Med Inform Assoc 2013;20: e67–e75.

Kwint, E., Zoet, A., Labunets, K., & Brinkkemper, S. (2023). How Different Elements of Audio Affect the Word Error Rate of Transcripts in Automated Medical Reporting. *Proceedings of BIOSTEC*, 5, 179-187.

Lockett, A., Wright, M., & Franklin, S. (2003). Technology transfer and universities' spin-out strategies. Small business economics, 20, 185-200.

Loyarte, E., Garcia-Olaizola, I., Marcos, G., Moral, M., Gurrutxaga, N., Florez-Esnal, J., & Azua, I. (2018). Model for calculating the intellectual capital of research centres. *Journal of Intellectual Capital*, 19(4), 787-813.

Maas, L., Geurtsen, M., Nouwt, F., Schouten, S., Van De Water, R., Van Dulmen, S., ... & Brinkkemper, S. (2020, January). The Care2Report System: Automated Medical Reporting as an Integrated Solution to Reduce Administrative Burden in Healthcare. In HICSS (pp. 1-10).

Mathisen, M. T., & Rasmussen, E. (2019). The development, growth, and performance of university spin-offs: A critical review. The Journal of Technology Transfer, 44(6), 1891-1938.

Mets, T., Leego, M., Talpsep, T., & Varblane, U. (2007). The role of intellectual property protection in the business strategy of university spin-off biotech companies in a small transition economy. Review of Central and East European Law, 32(1), 19-40.

Meoli, M., Paleari, S., & Vismara, S. (2013). Completing the technology transfer process: M&As of science-based IPOs. Small Business Economics,40, 227–248.

Osterwalder, A., Pigneur, Y., Oliveira, M. A. Y., & Ferreira, J. J. P. (2011). Business Model Generation: A handbook for visionaries, game changers and challengers. *African journal of business management,* 5(7), 22-30.

Overeem, M., Spoor, M., Jansen, S., & Brinkkemper, S. (2021). An empirical characterization of event sourced systems and their schema evolution—Lessons from industry. *Journal of Systems and Software*, 178, 110970.

Proykova, A. (2023). Artificial intelligence brings opportunities for the university's spin-off companies.

Reichman, J. H., & Samuelson, P. (1997). Intellectual property rights in data. Vand. L. Rev., 50, 49.

Savva, N., & Taneri, N. (2015). The role of equity, royalty, and fixed fees in technology licensing to university spin-offs. Management Science, 61(6), 1323-1343.
Shane, S. A. (2004). Academic entrepreneurship: University spinoffs and wealth creation. Edward Elgar Publishing.

Schulenburg, P. (2023, May 23rd). The importance of intellectual property in the digital age. *Pagel Schulenburg Attorneys & Notaries*. https://pagelschulenburg.co.za/the-importance-of-intellectual-property-in-the-digital-age/

Shahzad, B., & Safvi, S. A. (2008, April). Risk mitigation and management scheme based on risk priority. In *WSEAS International Conference. Proceedings. Mathematics and Computers in Science and Engineering* (No. 7). World Scientific and Engineering Academy and Society.

Silva, A., Henriques, E., & Carvalho, A. (2009). Creativity enhancement in a product development course through entrepreneurship learning and intellectual property awareness. European Journal of Engineering Education, 34(1), 63-75.

Spijkman, T., de Bondt, X., Dalpiaz, F., & Brinkkemper, S. (2023, April). Summarization of Elicitation Conversations to Locate Requirements-Relevant Information. In *International Working Conference on Requirements Engineering: Foundation for Software Quality* (pp. 122-139). Cham: Springer Nature Switzerland.

Stanfill, R. K., & Astleford, T. (2007, June). Improving entrepreneurship team performance through market feasibility analysis, early identification of technical requirements, and intellectual property support. In 2007 Annual Conference & Exposition (pp. 12-853).

Stiroh, L. J., & Rapp, R. T. (1998). Modern methods for the valuation of intellectual property. *NERA Consulting Economists.*

Teece, D. J. (2018). Business models and dynamic capabilities. Long range planning, 51(1), 40-49.

Teixeira, A. A., & Ferreira, C. (2019). Intellectual property rights and the competitiveness of academic spin-offs. Journal of Innovation & Knowledge, 4(3), 154-161.

Thompson, A. (2005). Entrepreneurship and business innovation: the art of successful business start ups and business planning. Business Feasibility study outline, 185-198.

van de Weerd, I., & Brinkkemper, S. (2009). Meta-modeling for situational analysis and design methods. In *Handbook of research on modern systems analysis and design technologies and applications* (pp. 35-54). IGI Global.

Van Riel, C. B. (2012). *The alignment factor: Leveraging the power of total stakeholder support*. Routledge.

van Zandvoort, D., Wiersema, L., Huibers, T., van Dulmen, S., & Brinkkemper, S. (2023). Enhancing Summarization Performance through Transformer-Based Prompt Engineering in Automated Medical Reporting. *arXiv preprint arXiv*:2311.13274.

Verrue, J. (2014). A critical investigation of the Osterwalder Business Model Canvas: an in-depth case study. In *Belgian Entrepreneurship Research Day*.

Wegstapel, J., den Hartog, T., Mick Sneekes, B. S., van der Scheer-Horst, E., van Dulmen, S., & Brinkkemper, S. (2023). Automated Identification of Yellow Flags and Their Signal Terms in Physiotherapeutic Consultation Transcripts. In *Proceedings of the 16th International Joint Conference on Biomedical Engineering Systems and Technologies, BIOSTEC* (Vol. 5, pp. 530-537).

Wennberg, K., Wiklund, J., & Wright, M. (2011). The effectiveness of university knowledge spillovers: Performance differences between university spinoffs and corporate spinoffs. Research Policy, 40(8), 1128-1143.

Wieringa, R. J. (2014). Design science methodology for information systems and software engineering. Springer.

Wohlin, C. (2014). Guidelines for snowballing in systematic literature studies and a replication in software engineering. *Proceedings of the 18th international conference on evaluation and assessment in software engineering*. 2014.

Zijlstra, B., Sjoerts, J., Bos, A., & Kolkman, R. (2023). Spin-off deal term principles. *UNL working group Dealterms*.

Grey Literature

How to spin your scientific research out of a university and into a startup | Y Combinator. (2023). Y Combinator. https://www.ycombinator.com/blog/how-to-spin-your-scientific-research-out-of-a-university-and-into-a-startup

Spin-off deal term principles: For scientific founders who are committed to working full-time for their spin-off. (2023, February). Universiteiten van Nederland. Accessed on November 1, 2023, from https://universiteitenvannederland.nl/files/documenten/Dealterm%20Principles%20UNL.pdf

Reem, Y. (2023a, mei 9). *Yair Reem on LinkedIn: #Climatetech #Venturecapital #fundraising #Captable | 171 comments*. https://www.linkedin.com/posts/yairreem_climatetech-venturecapital-fundraising-activity-7061591371698073600-7vNH/?utm_source=share&utm_medium=member_ios

Reem, Y. (2023b, 17 mei). *Yair Reem on LinkedIn: #Climatetech #startups #Venturecapital #fundraising #captable | 115 comments*. https://www.linkedin.com/posts/yairreem_climatetech-startups-venturecapital-activity-7064490722120359936-SqPz/?utm_source=share&utm_medium=member_ios

Reem, Y. (2023c, juni 19). Negotiating technology transfer agreements like a pro. *Medium*. https://medium.com/extantia-capital/negotiating-technology-transfer-agreements-like-a-pro-62f4f20c4cf9

Reem, Y. (2023d, december 4). The five biggest cap table mistakes and ways to avoid and fix them. *Medium*. https://medium.com/extantia-capital/the-five-biggest-cap-table-mistakes-and-ways-to-avoid-and-fix-them-c7a678a7f8d7

Appendix

Ethics and Privacy Quick Scan

Response Summary:

Section 1. Research projects involving human participants

P1. Does your project involve human participants? This includes for example use of observation, (online) surveys, interviews, tests, focus groups, and workshops where human participants provide information or data to inform the research. If you are only using existing data sets or publicly available data (e.g. from Twitter, Reddit) without directly recruiting participants, please answer no.

- Yes

Recruitment

P2. Does your project involve participants younger than 18 years of age?

- No

P3. Does your project involve participants with learning or communication difficulties of a severity that may impact their ability to provide informed consent?

- No

P4. Is your project likely to involve participants engaging in illegal activities?

- No

P5. Does your project involve patients?

- No

P6. Does your project involve participants belonging to a vulnerable group, other than those listed above?

- No

P8. Does your project involve participants with whom you have, or are likely to have, a working or professional relationship: for instance, staff or students of the university, professional colleagues, or clients?

- Yes

P9. Is it made clear to potential participants that not participating will in no way impact them (e.g. it will not directly impact their grade in a class)?

- Yes

Informed consent

PC1. Do you have set procedures that you will use for obtaining informed consent from all participants, including (where appropriate) parental consent for children or consent from legally authorized representatives? (See suggestions for information sheets and consent forms on the website.)

- Yes

PC2. Will you tell participants that their participation is voluntary?

- Yes

PC3. Will you obtain explicit consent for participation?

- Yes

PC4. Will you obtain explicit consent for any sensor readings, eye tracking, photos, audio, and/or video recordings?

- Not applicable

PC5. Will you tell participants that they may withdraw from the research at any time and for any reason?

- Yes

PC6. Will you give potential participants time to consider participation?

- Yes

PC7. Will you provide participants with an opportunity to ask questions about the research before consenting to take part (e.g. by providing your contact details)?

- Yes

PC8. Does your project involve concealment or deliberate misleading of participants?

- No

Section 2. Data protection, handling, and storage

The General Data Protection Regulation imposes several obligations for the use of **personal data** (defined as any information relating to an identified or identifiable living person) or including the use of personal data in research.

D1. Are you gathering or using personal data (defined as any information relating to an identified or identifiable living person)?

- No

Section 3. Research that may cause harm

Research may cause harm to participants, researchers, the university, or society. This includes when technology has dual-use, and you investigate an innocent use, but your results could be used by others in a harmful way. If you are unsure regarding possible harm to the university or society, please discuss your concerns with the Research Support Office.

H1. Does your project give rise to a realistic risk to the national security of any country?

- No

H2. Does your project give rise to a realistic risk of aiding human rights abuses in any country?

- No

H3. Does your project (and its data) give rise to a realistic risk of damaging the University's reputation? (E.g., bad press coverage, public protest.)

- No

H4. Does your project (and in particular its data) give rise to an increased risk of attack (cyber- or otherwise) against the University? (E.g., from pressure groups.)

- No

H5. Is the data likely to contain material that is indecent, offensive, defamatory, threatening, discriminatory, or extremist?

- No

H6. Does your project give rise to a realistic risk of harm to the researchers?

- No

H7. Is there a realistic risk of any participant experiencing physical or psychological harm or discomfort?

- No

H8. Is there a realistic risk of any participant experiencing a detriment to their interests as a result of participation?

- No

H9. Is there a realistic risk of other types of negative externalities?

- No

Section 4. Conflicts of interest

C1. Is there any potential conflict of interest (e.g. between research funder and researchers or participants and researchers) that may potentially affect the research outcome or the dissemination of research findings?

- No

C2. Is there a direct hierarchical relationship between researchers and participants?

- No

Section 5. Your information.

This last section collects data about you and your project so that we can register that you completed the Ethics and Privacy Quick Scan, sent you (and your supervisor/course coordinator) a summary of what you filled out, and follow up where a fuller ethics review and/or privacy assessment is needed. For details of our legal basis for using personal data and the rights you have over your data please see the University's privacy information. Please see the guidance on the ICS Ethics and Privacy website on what happens on submission.

Z0. Which is your main department?

- Information and Computing Science

Z1. Your full name:

Joep Wegstapel

Z2. Your email address:

j.w.g.wegstapel@students.uu.nl

Z3. In what context will you conduct this research?

- As a student for my master thesis, supervised by::
  Sjaak Brinkkemper

Z5. Master programme for which you are doing the thesis

- Business Informatics

Z6. Email of the course coordinator or supervisor (so that we can inform them that you filled this out and provide them with a summary):

S.Brinkkemper@uu.nl

Z7. Email of the moderator (as provided by the coordinator of your thesis project):
G.Wagenaar@uu.nl

Z8. Title of the research project/study for which you filled out this Quick Scan:
Business Model Feasibility Effects by Intellectual Property Rights: the case of Care2Report

Z9. Summary of what you intend to investigate and how you will investigate this (200 words max):
The aim of this research project is to investigate the feasibility of successfully bringing the Care2Report project (Automated Medical Reporting (AMR)) to the market.
I will more deeply investigate the
- Consequences of Intellectual Property (IP) on knowledge-based startups powered by a university.
- Consequences of receiving subsidies, investments, and seed money from a governmental agency or venture capital fund (do they want shares, and if so, how many?).
This will be done by doing literature research and performing expert interviews.

Z10. In case you encountered warnings in the survey, does supervisor already have ethical approval for a research line that fully covers your project?
- Not applicable

Scoring

- Privacy: 0
- Ethics: 0

IPAG Method Activity and Concept Tables

Activity table

Activity	Sub-Activity	Description
UIS needs assessment	Identify UIS objectives	In this activity the UIS OBJECTIVES are identified and listed.
	Identify UIS needs	Here the UIS NEEDS are identified and listed.
Stakeholder alignment	Identify stakeholders	In this activity the different stakeholders, internal as well as external, are identified and listed. Internal stakeholders include everyone working at the UIS on a managerial level, like founders and other managers, whereas external stakeholders include advisors and potential investors.
	Align internal stakeholders UIS	Here the internal stakeholders from the STAKEHOLDER LIST are aligned with each other.
	Align external stakeholders UIS	Here the external stakeholders from the STAKEHOLDER LIST are aligned with each other.
	Align int. & ext. UIS Stakeholders	After aligning the internal and external stakeholders separately, the two groups are aligned. Stakeholders are aligned when they all agree on the UIS OBJECTIVES and their corresponding UIS NEEDS.
Risk analysis	Identify IP risks	When enough stakeholders have been aligned, IP RISKs are identified and listed here.
	Evaluate risks	The identified risks are evaluated, leading to a certain EVALUATION.
	Analyze impact	The potential IMPACT of each risk is analyzed, leading to a certain IMPACT.
	Prioritize risks	Based on the EVALUATION and IMPACT, a risks PRIORITY is determined here, based on which risks are ranked.
	Risk mitigation planning	Potential solutions to mitigate risks from the IP RISK LIST effectively are discussed and documented.
	Decide whether to hire IP expert/lawyer	Here the decision is made whether or not to hire an IP expert or lawyer.
IP Negotiation	Check IP mechanism applicability	When a deal needs to be made, it is checked what IP mechanisms described in chapter 4.3 are applicable to the specific UIS case.
	Check acceptable mechanism values	For all the applicable mechanisms, the acceptable values are checked and noted.
	Identify IP negotiation strategies	Here the IP NEGOTIATION STRATEGIES are identified.
	Start negotiating IP terms	Now it is time to start negotiating IP terms with the Technology Transfer Office (TTO), using the IP NEGOTIATION STRATEGIES.
IP Deal closing	Write IP deal proposal	Based on the negotiations with the TTO, an IP DEAL PROPOSAL is written here.
	Check acceptance for both parties	In this activity, the acceptance of the IP DEAL PROPOSAL is checked for both parties.

Activity	Sub-Activity	Description
	Sign IP deal document	When both parties accept the deal, the IP deal document is signed here, leading to the SIGNED IP DEAL DOCUMENT.
Monitoring and adaptation	Create IP overview	Here an IP OVERVIEW is created so it can be monitored and eventually adapted.
	Identify changes in IP overview	The IP OVERVIEW is checked regularly and here potential changes in this overview are identified, leading to IP CHANGES.
	Assess IP changes	Here the IP CHANGES are assessed.
	Keep documentation up-to-date	This is a repetitive activity; it is automatically repeated all the time so that the documentation is always kept up-to-date.
	Adapt UIS objectives	In case no additional risk analysis is needed, UIS OBJECTIVES are adapted here.

Concept table

Concept	Description
UIS OBJECTIVES	The UIS OBJECTIVES are the objectives that have to be met according to the UIS founders. They generally come down to 3P's: People Plan and Profit.
UIS NEEDS	The UIS NEEDS are based on the UIS OBJECTIVES. These needs generally have something to do with either staff, knowledge, equipment or funding.
STAKEHOLDER LIST	This concerns a list of all the identified internal and external stakeholders of the UIS.
ALIGNMENT PROBLEMS	Stakeholders might have some ALIGNMENT PROBLEMS, which are listed here. These problems concern the reasons why certain stakeholders from the STAKEHOLDER LIST do not agree on (a) specific topic(s) (Van Riel, 2012; Hambrick & Wowak, 2021).
IP RISK	An IP RISK is an IP related risk that a UIS might face. An example is the risk that an IPR protected part or core of the solution or business can be circumvented or recreated. It also concerns the extent to which a part or core of the solution or business IPR can be protected (UNL, Zijlstra, 2023).
EVALUATION	This concerns the EVALUATION of an IP risk.
IMPACT	This concerns the potential IMPACT an IP risk might have on the UIS business model. See chapter 5 for more information on this topic.
PRIORITY	The risk PRIORITY is determined based on the EVALUATION and IMPACT. Each IP RISK has a certain PRIORITY bases on which the risks are ranked in the IP RISK LIST.
IP RISK LIST	This is a list op all IP RISKs, ranked based on risk PRIORITY.
SCENARIOS	Here the possible SCENARIOS for IP negotiation are listed. The SCENARIOS generally concern either an equity deal, royalty deal or milestone payments. Exclusivity is also included here. These SCENARIOS are mainly based on express license agreements and the UNL Deal Terms (DeSimone & Mitchell, 2010; Savva & Taneri, 2015; Y Combinator, 2023; UNL, Zijlstra, 2023).
IP NEGOTIATION STRATEGIES	Based on the potential SCENARIOS, the available IP NEGOTIATION STRATEGIES are listed here. This concerns different ways to respond to the potential SCENARIOS and claims made by the University's TTO.

Concept	Description
DOCUMENTATION	The whole process of IP appropriation is documented well in this DOCUMENTATION concept.
IP DEAL PROPOSAL	This concept concerns a proposed IP deal. When both parties agree on this IP DEAL PROPOSAL, it becomes a SIGNED IP DEAL DOCUMENT.
SIGNED IP DEAL DOCUMENT	After acceptation by both parties, an IP DEAL PROPOSAL becomes a SIGNED IP DEAL DOCUMENT. This document outlines the deal that has been made, including the decisions that have been made concerning the equity division, potential royalty or milestone payments, and what has been decided in terms of exclusivity. All IP mechanisms from chapter 4.3 and their values must be listed in this document.
IP OVERVIEW	This concept concerns an overview of how the spinoff and its products are protected in terms of IPR. The overview contains all the company's patents, copyrights, design registrations, trademarks and trade secret law.
IP CHANGES	Potential IP CHANGES are listed here, and these changes are included in the IP OVERVIEW.