Immaterial property rights, protection and technology transfer in academic research

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**Abstract:**

The nature of academic research poses different implications for the protection of inventions than an industrial setting. Researchers operate in a collaborative environment where the exchange of ideas and dissemination of research findings through publications is a norm. The technology transfer offices (TTOs) of universities, in turn, try to serve the third mission of universities by transferring the university findings to companies to create a societal impact.

The aim of the thesis was to investigate the nature of academic research, the implications it sets for IP protection and commercialisation of research findings. The most relevant forms of IP in academic research include copyrights with regard to publications and patents with regard to inventions. Universities commercialise research finding to which they own the rights to by licensing or selling the IP or forming spinout companies.

The most common IP related problems in academic research include lack of IP know-how, which may lead to unintentional disclosures of confidential information, and the consequent loss of trade secrets, premature disclosures, which may destroy the novelty of an invention, authorship disputes concerning publications and inventorship disputes related to patents.

**Keywords:** academic research, immaterial property rights, university born inventions, technology transfer, commercialisation
CONTENTS

1 INTRODUCTION........................................................................................................1
  1.1 Purpose of the Study .......................................................................................... 1
  1.2 Research Methods ............................................................................................ 2

2 NATURE OF ACADEMIC RESEARCH................................................................. 4
  2.1 University Missions and Funding ...................................................................... 4
  2.2 Academic Research .......................................................................................... 4
  2.3 Scientific Publishing ......................................................................................... 6
  2.4 Research Funding .............................................................................................. 7
  2.5 Collaboration with other Universities and Research Organisations ............... 9
  2.6 Company Collaboration ................................................................................... 9
  2.7 Networking ....................................................................................................... 10

3 IMMATERIAL PROPERTY RIGHTS IN ACADEMIC RESEARCH............. 11
  3.1 Introduction to University IP .......................................................................... 11
    3.1.1. Research Ideas ......................................................................................... 12
    3.1.2. Trade Secrets .......................................................................................... 13
    3.1.3. Copyright ................................................................................................ 15
    3.1.4. Patents ..................................................................................................... 16
  3.2 Ownership of IP ............................................................................................... 18
  3.3 IPR Strategies .................................................................................................. 21
    3.3.1. Invention Disclosures............................................................................... 23
    3.3.2. Finnish Patent Applications ..................................................................... 25
          Applications and Patents .................................................................................. 28
  3.4 World’s Most Innovative Universities .............................................................. 30

4 RESEARCH INTEGRITY ...................................................................................... 32
  4.1 Guidelines for Research Integrity and Responsible Conduct of Research .... 32
  4.2 Research Misconduct ...................................................................................... 32
    4.2.1. Investigation of Research Misconduct in Finland .................................. 34
    4.2.2. TENK’s RCR violation cases related to misappropriation ...................... 35

5 IPR RELATED PROBLEMS AND DISPUTES IN ACADEMIA............... 38
  5.1 Publishing vs. Patenting ................................................................................... 38
  5.2 Authorship, Inventorship and Ownership ...................................................... 39
1 INTRODUCTION

Protecting university born inventions is more challenging than the protection of inventions in the industry, due of the nature of academic research. Researchers have a constant pressure to publish their results before the competing research groups publish their results and because their graduation or funding is dependent on the publications. On the same time research funding cuts have been made and researchers and more and more dependent on external funding sources. The universities main tasks include teaching and disseminating information, however, universities also aim to make a societal impact. The third mission is often achieved through knowledge transfer, which ensures that academic research findings are made available to the society, often by commercial means. In addition to publication pressures, which create a limited window of opportunity to protect potential inventions, the nature of academic research, which is often collaborative, poses risks of premature or unintentional disclosures of confidential information, which may prevent patenting.

This thesis provides an overview into the nature of academic research, the protection and commercialisation of university born inventions, the immaterial property rights relevant to scientific publishing and knowledge transfer actions, the research integrity related matters and their relation to immaterial properties in university setting as well as other IP disputes that concern academic research. The thesis contains a literature review consisting of scientific articles, news articles as well as legal doctrines, and an empirical part, which provides more information on the current situation in Finland.

1.1 Purpose of the Study

This study aims to gain an understanding on how universities innovate, protect, manage and commercialise research their finding, and how they balance the sometimes conflicting interests of different parties involved in the creation and management of university born inventions.

This study aims to address the following research questions:

1) What is the nature of academic research, and what kind of implications it sets for IP protection and commercialisation of research findings?
2) Which forms of IP are the most relevant for in academic research, who owns them and how do universities manage technology transfer and commercialisation?
1.2 Research Methods

The study was conducted utilising three different research methods, doctrinal legal research, comparative research and qualitative empirical research. This chapter provides a brief introduction of each of these research methods and describes how the methods were used to address the issues defined in the research questions.

**Doctrinal legal research** is the most commonly used research method in law studies (Ali et al., 2017). Doctrinal research aims to describe and understand the existing law systematically, provide practical solutions for decision makers and justify the existing law, and thus it provides a good basis for legal research (Smits, 2015). The doctrinal process follows several steps including gathering relevant facts, identifying the legal issues in question, analysis of those issues, studying relevant background material including textbooks, policy papers, journal articles, locating the primary materials such as legislation and case law, analyzing the issues in the right context and drawing conclusions (Hutchinson and Duncan, 2012). Doctrinal research provides detailed information (Smits, 2015) and a good basis for legal research (Ali et al., 2017). However, since doctrinal research might not be sufficient enough in the current research environment (Hutchinson and Duncan, 2012) it does not take the social, economics and political aspects into consideration (Ali et al., 2017), and because it may portray a bias of the researcher (Knushal and Aynalem, 2009), other complementary research methods are often used in combination with the doctrinal method.

**Comparative legal research** involves comparing at least one legal system to another with regard to a specific topic. It aims to gain a better understanding of the domestic and foreign legislation by looking into the historical, philosophical and social issues related to law, and thus and provides an excellent tool to examine the differences between IP legislation in different countries. Due to globalization and technological advancements, researchers can easily access legal information such as legal databases, thus making comparative legal research easier (Calboli, 2013). Comparative research provides a tool for harmonisation (Van Hoecke, 2015), and it may be used to promote a legislative change based on foreign law (Calboli, 2013). However, the analysis may be challenging due to multiple aspects including cultural differences and their impact on law, and lack of knowledge of the social context may distort the view on the foreign legislation (Van
Hoecke, 2015). Furthermore, different national interests may also make the analysis more challenging (Calboli, 2013).

**Empirical research** is a complementary research method, which is often a combination of a legal part (doctrinal research) and an empirical part. The empirical part focuses on the analysis of the law in practice though real-life data such as interviews and observations. (Argyrou, 2017). Empirical research can be quantitative or qualitative in nature (Bell, 2016), and it is used to find out whether the law serves the needs of a society, how the society has influence the re-shaping of the law and are the law enforced properly (Knushal and Aynalem, 2009). Empirical data can be collected in many ways including structured or unstructured interviews and questionnaires conducted wither face-to-face or through other means such as email, as well data collection from literature (Knushal and Aynalem, 2009). Case study qualitative research gives insights to legal phenomenon in their real-life situations and involves interviews and constant engagement with the individuals involved. It is more demanding and time consuming than doctrinal research, but provides a wider perspective by taking the context and the social aspects into consideration. (Argyrou, 2017). Empirical research provides a broad and in-depth view on the issues and it may reveal underlying political and social dynamics (Argyrou, 2017). Furthermore, it may be used to reveal weaknesses of the current legislation to determine whether the current law requires changing (Knushal and Aynalem, 2009; Cane and Kritzer, 2010). However, empirical research is difficult to replicate and it cannot be used to generalise (Argyrou, 2017). Furthermore, and the prejudices of the researcher may affect the research outcomes (Knushal and Aynalem, 2009).

In this work, the overview of academic research and related IP considerations will be conducted by evaluating the policies of Finnish universities relating to innovation, protection of IP, commercialisation, funding as well as collaboration as well as looking into reports and scientific articles concerning innovation, protection and knowledge transfer of universities. Information related to IP and research integrity will be searched from guidelines and websites of provided by related organisations. Legal documents will be explored to build an understanding of the differences between different legal systems, mainly between Finland, Europe and the US and news articles will provide updates for IP disputes. Finally, an empirical study in the form of an online survey will provide some insight into the perceptions of researchers working in Finnish universities on idea theft (misappropriation) and its links to immaterial property.
2 NATURE OF ACADEMIC RESEARCH

2.1 University Missions and Funding

The mission of Finnish universities include promoting academic research, providing research-based higher education and promoting the social impact of university research findings (Universities Act 558/2009). The research results arising from university research include scientific publications as well as dissertations and theses, which have beneficial implications on welfare, standard of living and competitiveness (Opetus- ja kulttuuriministeriö, 2015). Furthermore, identifying commercial opportunities and advancing them through commercialisation aims to fulfil the third mission (Kangaspeska, 2015).

Finland’s Parliament decides the amount of basic funding, which is allocated to Universities by the Ministry of Education and Culture. In addition to this basic funding, universities also receive external funding from sources such as the Academy of Finland, Business Finland, foundations, companies and the European Union. The basic funding is allocated to universities based on performance indicators, which are stated in the financing models. The financing model currently consists of three building blocks: education (39 %), research (33 %) and other education and science policy consideration (28 %). Performance indications include the number of master’s (13 %), bachelor’s (6 %) and PhD degrees (9 %) as well as scientific publications (13 %) among others. (Ministry of Education and Culture, 2019a). However, the current financing models do not take into account to technology transfer actions such as the number of licenses, patents or spin off companies arising from the research results, which also contribute to the promotion of the “third mission” of the universities (Opetus- ja kulttuuriministeriö, 2015), and which often form a part of international social impact measurements (Lyytinen et al., 2015).

2.2 Academic Research

Academic research is more likely to result in radical innovations than research conducted by companies, because the research is not limited by existing solutions that have been heavily invested in, and, which need to be protected. Furthermore, academic research is not guided by customer needs like company research. However, the abovementioned reasons also explain why academic research does not always provide ready solutions for
markets. One example of this is drug development, which often begins when university researchers discover a promising drug molecule. However, it often takes up to 15-20 years before the drug molecule can be developed into a commercial drug by a multinational pharmaceutical company. (ETLA, 2018).

Each university has their own focus areas in research. Lappeenranta-Lahti University of Technology, for example, focus on solutions for climate change, green power sources, recycling and access for clean water and energy (LUT, 2019). The nature of research at Finnish universities varies greatly between different fields of science. For example, in agriculture and forestry research and research in technical fields are often multidisciplinary, while fundamental research in the fields such as physics and astronomy is often mono-disciplinary by nature. (Opetus- ja kulttuuriministeriö, 2016). Multidisciplinary research may foster the creation of greater scientific insights or outcomes as the research problems and findings can be investigated and evaluated from multiple different perspectives. However, multidisciplinary may also be the cause of scientific disputes if the stakeholders have different interests or research practices. (Cuevas et al., 2012).

Academic research is conducted at several levels. The first level is obtaining a doctoral degree, also known as a PhD. A doctoral degree consists of 30-60 credits of studies (the number of required credits varies between universities) and a dissertation that can be a monograph or more commonly an article-based doctoral dissertation, which consists of 3 to 5 articles published in peer-reviewed journals and a logical summary of those articles. After completing the doctoral dissertation, the students defend it in a public examination. (University of Helsinki, 2018; Tampere University, 2019). The researchers who have successfully completed their PhD are often called as post-doctoral researchers, or Postdocs. Postdocs often conduct their own research and participate in training and supervision of PhD students. Usually after a few years the postdocs gradually become senior researchers and take more responsibility in research planning and teaching the university students and doctoral candidates. Some senior researchers become professors or associate professors, which is the highest rank of the research staff. Universities may also have several other titles for researchers such as research assistant, which is often used for Master’s levels student conducting research, for example, in a collaborative project. In addition to manuscript writing, researchers often present their research results at internal department seminars and national and international conferences and other networking or partnering conferences.
2.3 Scientific Publishing

Publishing is the fastest way to disseminate information in a scientific manner and therefore researchers are obliged to publish their research results. Researchers are often encouraged publish the results in a scientific journal with a high impact factor as the quality of the journal affects university funding (Seuri and Vartiainen, 2018). More information about the classification of publications and publication points (so called JUFO points) can be found from the Publication Forum website (Publication Forum, 2016). The publication process in high-ranking journals involves a peer-review process during which the editor and two or more peer reviewers, who are often scientists familiar with the subject matter, evaluate the suitability of the content with regard to the scope of the journal, novelty and contributions to science. The researchers are often asked to provide a list of potential reviewers, or provide objections, but the ultimate selection is made by the editor. The reviewers provide constructive comments to the author(s) and may ask for revisions. They are expected to provide impartial and honest feedback and they should not mislead the editor or intentionally delay the publication or harm a competitor's reputation. (Raento, 2018). It is not uncommon that the review process can take several rounds to complete or that the authors are rejected and advised to submit to another journal if the subject matter does not match with the scope of the journal or if the science is not novel or up to the standards of the journal.

The most common type of a peer review in natural sciences, technology, medicine and engineering is single-blind review, in which the reviewer will know whose manuscript they are reviewing, but the reviewer’s identity remains unknown to the author. A double-blind review, in which both parties remain anonymous, is used more in the arts and social sciences. Peer review is supposed to improve the scientific quality of the publications, but the non-transparency of the review process provides an opportunity for misconduct as the scientists reviewing the manuscripts gain access to unpublished work and thus may use this confidential information to their advantage and they may intentionally slow down the publishing process. One solution to this would be open peer review, which would lead to more constructing reviews, provide acknowledgement for the reviewers and which would reduce biases. (Jytilä and Laakso, 2019).

The publishers receive the articles from the researchers for free, and the reviewers also perform their part free of charge, while universities spend large sums of money to give their researchers access to research papers including their own articles. For example, the California State University has been paying a yearly fee of $11 million to access Elsevier
journals, which accounts for approximately 25% of all scientific publications, however, they have recently stated that they will no longer renew the subscriptions. Universities in the Europe have increasingly began to favor open access publishing, which commonly means that the publication if freely available immediately after publication or after a limited time, such as one year. However, the publishers usually charge for open access publishing to cover the publication fees. (The Guardian, 2019)

The high subscription costs of journals and the resulting cuts made by universities in the subscriptions may have contributed to the birth of an illegal web services like Sci-Hub, which was created by a Khazak graduate student in 2012. Sci-Hub is perhaps the most known pirate website through which a free collection of scientific publication can be found. (The Guardian, 2019). It has been estimated that 85.1% of paywalled articles can be found from Sci-Hub (Himmerstein et al., 2018) and that the website grants access to approximately 62 million publications (Greshake, 2017). Sci-Hub retrieves and distributes scientific publications by bypassing paywalls and therefore the use of Sci-Hub may be considered as copyright infringement in many jurisdictions (Himmelstein et al., 2018). It is also presumed that the researchers themselves are providing copies of their works to the website (The Guardian, 2019). Another pirate website offering access to illegally obtained scientific publications is called the Library of Genesis (LibGen). Elsevier, a Dutch publishing giant, won a default legal judgement against Sci-Hub and LibGen in 2017 and was awarded $15 million in damaged for copyright infringement by New York district court. However, it is unlikely that Elsevier will be able to recover the damages or to shut down the illegal websites, since at least Sci-Hub is operated from Russia. (Schiermeier, 2017).

2.4 Research Funding

Research can be funded through employment at the university or through scholarships and grants (Tampere University, 2019). It is not uncommon that funding is secured only for a limited time and does not cover the whole 4 years, which is often the length of a PhD. Therefore, PhD students and other university researchers often also participate in grant application writing to secure more funding for their research. Funding can be sought from various foundations, which often specifically support certain fields of research. For example, the Jenny and Antti Wihuri Foundation supports projects widely in the fields of research, art and societal activities, the Runar Bäckström foundation grant money for commercialization of inventions and the Magnus Ehrnrooth foundation
supports research in the fields including physics, chemistry and astronomy. A comprehensive list of Finnish foundations and non-profit organizations, which grant research funding can be found from the Aurora funding database. Such foundations and non-profit organizations grant funding in many forms such as an incentive grant, travel grant, research grants, article writing grant and personal grants and postdoctoral grants, which may provide funding for, for example, 6 to 12 months. Grants from Finnish foundations often do not set conditions for IP and commercialization, though they might set timelines for publications.

Funding can also be obtained from sources, which may set tighter rules on research and, which therefore classify as contract research. Funding can be sought as an individual, or for a research project, in which case the funding may provide salaries for several researchers. For example, the Academy of Finland provides funding for postdoctoral researchers, research fellows and professors. The European Research Council (ERC) provides many different kinds of funding possibilities for researchers at different phases of their career as well as proof of concept for bringing their research towards commercialization. Business Finland (former Tekes) is also a major funder for university research. Business Finland grants research organizations sizeable TUTLI (Tutkimuksesta Uutta Liiketoimintaa) grants to advance research ideas towards commercialization and also offer co-innovation and co-creation funding, which encourages cooperation between research organizations and companies. Furthermore, more funders encourage researcher mobility and may even require the researcher to perform at least part of their research in another university (Malkki et al., 2019).

The competition for research grants is hard, especially as research funding has been cut in recent years. Typically the grant applications include a research plan, curriculum vitae, publication list, budget proposal and referrals from other researchers, most often from the supervisor. Grant applications are often evaluated by a panel of experts who base their evaluation according to a specific criteria set by the foundation or funding organization. The identity of the reviewer nor the evaluation of individual applications is not revealed to the public. (Suvikumpu, 2017). The reviewers are often professors working in a relevant field, but foundations also may use outside experts in evaluation of the applications. The reviewer cannot make decision for applications if there is a conflict of interest, for example, if the reviewer’s research group would benefit from the grant. Furthermore, the grant application are handled with confidentiality and thus the
reviewers are prohibited from disclosing confidential information to outsiders during or after evaluation. (Alfred Kordelinin säätiö, 2019)

2.5 Collaboration with other Universities and Research Organisations

Researchers often collaborate with researchers from different research groups and universities to leverage from the expertise from other research fields and resources. For example, the Ioncell project, in which used cotton textiles, wood pulp or newspaper are transformed into textile fibres is a collaboration between the University of Helsinki and Aalto University. The process utilizes ionic liquid, invented at the University of Helsinki, which dissolves cellulose, which the researchers at Aalto University transforms into strong fibres, from which yarn in produced. (Drahl, 2017; Ioncell, 2019) Research collaboration may also be international in nature. For example, researchers from the University of Turku and Harvard University have recently discovered a drug molecule, which may benefits patients suffering from a rare hereditary form of atrial fibrillation (Lehtinen, 2019).

Universities also often collaborate with other research organizations. For example, The Finnish Institute for Health and Welfare (THL) collaborates with almost all of the Finnish universities by allowing the utilization of data collected in the fields of medicine and public health. Another example of this kind of a collaboration is the Institute for Molecular Medicine Finland, which is joint research institute between the Technical Research Center of Finland (VTT), the Finnish Institute for Health and Welfare, the Helsinki University Hospital (HUS) and the University of Helsinki. (Pelkonen and Nieminen, 2015).

2.6 Company Collaboration

Universities also often collaborate with companies which provide valuable funding for research, offer universities networking possibilities and a great platform for piloting their innovations at an industrial scale. Companies, which collaborate with universities are often more innovative than the ones that do not. Most innovations born in university-company collaboration are related to products and processes, and companies who collaborate with universities often also improve their organizational activities and marketing efforts. (Moilanen, 2019).
Finnish universities collaborate actively with companies by providing thesis and research topics, trainee or summer job opportunities and by providing expertise, for example, in the form of guest lectures and excursions. For example, Tampere University of Technology estimated that they collaborate with approximately 1,000 companies each year (Vastamäki, 2018). The collaboration often results in innovations at the university side, which are then developed into products by the company. The companies are eager to gain access to the latest technological advancements and innovation skills of university researchers (Vastamäki, 2018). However, company collaboration is more likely to lead into incremental enhancements than innovations, and they are not always protected with immaterial property rights. Overall, collaboration between universities and companies has positive implications for the employment of the researchers and social impact of research. (Moilanen, 2019).

In the past, companies have often entered into one-off projects with universities, but nowadays long-term collaboration have become more and more common (Lutchen, 2018). Long-term relationships foster trust building, adaptation to the partner’s processes and in the long run enable achieving consensus on the utilization of the research results (Kunttu and Neuvo, 2019). One example of this is a 10-year cooperation agreement worth approximately 20 million euros between Aalto University and Saab Ab which is expected to bring new solutions in the sensor technology field (Aalto University, 2017a). However, during recent years the collaboration between universities and companies in Finland has decreased due to cuts in innovation funding due to parliament initiated funding cuts (Eronen, 2019). Between 2006 and 2016 company collaboration has been estimated to have decreased 13 % (Moilanen, 2019).

### 2.7 Networking

Universities are also often part of different networks which promote cooperation, multidisciplinary research and innovations. Such networks often organize seminars and other activities such as summer school, promote the academic career of researchers by providing networking possibilities and may even aid in commercialization of research results. Finnish universities often have long lists of networking partners. For example, University of Oulu’s networks include Oulu Innovation Alliance (OIA), EIT Raw Materials consortium initiated by the European Institute of Innovation and Technology (EIT) and CLIC Innovation cluster. (University of Oulu, 2019a).
3 IMMATERIAL PROPERTY RIGHTS IN ACADEMIC RESEARCH

3.1 Introduction to University IP

The main types of immaterial property (IP) in academic research are trade secrets, copyright and patents. In an academic setting trade secrets often relate to know-how, confidential information, which has not been made public yet or which cannot be protected with patents. However, trade secrets have limited use in academia in the long term compared to businesses, because researchers have an obligation to publish their research results. Copyright protects the material, such as presentations, posters, scientific articles, software algorithm and theses, created by university staff and researchers, while patents are used to protect inventions arising from research findings. Universities also utilize trademarks and domain names as part of their brand and communication and some universities, such as Aalto University, also seek protection for designs (Aalto University, 2017b).

It is important that the researchers have sufficient understanding of IP and their significance, because accidental disclosures may prevent commercial utilization of valuable research resulting in the loss of the societal impact as well (Aalto University, 2017b). Researchers may, for example, publish research result in a conference abstract and thus destroy the novelty aspect or they may accidentally reveal trade secrets, and thus cause economic losses to the university or a company that has sponsored a project. In addition to economic losses, the negligent disclosure of trade secrets may expose the researcher to civil and criminal liability and accusations of misappropriation (Aalto University, 2017b).

Universities technology transfer offices (TTOs), often called as the innovation services, offer guidance for researchers in IP related matters. Furthermore, university employment contracts often include clauses related to confidentiality and ownership of IP. For example, Aalto University’s employment contracts also function as a non-disclosure agreement (NDA) and the employees agree to transfer the ownership of IP generated in project with external funding sources to Aalto University by agreeing to the Annex 1 of the contract (Aalto University, 2017b). Universities keep their staff updated on IP related matters by providing IP and commercialization guidelines, as well as courses and seminars. For example, University of Oulu arranges course related to IP rights and research and utilization of patent databases (University of Oulu, 2019b).
Furthermore, the IPR University Center aims to promote the know-how related to IPRs by creating courses for universities and by arranging several IP related events, such as summer schools, seminars and hosts IP related conferences, which can be attended by university researchers (IPRUC, 2019).

### 3.1.1. Research Ideas

Research ideas are often inspired by gaps in science and they usually consist of topics for research, which have not been put into practice yet. Research ideas may be born in the mind of a single researcher while conducting literature research in the office or experiments in the lab or it may be the result of a brainstorming session in a group meeting or an enlightening discussion with a fellow researcher during a conference or networking event. The ownership of research ideas may cause some issues among researchers as the generation of ideas is not always a simple process and researchers might disagree, for example, whether they came up with the research idea on their own or whether other researchers also contributed to the process. Furthermore, it is possible that other research groups working on similar research areas might have independently identified a similar research gap and produced similar solutions to it.

As discussed before, academic researchers often engage with other researchers in different settings, such as coffee breaks, group meetings, joint projects, national and international seminars and conferences, and discuss their research topics and findings. Furthermore, researchers submit abstracts to conferences, grant applications to different organizations and foundations and submit manuscripts for review, and thus disclose unpublished and confidential information to other researchers, who might be working on a similar field or be considered even as competitors. This kind of a collaborative exchange of ideas is built on trust and acknowledging and crediting other researcher’s contribution. However, the nature of scientific research creates incentives to cheat as researchers try to establish a reputation and fight over contacts, funding sources as well as career and award possibilities (Hussinger and Pellens, 2018). This may lead to situations in which researchers might “scoop” other researcher’s ideas or fear that their own research ideas might get “scooped” if someone else claims priority to the research ideas. The term “scooped” is a slang word and often refers to misappropriation, which is form of research misconduct (Laine, 2017). The fear of being scooped might have negative consequences on the exchange of ideas and it might thus hinder innovation (Yong, 2018).
The term “scooped” may also just refer to another researcher independently investigating similar research topic and publishing the results before another researcher. Previously, this has been a problem as scientific journals usually expect high quality novel research and might refuse to publish a paper related to the same matter. However, recently some publishers, such as PLOS Biology, have started to accept papers that have been scooped less than six months ago, and refer to such papers as “complementary” papers instead of using the word “scooped”. (Yong, 2018).

The problem is that ideas, as such, cannot be protected with IPRs (Quinn, 2018). Research ideas could be considered as pre-IP or trade secrets, which may translate into real IP such as copyright if the idea is expressed in some creative way, such as put into words, or patent if the research findings provide a technical solution which meets the patentability criteria. However, researchers should be aware of what aspects of their research they should keep confidential before it is protected with IP and/or published, and what aspects they are allowed to discuss and with who. Universities often use non-disclosure agreements (NDAs), which lay down the conditions for disclosure or confidential information and liabilities. However, it is often the responsible of the principle investigators (PIs) to ensure that the research group members and outside participants, such as visiting researchers know the significance of confidential information and IP.

3.1.2. Trade Secrets

Trade secrets are a form of IP, which contain confidential information that has commercial value if kept as a secret (WIPO, 2019a). The Agreement on Trade-Related Aspects on Intellectual Property Rights also known as the TRIPS agreement, which the members of the World Trade Organization (WTO) are obliged to follow, addresses the protection of undisclosed information in Article 39. Furthermore, the EU Trade Secrets Directive 2016/943/EU defines what can be protected as a trade secret and which acts count as unlawful acquisition, use or disclosure, provides a list of civil law remedies as well as requirements for its Member States. In academic research trade secrets may be, for example, research ideas, research data, algorithms, precise manufacturing processes or methods or recipes that have not been disclosed in a public manner. One of the requirements for trade secrets is that it must be kept as a secret using reasonable steps. This is often handled by signing the (NDAs) with different parties (WIPO, 2019). Protection can be sought against unlawfully acquired, used or disclosed trade secrets.
Infringements include unauthorized access, breach of confidentiality and breach of a contractual duty. However, independent discovery and disassemble (and proceeding reverse engineering) of a product or object that has been made public does not count as an unlawful action. Finland ratified the new Trade Secrets Act on August 10, 2018, which replaced the provisions of the Unfair Business Practices Act. Due to the implementation of the Directive, the definitions for trade secrets have been harmonized across EU and grants Finnish district courts jurisdiction to decide whether civil or criminal actions will be taken, while the Market Court may also hold civil proceedings. (Borenius, 2018).

Trade secrets offer a more affordable form of protection than patenting and it can be utilized for inventions that do not fulfill the patentability criteria. However, as having a trade secret does not prevent anyone else from reverse engineering a product or another research team working in the same field from independently developing a similar process or a product, and therefore trade secrets do not provide as wide protection as patents (WIPO, 2019a). Furthermore, keeping research findings in academic settings is not always possible due to publication pressures. Earlier it was a common practice in Finland to keep a master’s as a secret for a limited time, especially in the field of technology, if it contained confidential information. After 2004 the Ministry of Education advised universities to separate confidential information to an appendix instead of keeping the whole thesis as confidential. (Miettunen, 2007). Currently, for example, the University of Oulu states in their guidelines that a master’s thesis must be public. The thesis they may contain anonymized information, but confidential information should be left for background material or separate reports, which do not become public (Oulu yliopisto, 2013). Dissertations are more problematic than master’s theses as they involve a public defense, where the content of the articles and the dissertation are discussed in an open event. Generally, both the articles and the dissertation become public during the PhD, though some confidential material can be left out of the public documents. (Miettunen, 2007).

The US is also a member of the WTO and is therefore obligated to provide protection for trade secrets. The Defend Trade Secrets Act (DTSA) of 2016 enables the owner of a trade secret the right to sue another party for trade secret misappropriation in federal court. The courts may order the misappropriating party to take steps to keep the trade secret as a secret, and compensate the owner of the trade secret, for example, by paying royalties, court costs, attorney feed and award damages. (USPTO, 2019). The Federal Bureau of Investigation (FBI), which is the domestic intelligence and security service of the US has
been worried that technology and trade secrets are leaking to China from the US. FBI has actively contacted universities regarding potential trade secret thefts and they have visited American colleges and universities and promoting the importance of trade secrets and shared cautionary tales. The promotion campaign has probably been sparked by long term suspicions that the Chinese government and Huawei, a Chinese company, have stolen trade secrets. (Tucker, 2019).

3.1.3. Copyright

Copyright is a form of intellectual property, which protects original literary, scientific and artistic works. In academic setting copyright concerns, for example, theses, scientific publications, presentations and posters, datasets and software. Copyright protects only the expression, not the idea behind the work. Copyright protection often lasts at least 50 years after the death of the author. According to the Berne Convention, protection is granted automatically without any formalities or registration. However, some countries offer voluntary registration, which offer clarity in ownership disputes and when copyrighted works are assigned or the rights are transferred. (WIPO, 2019b).

The international framework for copyright is formed from the Berne Convention, the Rome Convention and the TRIPS Agreement, as well as the WIPO Copyright Treaty, the WIPO Performances and Phonograms Treaty, Beijing Treaty and Marrakesh Treaty. At EU level, the copyright legislation is guided by eleven directives, such as the Directive on the harmonisation of certain aspects of copyright and related rights in the information society (Directive 2001/29/EC, also known as the InfoSoc Directive), the Directive on the legal protection of computer programs (Directive 2009/24/EC, also known as the Software Directive), the Directive on the legal protection of databases (Directive 96/9/EC, also known as, the Database Directive), two regulations as well as some additional instruments. (European Commission, 2019a).

The Finnish Copyright Act (404/1961) is based on the abovementioned international frameworks and international conventions. Copyrights are divided into economics rights and moral rights. The economic rights grant the owner of the copyright the exclusive right to make it available to public and to reproduce the work. The moral rights refer to the fact that the authors should be included in copies of the work and that the work cannot be altered. Furthermore, the act states that a copyrighted work has been made public when it has been made available and a work is considered published when it has been distributed to the public. In Finland and in Europe, the copyright is subjected to
several limitations including that copyrighted works can be reproduced for private use as well as educational use and scientific research. In Finland, copyright is granted automatically and it does not need to be registered (Aalto University, 2017b).

The US copyright law is based on the Copyright Act of 1976 (17 U.S.C.). The U.S. copyright law offers protection for “original works of authorship” such as literature works and architectural works, which are fixed and can be either published or unpublished. Copyright does not protect ideas, facts or methods of operation. Copyright is automatically granted, but the authors may also register a copyright. (U.S. Copyright Office, 2019a). Registering the copyright may bring some advantages to works that are exploited in a commercial setting, such as software, as it may function as proof of originality, and be hence be useful in litigations. However, registration does not always bring added benefits. For example of this is scientific publications. (Aalto University, 2017b). In general, copyright protects the works for the life of the author plus 70 years (U.S. Copyright Office, 2019a). One difference between the European copyright legislation and the US copyright legislation is that US uses a fair use clause, which permits the unlicensed use of copyrighted works under certain circumstances, such as news reporting, teaching and research. Fair use is evaluated using four different factors; determined using four factors: purpose and character of use, nature of the work, amount used and effect on potential market. (U.S. Copyright Office, 2019b).

3.1.4. Patents

Patents are used to protect inventions with a technical character if the invention is new (not disclosed publicly), involve an inventive step, which differs from the state of the art and which can be used in an industrial application (Aalto University, 2017b). Patent is an exclusive right, which is granted for a limited time, usually 20 years, and it can be used to prevent others from exploiting the invention commercially unless they either acquire a license to use the invention or buy the patent. The inventive process is often time consuming and requires resources. The patent system has been designed so that it encourage companies and universities to invest into the research and the patent can be seen as a reward for this. In exchange for getting patent protection, the invention is disclosed to the public. (European Commission, 2019b).

Contrary to trade secrets, which exist are valid automatically as long as the confidential information is kept a secret, and copyright, which is granted automatically once an original work is created, patent protection is not granted automatically. Patents consist
of multiple parts including descriptions, claims and drawings and it is often drafted by a professional patent attorney. Finnish universities outsource the patent drafting to a professional, however, the researchers are needed to provide the information, such as a manuscript from which the patent is drafted, and they are expected to participate in the patent filing process, which involved also reviewing the draft and commenting on the decisions (Aalto University, 2017b).

The international legal framework for patents is formed by the Paris Convention, Patent Cooperation Treaty (PCT), Strasbourg Agreement Concerning the International Patent Classification, Patent Law Treaty (PLT) and the Budapest Treaty. (WIPO, 2019c). At European level, patent legislation is guided by by Directive 98/44/EC on the legal protection of biotechnological inventions, also known as the Biotech Directive. Under the Biotech Directive neither human genome or DNA can be patented, because they are discoveries, not inventions. However, if a DNA sequence can separated utilising a novel technical procedure and the gene is introduced to the commercial market for the first time, it can be considered new and patentable. The directive also prohibits methods for cloning human beings, using human embryos for industrial or commercial purposes and modifying the genetic identity of human beings or animals, if the animals might suffer due to the actions. The Biotech Directive also covers patenting of genetically modifying plants. (European Commission, 2000).

Patents are territorial rights, i.e. they only grant protection against commercial exploitation of the invention in the country or region in which the patent has been granted. Patents can be filed at national patent offices of individual countries or at regional patent office such as the European Patent Office (EPO). In Finland, the national office is the Finnish Patent and Registration Office (PRH) and the Finnish Patent Act (550/1967) provides the legal framework for patenting. The regional system enables a patent to be applied in several different countries with a single application. For example, European patent application can be filed in the European Patent Convention (EPC) contracting states, which include the Nordics, Germany and France (European Patent Office, 2019). The granted patents have the same effect in the individual countries as the granted patents, which were filed at national offices. (WIPO, 2019d).

Currently, there is no worldwide patent. However, it is possible to file a single international patent application under the Patent Cooperation Treaty (PCT). (WIPO, 2019d). Currently there are 153 PCT Contracting States. The patent application can be filed at a national or regional patent office (for example, EPO for EPC route) or directly
to WIPO (PCT route). An International Searching Authority (ISA) evaluates the patentability of the application by examining if the patentability requirements are met and provides a written opinion. The international patent application is published 18 months after priority date. The applicants may utilize a second ISA or an additional patentability analysis before the PCT procedure ends. At the 30 month mark, the applicants may decide in which countries they want to enter the national phase. (WIPO, 2017).

The patent system in the US differs from the European system in many ways. For example, the US patent legislation (35 U.S.C.) allows filing of a provisional patent application, which does not include claims, and an application may be filed even after an invention has been made public due to the grace period system. These differences provide more flexibility, which could be beneficial for universities, especially in the case of premature or accidental disclosures, which prevent patenting in most European countries. However, some of the differences may also make patenting more difficult in the US compared to Europe. The differences in patentable subject matter may lead to a situation in which a patent may be granted in the US but not in Europe or vice versa. In Europe, medical treatment methods are not patentable and patents in general are granted strictly for subject matters which relate to technical solutions and problems. The same restrictions do not apply in the US, however, natural laws or phenomenon or products of nature cannot be patented. Europe utilizes a problem-solution evaluation to determine if an invention includes an inventive step. The US Patent and Trademark Office (USPTO), in turn, uses a set of criteria from a US Supreme Court case (KSR Decision), which may lead to a different interpretation of the inventiveness of an invention. (Finnish Patent and Registration Office, 2019).

### 3.2 Ownership of IP

The ownership of IP related to academic research may vary from one country to another and from one university to another depending on several factors such as what is the nature of the work, is it perhaps an invention, a copyrighted work or confidential data, and who is the creator or inventor and what is their affiliation to the university, are they students, employed by the university, or do they have a visitors agreement or are they a collaborator. Generally students, who are not employed by the university, own the IP related to their work or inventions, unless the sponsor of the research have included conditions regarding the ownership of IP, students work in collaborative projects or use
university resources. In the case of visiting researchers, the ownership of the IP is often specified in a separate visitor’s agreement. However, the funding of the visiting researcher may affect the ownership of the IP. In the case of the collaborative research, in turn, the IP is determined by forming contracts between the different parties. In such contracts, the parties usually separate the ownership of background IP, which each party brings to the projects, and the ownership of the foreground IP, which is expected to arise during the project. Some of the IP is therefore owned by each party, but some of it can be owned jointly. If a project has been fully sponsored by a company, the company usually owns the IP arising from the project (Aalto University, 2017b). Other factors include the funds or resources used and the circumstances of creation or inventive work referring to whether the creative or inventive work done as an individual or in collaboration and was it done during working hours or on the free time. (WIPO, 2019e).

The ownership of IP can usually be determined by looking into national IP law, the IP policies of the university in question as well as contracts or agreements related to funding, collaboration. There are two main approaches to the ownership of IP rights born in university research professors privilege and institutional ownership. Institutional ownership can be further divided into pre-emption rights and automatic ownership. (WIPO, 2019e).

Sweden is one of the countries that use the professor’s privilege or teacher’s exemption, which is a direct translation of “lärarundantaget” (Petterson, 2018). According to professor’s privilege, the university researchers and professors have full rights to the IP they have created even if public funds were used (WIPO, 2019e), unless the researchers have agreed otherwise (Uppsala University, 2019). The researchers can decide if they want to pursue patenting and commercialization, and they are usually supported by university innovation services (WIPO, 2019e). Uppsala University, for example, offer the researchers access to their network (Uppsala University, 2019).

In the institutional ownership approach, the IP rights or the publicly funded research findings are owned by the university, not the researcher, unless the inventive work was done during the researcher’s free time as part of collaborative or sponsored research. The university often takes care of the protection and commercialization of the research findings. Some countries, such as Austria and Czech Republic use pre-emption rights system, in which the rights often belong to the university researcher, but the institution can claim the invention within a certain time period. It is common that the university compensates the researchers when they transfer the rights to the university. A more
common approach is automatic ownership, in which case the university is the first owner of the IP rights with some conditions related to, for example, compensating the inventors. (WIPO, 2019e). The US is an example of automatic ownership. The Bayh Dole Act (P.L. 96-517, Patent and Trademark Act Amendments of 1980) gives US non-profit organizations such as universities the right to own publicly funded inventions and lead their protection and commercialization. Universities are expected to file patents on the inventions they take rights to and they are expected to license them to small businesses (AUTM, 2019). Actually, several European countries used to utilize the professors privilege approach, but made reforms in their law and policies following the US Bayh Dole Act due to the success of US based universities in commercializing university born inventions (Lissoni et al., 2008). However, the impact of the abolishment of the professor’s privilege might have had an opposite effect on university patenting (Hvide and Jones, 2017; Ejermo and Toivanen, 2018). Currently, Denmark and Germany also use a version of the automatic ownership model (WIPO, 2019e).

In Finland, the inventions arising from universities are covered by the Act on the Right in Inventions made at Higher Education Institutions (369/2006), also known as the University Invention Act. The act defines the ownership of the invention, which is determined by the source of funding. Research is divided into three types: open research, contract research and inventions made under other circumstances. When the research is conceived utilising university basic funding or funding comes from an external source which does not include conditions related to IP or commercialisation, such as Walter Ahlstrom Foundation or Jane and Aatos Erkko Foundation, the research classifies as open research, and the immaterial property (IP) belongs to the inventors. If the funding comes at least partially from outside the university, such as EU funding, Academy of Finland or Business Finland, from a company or from a foundation, and involves a contract or some conditions on IP ownership or commercialisation, the research falls under contract research and the university owns the rights to the invention. The IP rights can, however, be transferred from party to another. In rare cases, the funding source or funding terms fall under the third classification, if it cannot be clearly identified as open or contract research.

Universities also have different approaches to the ownership of teaching materials created by employees. In one approach that the university owns the copyright of teaching materials and grants the employee a royalty-free license for using the material in non-commercial purposes. In this approach the university may utilize the material
commercially and the potential revenues may be shared with the creator of the material. In another approach, the ownership remains with the creator. The creator is often obliged to grant the university a royalty-free non-exclusive right to use the material for teaching purposes, however, they can also license the material to a third party. (WIPO, 2019e).

### 3.3 IPR Strategies

Each university has their own strategies and policies related to IPR management, technology transfer and commercialization. These activities are managed by the TTOs of the universities, such as Green Campus Open (GCO) of Lappeenranta-Lahti University of Technology also, known as LUT University (Green Campus Open, 2019) and Helsinki Innovation Services Ltd. (HIS), which is the is a fully owned subsidiary of the University of Helsinki Funds (HIS, 2019). The TTOs identify inventions, protect promising innovations with intellectual property rights and eventually commercialising the inventions through suitable commercialisation routes (Kangaspeska, 2015). The universities often have employees dedicated for evaluating inventions arising from specific fields of research. For example, at Aalto University, each school has their own dedicated Innovation Advisor, who evaluate the inventions and support the researchers in IP and commercialization related matters (Aalto University Innovation Services, 2019).

Under the University Inventions Act, the researchers in Finland are obligated to notify the university’s TTO if they have invented something that might have commercial potential. This is done in the form of an invention disclosure. Some universities also use other related disclosures such as software disclosures (Aalto University, 2017b). The invention disclosure form varies between universities and but it usually contains at least a brief description of the invention and the problem it solves, funding sources, names of the inventors and their contribution as well as publication details (University of Oulu, 2013). The inventors may also be asked to estimate the market size, and how money could be made with the invention (Aalto University, 2019a). The TTOs then determine the ownership of the invention and potentially ask the inventors whether they would be willing to transfer the rights to the university. University of Helsinki’s commercialization policy, for example, states that the university does not participate in the protection, licensing or sale of the inventions that are owned by the inventors. If the university owns the rights, HIS evaluates the commercial potential of the invention and decides on which
exploitation method including protection, licensing, sale, own use or publishing is the most suitable in each case. However, the university is not obliged to patent the inventions it holds rights to. The decision on whether to protect or not or commercialise or not depends on the evaluation and commercial potential of the invention. (University of Helsinki, 2015). The nature of the invention determines whether IP needs to be protected and which commercialisation route is the most suitable in each case. For example, algorithms and computer programs are automatically protected by copyright. In some cases, such information is kept as a trade secret, which a university spin-out company may use as a source of competitive advantage. Computer programs may also be eligible for patent protection, if they are part of a device, if they are technical in nature and have a technical effect. Research tools and methods, such as cell lines and antibodies, can also be out-licensed to a third party without IP involvement. (Kangaspeska, 2015)

Universities typically commercialize research findings by either licensing research findings, know-how, inventions or IP to third parties. The licensing agreements are often agreed case by case and they can be exclusive or non-exclusive, limited to a certain geographic area and it can provide either limited or full rights. The licensing agreements usually contain royalties, because university research if often at an early stage and might reach its full potential years after the negotiations. Universities may also sell inventions and IP to interested parties. An alternative commercialization route is the establishment of a spinout company. Setting up a company might be a suitable route, for example, if the invention cannot be commercialized via licensing or other means. However, setting a spinout company requires a committed team and investors. (University of Helsinki, 2015). Universities have different policies regarding the formation of spinout companies. Aalto University, for example, does not participate in the spinout company formation (Aalto University, 2017c).

The key aspect in the formation of research based spinout companies is Business Finland’s New Business from Research Ideas (TUTLI) funding, which was launched in 2012. For example, by 2018 the University of Oulu had received TUTLI funding for 31 projects from which 10 new businesses were created by 2018. (University of Oulu, 2018). TUTLI funding can aid researchers to develop a research idea into a new business. The idea must have enough commercial potential to either become a startup or a licensable IP to get funded. The funding is applied with the technology transfer office (TTO) of the university and at least 40 % of the costs must be related to preparation of commercialization. Novelty search, freedom-to-operate (FTO) analysis and market
analysis are activities that can be included into the commercial budget. One of the conditions for obtaining the TUTLI funding is that the university own the background IP and the IP generated during the project so that the university can license or sell the IP to a third party of the startup formed after the TUTLI project. (Jyväskylän yliopisto, 2019)

Finnish universities protect research findings and inventions when possible, however, they do not usually aim to expand their patent portfolios, because they focus on transferring the patent and technologies to companies for further commercialization (Kolster, 2019; Tampereen korkeakoulu, 2019). The income gained from licensing agreements and assignments flows back to the inventors and to the university. Universities policies for compensating the inventors vary slightly. For example, at the University of Helsinki the inventors get 50 %, the department 20 % and the university 30 % of the net revenues, when the net revenues are under 100 000 euros. When the net revenues exceed 100 000 euros, the inventors, department and university get an equal 1/3 of the net revenues. (University of Helsinki, 2015). The University of Jyväskylä also rewards the inventors by giving them 50 % of the net revenues, while the rest goes to the department (25 %) and maintaining innovation activity (25 %). University of Jyväskylä also rewards the inventors for submitting an invention disclosure if the invention proves to be patentable, for submitting a patent application, for a granted patent. (University of Jyväskylä, 2012).

### 3.3.1. Invention Disclosures

The Ministry of Culture and Education and the Finnish National Agency for Education collect statistics of invention disclosures (also known as invention announcements) and granted patents, in an education administration’s reporting portal called Vipunen. Figure 1 shows the invention disclosures received by different Finnish universities between 2014 and 2018. Most invention disclosures between 2010 and 2018 have been made in engineering and technology (44 %), natural sciences (26 %) and medical and health sciences (7 %). However, in 19 % of the invention disclosures the discipline has not been disclosed. (Opetushallitus, 2019). No details were found for Lappeenranta-Lahti University of Technology (LUT) for years 2014, 2015 or 2016, and therefore the total number for LUT do not represent the real number of invention disclosures. The number of invention disclosure for University of Helsinki for 2016 was missing from Vipunen, but found from a report (University of Helsinki, 2017).
The clear winner of invention disclosure submissions is Aalto University, which has gathered almost 700 invention disclosures in five years. More than 100 invention disclosures are filed at Aalto University each year. For example, in 2016 as many as 154 and in 2017 138 invention disclosure were filed (Aalto-yliopisto, 2018). For comparison, MIT received 822 invention disclosure in 2018 (MIT, 2019). The University of Helsinki has received the second largest number of invention disclosure in recent years. The number of invention disclosures were almost doubled between 2015 (57) and 2017 (108). The majority of the invention disclosures at the University of Helsinki arise from the Kumpula campus, which focuses on natural sciences and from the multidisciplinary Viikki campus, which in includes the Faculty of Pharmacy, Agriculture and Forestry and Biological and Environmental Sciences. (Helsingin yliopisto, 2018). Tampere University is currently the third place. The number of invention disclosures received seems to vary depending on the year. For example, in 2016, Tampere University received a record 94 invention disclosures, but on the following year, the number dropped 35% to 61 invention disclosures (Heinikangas, 2018).
According to ASTP report on knowledge transfer activities in Europe, the average number of invention disclosures per European TTO in 2016 was 27.5 (ASPT, 2018). American research institutes seem to be much more active in filing invention disclosures than European research institutes. According AUTM, the average number of invention disclosures per TTO was 129.5 (AUTM, 2017). Finnish universities ranked quite well on the European level, but only Aalto University has been able to reach the American average value.

Finnish universities have published nearly 20 000 refereed journal articles on a yearly basis between 2014 and 2018, but only 388 – 448 invention disclosures have been submitted between the same years (Opetushallitus, 2019). This suggests that only 2.0 % - 2.5 % of research findings have translated into invention disclosures. This is only just a very crude estimation, since inventions are not born in all fields of research. However, it still indicates that a large amount of potential inventions might not be identified. A questionnaire conducted by the University of Jyväskylä might shed some light on this matter. As part of the questionnaire, the university staff and researchers were asked to choose the most suitable commercialisation route for research findings. The majority of the respondents thought that research results should be given for free to interested parties while only 8.9 % of the respondents suggested that selling the IP to an interested company would be the most suitable route. However, almost one fifth (18.3 %) thought that the most suitable way to commercialise the results would be through a project in which the commercialisation routes would be explored. Similarly nearly fifth of the respondents (17.7 %) believed that they should be the ones to commercialise the results. (Neittaanmäki et al., 2017). This indicates that the researchers might not share the views of TTOs, which mainly aim to commercialise research finding by licensing or selling them to companies. The Research Institute of Finnish Economy (ETLA) has also reported that Finnish universities are underperforming when it comes to transferring research results into profitable business. ETLA suggests several different remedies for tackling the problem, such as hiring business professionals to the TTOs and including measuring the performance of universities in their third mission and adding this new indicator to public university finding (ETLA, 2018).

### 3.3.2. Finnish Patent Applications

Figure 2 shows the national patent applications and their status filed by Finnish universities. The values were obtained from the Finnish Patent and Registration Office’s
PatInfo (PRH, 2019a) database April 25, 2019 by using both the Finnish and English versions of the universities names. The most applications have been filed by Aalto University (142) including patent applications filed by Helsinki University of Technology, followed by University of Helsinki (87) and Lappeenranta University Technology (LUT University) (82). The most efficient applicants in terms of the percentage of patents granted seem to be LUT University (17.1 %), Åbo Akademi (13.8 %) and University of Helsinki (9.2 %). Interestingly, the majority of the patent application were withdrawn; even 82 % of the applications in the case of Åbo Akademi. The universities with the least withdrawals were LUT University (33 %) and the University of Jyväskylä (34 %). The high withdrawal percentages may be an indication of the fact that a patent application may have been withdrawn in order to modify its contents. If the patent application is withdrawn, it does not become public, and, therefore it does not count as prior art. However, by doing this, the applicant loses the original priority date, which could threaten the patentability of a later patent application. Without knowing the reasons behind the patent decisions, it is hard to draw conclusions. However, Figure 2 shows that different Universities employ different strategies in their IP management. It is not possible to draw reliable conclusion on how often patents are granted, since many of the applications are still in the inspection or examination phase.

Figure 2. National patent applications and their status filed by Finnish universities.

Figure 3 shows the number of national patent application filed by Finnish universities during the past five years. The graph shows that Aalto University, LUT University and University of Helsinki have been the most active universities. Aalto University has clearly
increased their activity since 2017 compared to the other universities. This could be in indication of IPR strategy shift at Aalto. No patent application were filed by the University of Lapland. However, this is not surprising since the research at the University of Lapland focuses on fields, such as law and social sciences, which are not known for patentable inventions. University of Vaasa has only has one patent application. University of Vaasa conducts research in the smart electric systems and renewable energies fields; however, it is possible that the number of researchers in those fields are low in Vaasa.

Figure 4 shows the patent related hits for Finnish universities obtained from three freely accessible patent databases, Espacenet from the European Patent Office (EPO), PatentScope from the World Intellectual Property Organization (WIPO) and Google Patents. The search was performed on April 18, 2019. Each of these patent databases has slightly different coverages. Espacenet covers more than 95 million patent documents from 90+ search authorities, Patentscope 58 million from 41 search authorities and Google Patents over 87 million patent publications from 17 search authorities (Krabbe et al., 2017). The patent hit value for each university is a combination of hits obtained by using both the Finnish and English name of the university as the assignee/applicant. The results were screened to remove false hits resulting from similarity of university names, such as University of Helsinki and Helsinki University of Technology.
The number of patent hits varied significantly between the three patent databases. However, Aalto University and the University of Helsinki received the most hits in all three patent databases. Tampere University, LUT University and the University of Oulu received fairly similar search hits followed by the University of Turku. There results, however, do not indicate the phase of the patent application or how patent families the search hits cover.

Figure 5 shows the patent applications and granted patents obtained from the US Patent & Trademark Office (USPTO). The searches were performed on May 3rd, 2019 using AppFT to search for patents and PatFT to search for patents using the university name in the applicant name field. The PatFT shows full-text patents from 1976 onwards.
whereas the AppFT application details have been published since 2001 (USPTO, 2019). University of Helsinki has the most US applications, however, Aalto University and Tampere University have been granted more US patents than the University of Helsinki.

![Figure 5](image.png)

Figure 5. Number of US patent applications and granted US patents obtained from USPTOs APPFT and PatFT search engines.

3.4 World’s Most Innovative Universities

Reuters ranks World’s Most Innovative Universities annually together with Clarivate Analytics based on three areas total patents filed, success rate and commercial impact score. The success rate refers to the ratio of patent applications and granted patents, while the commercial impact score indicates how university research has influenced commercial research and development (R&D) activities and this is measured by research papers cited in patent applications. The six best ranking universities are from the US, including Stanford University, Massachusetts Institute of Technology (MIT) and Harvard University. The top 10 includes only two universities from outside US, KU Leuven from Belgium (No. 7) and Imperial College London from the UK (No. 10). The US have in total 48 universities in the top 100 list, followed by Europe with 32 universities, Asia with 18 universities and Middle East with 2. In Europe, Germany, France and UK are among the most innovative universities based on the Reuters’ ranking. The European universities seem to be falling behind especially on the
commercial impact score. Finnish universities have not made it to the list. (Ewalt, 2019). ETLA has suggested the technology transfer related activities in Finland are lagging behind partially because the TTOs are relatively small and very dependent on the strategy of the university as they get their funding from their universities. Many American TTOs are independent from the university and get their funding from licensing. Therefore, they probably have more resources to commercialise the university born inventions. (ETLA, 2018).
4 RESEARCH INTEGRITY

4.1 Guidelines for Research Integrity and Responsible Conduct of Research

Research integrity refers to conducting research in an ethical and professional manner. There is no universally accepted definition of research integrity, but the matter is discussed in several global statements including the Singapore Statement on Research Integrity (WCRI, 2010), the Montreal Statement on Research Integrity in Cross-Boundary Research Collaborations (WCRI, 2013), and guidelines such as The European Code of Conduct for Research Integrity (ALLEA, 2017) and Doing Global Science: A guide to Responsible Conduct in Global Research Enterprise (Interacademy Partnership, 2016). Furthermore, several organizations including the United States Office of Research Integrity (ORI), The European Network of Research Integrity Offices (ENRIO), UK Research Integrity Office (UKRIO) and the Committee of Publications Ethics (COPE) oversee research integrity and ethics matters, educate researchers and provide case studies on research integrity.

In Finland, the Finnish Advisory Board on Research Integrity (TENK) has established the guidelines for responsible conduct of research in Finland, which are utilised voluntarily by universities, universities of applied science and research institutes. In general, the guidelines promote proper research and reporting methods, open dissemination of research results, agreeing on researchers’ rights and obligations beforehand, crediting other researchers, seeking necessary research permits and preliminary ethical review if applicable and announcement of conflicts of interest. (TENK, 2013).

4.2 Research Misconduct

Research misconduct is one form of a violation of the responsible conduct of research. It is a form of violation that often mislead the research community and or decision makers. TENK divides research misconduct to four categories: fabrication, falsification, plagiarism and misappropriation (TENK, 2013). TENK does not provide opinions for copyright and patents related matters. However, some forms of misconduct have links to IP.
Fabrication refers to either making up results or using different methods than have been reported to achieve the results. Falsification, in turn, refers to purposely altering or selecting the results to achieve results that are more desirable. (TENK, 2013). These types of misconduct may mislead the science community; however, they are not linked to IP. Fabrication or falsification are often suspected if the research results cannot be successfully repeated by other researchers (Schulz, 2010). On example of falsification in Finland occurred in 2010 when a researcher working at the Radiation and Nuclear Safety Authority (STUK) was found to have falsified results related to the effects of radiation on cells. Luckily, the falsification was noticed early on and no harm was done. (Yle Uutiset, 2010).

Plagiarism refers to knowingly or unknowingly “forgetting” to refer to the original source of information, which makes the thoughts seem original (TENK, 2013). It is perhaps the most familiar forms of misconduct in academia, and it often causes confusion in students taken first attempts on academic writing. Finnish universities use software such as American Turnitin or Swedish Urkund to detect unoriginal text in mainly for thesis and dissertations (Venttola, 2016) as well as assays and other writing tasks (Huotari et al., 2016). These software, however, only mark text that show similarity to other works, not plagiarism, and therefore the evaluator still needs to check whether the text has or has not been cited properly (Mäntylä, 2018). Overall, students and teachers do not see plagiarism as a big problem in Finland according to a study conducted at the University of Helsinki (Huotari et al., 2016). One of the most recent plagiarism scandals in Finland revolves around the Finns Party MP Laura Huhtasaari’s 2003 master’s thesis titled “Cultural Practices in Multicultural Basic Education Groups”, in which entire pages and whole chapters as well as most of the conclusion had been plagiarised (Yle Uutiset, 2018). Plagiarism has common features with copyright, though it is considered as an ethical issues rather than copyright infringement. However, it is evident that the two terms cause confusion, since a simple Google search reveals several search hits discussing the similarities and differences between the two.

Missappropriation refers to presenting other researchers ideas, results or data as their own. In many countries, plagiarism and misappropriation are classified as a same category of misconduct. (TENK, 2013). In Finland the terms are separated, perhaps, because plagiarism applies more to copying someone’s text without proper citation, while misappropriation can be seen to apply to unwritten materials, such as research topics or ideas overheard during conversations. Misappropriation may be a form of trade secret.
infringement, if the misappropriation targets such information that fulfils the requirements of a trade secret, such as that the confidential information is valuable when it is kept a secret and when the information has been kept as a secret systematically. However, overheard discussion or normal conversations with fellow researchers do not fulfil the criteria unless NDAs have been signed. In one example of misappropriation, a competing American research group had possible gained access to Finnish researchers’ manuscript related to papillomavirus through peer-review process, or at least this is what the author suspects. The author of the manuscript became aware of the misappropriation, as the American research group had used the same parameters and a model developed by the author. Furthermore, the American groups had the same mistake in their analysis in their conference presentation as the Finnish researchers had in their manuscript, and therefore this could not be a case of independent research. (Kettunen, 2018).

4.2.1. Investigation of Research Misconduct in Finland

The investigation of research misconduct, called the RCR procedure, starts with a written notification, which is submitted to the organisation in which the misconduct took place. The director of the organization, often the rector, evaluates the notification and decides whether the allegations fall within the scope of the research misconduct and if a preliminary inquiry is needed. During the preliminary inquiry, the person who has submitted the notification as well as other relevant parties are interviewed. If there is reason to believe that misconduct took place and the person accused of misconduct does not accept the preliminary inquiry, a proper investigation is initiated. This involves formation of an investigation committee consisting of member from inside and outside the organisation whose task is to provide a report to the rector who then decides if an RCR violation has taken place. TENK is informed on the RCR process, but the process is dealt internally within the organisation. (Responsible Research, 2019)

However, a statement can be requested from TENK if either the person who submitted the notification or the person who was accused of the misconduct are not happy with the results of the internal RCR process. TENK then evaluates if the investigation was conducted a proper manner and can provide a comment on whether an RCR violation has taken place. TENK can recommend a further investigation, but TENK does not provide statements for any other issues, such as violations related to copyright law or patent law. (Responsible Research, 2019)
According to Hanna Kaisa Spoof, TENK receives approximately 25 notifications of research misconduct every year. The notifications lead to consequences only seldom. The sanctions may, however, have devastating consequences to the researchers career and can range from end of funding to termination of the employment or withdrawal of a degree. (Mäntylä, 2018). TENK publishes Annual Reports, which include short descriptions of the RCR violation cases. The names and universities of the cases have been replaced with letters to preserve anonymity. (TENK, 2019).

A recent study conducted by researchers from the University of Vaasa and commissioned by TENK, investigated the prevalence of research misconduct in Finland and found that severe violations of research misconduct are not common. The survey gained 1246 respondents from different universities, universities of applied science and research institutes. According to the survey, 51 % of the respondents answered that they had never noticed misappropriation, while 27 % responded seldom, 17 % sometimes, 4 % often and 1 % regularly. In open answers, the respondents mentioned that they have encountered problems related to, for example, authorship, inadequate citations and bias referee processes (Salminen and Pitkänen, 2019).

4.2.2. TENK’s RCR violation cases related to misappropriation

Most of the TENK cases involve authorship disputes and plagiarism, but some of the cases also have elements of misappropriation such as stolen research results. The cases related to misappropriation were read carefully through to see if they contained elements related to IP such as trade secrets or patents.

In 2011, TENK was asked to provide a statement to a case involving a patented invention (Statement 4: Authorship of a scientific publication and inventorship of a patented invention). A medical researcher, who had been dismissed from the research group filed a complaint as he/she had not been named as an inventor of an invention patented by the group leaders. The university stressed that the requirement for inventor in a patent are more demanding than those of an author in a scientific publication are. TENK did not comment on the patent related matter, but advised the university to build procedures for agreeing on researchers rights before a project starts. (TENK, 2012). This case was related to a publication and a patent. As TENK does not provide opinions for patent related matters, that part of the incident has been covered in the internal investigation of the university. The difference between authorship and inventorship and their requirements will be discussed further in Chapter 5.1.
In 2014, to researchers were found guilty of research misconduct due to theft when they published a joint article without the consent of a co-author who was not credited either (Case 5: RCR violation in the writing process of an article). (TENK, 2015). In 2015, one case related to stealing research material emerged (Case 5: Theft of research material by research team leader and junior researcher). The case involves an international research team working in the medical field, which was accused of several research misconduct violations. The TENK report does not provide many details of the case, however it hints that the leading professor and a junior researcher did not give appropriate credit to the contribution of the other researchers. TENK provided a statement for a case related to stolen data and unpublished text (Statement 2: Alleged misconduct was not related to research integrity). However, in this case this misconduct was not found to be related to research integrity. Again, the TENK report does not provide much details of the case, such as reasoning why this alleged misconduct was not an RCR violation. TENK also provided a statement related to a stolen research idea (Statement 8: Coming up with the idea for a research project did not automatically confer authorship). In this case, TENK stated that the professor who submitted the RCR notification was unable to prove that an original scientific idea had been stolen. He/she has lead a project in which the accused were also part of and accused the other researchers of not giving him the appropriate credit in a publication among other things. (TENK, 2016).

In 2016, one case of misappropriation was verified (Case 2: Supervisors used student’s material as their own in an article). In this case, a university lecturer an emeritus professor in social sciences had used material collected for a Master’s thesis in their article without referring to the article or offering join authorship. After the rector had informed the lecturer and emeritus professor of the ruling of misappropriation, they had to add a proper reference to the Master’s thesis and inform the publisher of the violation. (TENK, 2017). In 2018, TENK provided statements for two case involving allegations of stealing a research idea. In the case involving Statement 4 (TENK 2018:4 – Conducting research on the same area of study does not obligate reference to a specific study), two researchers in the field of humanities accused their fellow researcher working in the same research premises of stealing an idea for a dissertation (as well as plagiarism). The university did not see any grounds for stealing. According to TENK, in this case the research matter had already been studied widely internationally and therefore the research topic was not seen as an idea as such. TENK also saw the accusations of stealing as more as a scientific dispute than a RCR violation. In the other case (TENK 2018:6 – Allegations of stealing and plagiarism of research idea unfounded), a licentiate in the
field of humanities accused his/her supervisor of plagiarising a research plan and stealing research ideas revealed during discussions with the supervisor which lead the supervisor to secure project funding. The accusations were made based on public project descriptions. The rector found that the projects were not similar to the research plan, and therefore no violation took place. TENK also stated that the project descriptions did not provide sufficient proof of a RCR violation. (TENK, 2019).

Only one case mentioned a patent and therefore it seems that the research misconduct violations are not strongly linked to IP. However, as TENK does not provide statements for IP related matters, it is possible that they would be handled within the university, without notifying TENK if they do not contain elements of research ethics or integrity.
5  IPR RELATED PROBLEMS AND DISPUTES IN ACADEMIA

5.1 Publishing vs. Patenting

Researchers’ pressure to publish their research results are sometimes in conflict with the technology transfer office’s (TTOs) aims to protect the inventions with patents. The researchers might not be familiar with patent requirements or the procedures TTOs utilise to commercialise inventions. This may lead to premature disclosures. It is possible to do both, publish the results and patent the invention. However, it is all about the timing. If an invention disclosure is submitted to the university early on, the patent and manuscript drafting can take place simultaneously. Universities often advice researchers to keep the research data confidential before a patent application is filed, because premature disclosure can kill the novelty of a patent. After the patent has been filed, the researchers are allowed to publish the data. (Aalto University, 2019b). At Aalto University, the patent drafting process takes typically 1.5 to 2 months (Aalto University, 2017b).

Finland does not have a grace period, which would enable researchers to file a patent even after disclosure. However, approximately 30 countries use such a grace period, which allows the inventors to publish information related to an invention without destroying the novelty as long as the patent application is filed before the end of the grace period. The typical grace period is 6 or 12 months. US is one of the countries, which utilize a 12 month grace period. Some countries, like German has a conditional 6 month grace period, which for example does not count for international exhibitions or evident abuse (European IP Helpdesk, 2019). The grace periods are mainly utilised by academic researchers in situations where there is a pressure to publish soon, when an accidental disclosure has taken place or when the TTOs has been informed of an invention after it has been submitted to a journal. However, utilization of the grace period is often not the favoured route, because if are restricts patenting to countries, which also have a grace period, such as Canada, Australia and Japan, thus leaving our many potential markets in Europe. A more harmonised system regarding the grace periods would be beneficial for patenting university inventions (IPO, 2015).
5.2 Authorship, Inventorship and Ownership

In academic research terms such authorship, inventorship and ownership may cause confusion and disputes among researchers. Issues may arise when a patent application is drafted and a question arises whether the authors of a publication should be included as inventors in the patent application. This issue is especially important if the university decides to apply for a patent in the US, since the whole patent may be invalidated if an inventor has been left out or an inventor who has not contributed to the invention intellectually has been included as an inventor (Chen et al., 2017). Authorship identifies the creator of an original work, inventorship identifies the creator of an invention and ownership defines who owns the copyright and patent right (European IPR Heldesk, 2013).

Authorship refers to scientific publications and presentations in academic research. The Copyright Act (404/1961) states, “a person who has created a literary or artistic work shall have the copyright therein, whether it be a fictional or descriptive representation in writing or speech...or expressed in some other manner”. Furthermore, the Act states the following concerning work by multiple authors: “If a work has two or more authors whose contributions do not constitute independent works, the copyright shall belong to the authors jointly.” Copyright is an immaterial property right that is automatically granted for independent and original works, which are a result of creative input. Thus, the main criteria of copyright is creativity and originality (Ministry of Education and Culture, 2019b). With this in mind, the author of a scientific publication can be anyone who has contributed to the writing or creation of figures or graphs for a publication. It is also common to acknowledge researcher who have not contributed to the creation of the publication itself, but who have, for example, performed some of the experiments of the publication or provided valuable feedback or advice, which has influenced the research. In case of scientific publications, the authors often transfer their financial rights to a publisher who may then reproduce and sell copies of the publication. However, the moral rights remain with the author, which means that the authors of the publication are credited in the publication and no one can make alterations to the work. (Norkola and Onikki-Rantajääskö, 2018). Furthermore, the authors have the right to decide if a publication should be published as well as how it is published, and they may also withdraw the work from publication (European IPR Heldesk, 2013).
Intentorship, in turn, refers to patents. The Patents Act (550/1957) states that “Anyone who has made an invention which is susceptible of industrial application, or his successor in title, shall be entitled, on application, to a patent and thereby to the exclusive right to exploit the invention commercially, in accordance to this Act.” The inventor is someone who has conceived the idea, contributed to the development of the invention, provided solutions to problems of implemented the innovation. The inventor is not someone who has merely suggested hypothesis, performed routine tasks or tests following the instructions of others. (European IPR Heldesk, 2013). A patent can be filed by the inventor(s) or a party to which the inventor(s) has/have transferred the rights to (PRH, 2019b). The ownership of the IP rights depends on whether the inventor is a private person, employed by a company or affiliated to a university. If a person is employed by a company he/she the Act on the Right in Employee Inventions (656/1967) applies. In this case, if the invention has been made while performing work related duties or if it is a result of intellect gathered while being an employee of a company, the company may acquire the right in the invention. If, however, the inventive work was started before the employment started or it was been done outside working hours or the invention is from another field than their job is or if the inventor had their own funding, the inventor is the owner of the invention (European IPR Heldesk, 2013). If the person is employed by a university the Act on the Right in Inventions Made at Higher Education Institutions (369/2006) applies and the ownership of the IP depends on the funding source, as discussed earlier. In both cases, whether the researcher is employed by a company or a university, an invention notification is sent either to the company or to the university. In some cases, different research organisations, companies and universities collaborate, in which case an invention disclosure is submitted to each of the parties involved. The IP rights can be transferred from party to another using transfer of rights documents. However, the original inventors names will be listed in the patent application and granted patent as the inventors, even if the patent is assigned to a third party.

5.3 Patent Disputes

Based on the scarcity of sources, patent disputes in academic settings in Finland seem to be rare. One case was found from 2003 regarding a dispute over patenting costs at the University of Oulu. The University of Oulu sent 10 000 – 15 000 € bills to at least two researchers of research groups demanding them to pay back funds used for patenting inventions the university did not own the rights to. The university was referring to new patenting policies, which however were not in force when the patent was filed. The
researchers had used funding from Tekes (currently known as Business Finland) to cover the patenting fees. They had offered to transfer the patent to the university, but the university was not interested. However, the university was named as a beneficiary in an commercialisation agreement formed with a company interested in the technology. However, at the time of receiving the bill, the researchers had not made any money on the patent. The university had, however, been mentioned in several international publications ad it had received funding for advancing the invention. (Pentzin, 2003).

The Wisconsin Alumni Research Foundation (WARF), the TTO of the University of Wisconsin-Madison filed a patent suit against Apple in 2014 for infringing a technology called “predictor circuit” it has developed. US District Judge ruled in favour of WARD in 2015 and ordered Apple to pay WARF $506 million for infringing their patent. (Wolfe, 2017). However, later a federal appeals court ruled in Apple’s favour stating that Apple had not infringed the university's patent (Kastrenakes, 2018).

Inventorship issues are one form of patent dispute. Cases were not found from Finland, but US has several examples of inventorsip related disputes. In Joany Chou v. The University of Chicago (59 U.S.P.Q.2d 1257 (Fed. Cir. 2001)) a graduate student had developed a vaccine for herpes virus and presented the discovery to her supervisor. The supervisor turned the idea down, but later patented the invention without telling or crediting Joany Chou. The supervisor enjoyed from royalty payments when the invention was licensed to a pharmaceutical company while Joany did not receive anything. Once Joany found out about the patent, she sued the University of Chicago due to exclusion from inventorship. The District Court ruled in favour of the university, but the ruling was reserved by the Federal Circuit. (Beattie, 2019).
6  EMPIRICAL PART

6.1  Goals and Methods of the Empirical Study

The goal of the empirical part of the thesis was to investigate whether idea theft, more formerly known as, misappropriation of research results is a common phenomenon in academic research in Finland, which forms misappropriation occurs in Academic settings and if the has implications for immaterial property. Due to the limited amount of information available on the subject matter in Finland, an empirical study in the form of a survey was conducted in the hopes that the answers would shed some light on the situation in Finland.

6.2  Survey on “Idea theft in Academia”

A survey titled “Idea theft in Academia” was created using online survey and reporting tool Webpropol 3.0. Before filling the survey, the respondents were either introduced to the survey topic and a consent message (Appendix 1). The template for the consent message was obtained from Hanken’s privacy instructions (Hanken, 2019). The survey starts with giving consent to processing personal data and contains 15 points/questions including Yes/No answers, multiple choices, open questions and an opportunity to leave contact details for further interviews. A copy of the survey template can be found in Appendix 2. An approval for the survey was obtained before publishing from Professor Nari Lee and Hanken’s data protection officer Urpo Kaila. An opinion was also asked from the Research Ethics Committee regarding a need for a preliminary ethical evaluation of the research project, but as the study method does not involve any of the six criteria which would necessitate an ethical pre-review (Hanken, 2019), such evaluation was not necessary.

The survey was set as public so that the survey link could be shared to a wide audience (instead of only shared the link to certain email addresses). The survey was also chosen to be anonymous due to the sensitivity of the survey topic. The anonymity means that the specific answers cannot be linked to a specific respondent. This option protects the identity of the respondents, and potentially leads to more honest and elaborate answers, especially to the open questions.

Ten Finnish universities were contacted via email with the aim of getting the survey published on either their internal communication channels or email lists to reach as
many university researchers as possible: Aalto University, University of Helsinki, University of Eastern Finland, University of Jyväskylä, Lappeenranta-Lahti University of Technology (also known as LUT University), University of Oulu, Tampere University, University of Turku, University of Vaasa and Åbo Akademi University. The Universities were chosen by evaluating the type of research performed. For example, the University of Lapland was excluded from the list, because their studies and research focus on Art and Design, Education, Law and Social Sciences, instead of fields such as technology, which is more likely to result in creation of patentable innovations. University of Tampere and Tampere University of Technology merged and formed a new Tampere University in early 2019 (Aarresaari, 2018).

The initial idea was to send an email invitation including a link to the survey titled “Idea theft in Academia” to the university mailing lists of each university. However, universities do not wish to spam their staff and researchers with excess emails. A few universities were willing to distribute the survey in their internal communication channels. The survey was published at Aalto Into website (Aalto University, 2019c), University of Eastern Finland’s internal Yammer channel and in the University of Oulu’s Intranet. However, the survey was getting only a few hits and responses. In order to obtain a satisfactory amount of responses to the survey, contact details of researchers from the abovementioned universities were obtained from their universities websites. The email including a short introduction of the research, consent message and a link to the survey (Appendix 1) was sent to approximately 8436 university employees including PhD candidates, researchers and professors. The link was also shared in my personal Facebook and LinkedIn feed and in a Facebook group “Akateeminen ompeluseura”.

6.3 Interviews

Originally, the idea was to conduct interviews with interested respondents in addition to the online survey. Volunteers were asked to leave their contact information at the end of the survey or contact via email if they wished to be further interviewed on the matter. Altogether 31 respondents expressed their willingness for an interview, most of them (24) through the survey, and the rest (7) through email. However, since the answers obtained from the survey proved to be extensive enough for a master’s thesis, interviews were not held.
6.4 Results of the Empirical Research

6.4.1. Response Rate

Altogether, 193 respondents took part in the survey. The goal was to obtain at least 100 responses to generate sufficient amount of data for the thesis. This goal was surpassed, mainly due to the manual email contacting, which increased the responses from 15 to 193. Estimating the exact response rate is difficult, because the exact number of relevant people who have seen the survey is hard to estimate. The best estimate can probably be derived using the number of research personnel contacted via email (8436). This way the response rate would be 2.3 %. The university specific response rates are presented in Figure 6 with the exception of University of Eastern Finland, because the number of emails sent to researchers could not be retrieved from the email. The response rates are quite low and thus very generalizable conclusions cannot be drawn from the data. It is not uncommon that an online survey receive low response rates. Online surveys offer an easy way to contact a large number of respondents quickly, however, the surveys can easily drown in the mass of surveys or emails and, thus, it can be difficult to attract respondents. Furthermore, people are often reluctant to participate in surveys if they are busy or if the topic is not relevant to them.

![Response rate per university](image)

Figure 6. Response rate per university estimated using the number of responses from each university and the number of emails sent to research staff of each university.
According to Saled and Bista (2017), online survey response rate depends on several factors including the respondent’s email checking habits, their attitude and interest toward the research, rewards, length of the survey, privacy and confidentiality related issues, the survey structure, reminders and pre-notifications. For example, over 50% of the participants stated that they only open emails from people they knew. Generally, the participants are more willing to respond to surveys if they came from students, colleagues or authority figures, the participant was interested in the topic, the survey was academic in nature, the completion of the survey took less than 15 minutes, the survey questions were short and concise, the email invitation looked professional and if the participants were assured of anonymity and confidentiality. Pre-notifications and reminders were also seen to increase the willingness to respond. Van Mol (2015) also found that extra reminders are a highly effective way to obtain greater sample sizes and suggested that students receive so many surveys that they might suffer student survey fatigue.

The survey invitation email was titled “Survey related to idea theft in Academia / Tiedevarkauteen liittyvä kysely”. The title was chosen so that it was informative with regard to the topic of the survey and the target audience. The email was started with a question” Has anyone ever stolen your research ideas or results, or has someone else’s actions prevented you from patenting your inventions?” to pique the interest of the respondents. The question was followed a short introduction of the survey creator, the reasons why the survey is conducted and a short description of the survey topic. The respondents were asked to participate to the survey by providing a hyperlink. The email message was provided in English and in Finnish, though the survey was only available in English.

The survey invitation email was designed to be professional, informative, and easy to understand. For this reason, the words ‘idea theft’ was used in the email title and in the survey title instead of the actual term ‘misappropriation’, which is probably unfamiliar to most of the respondents. The term misappropriation, however, was used in the actual survey questions, with a definition from TENK explaining the meaning of the term. In hindsight, it would have been useful also to explain how plagiarism and misappropriation differ from each other and to ask if the respondents have experienced plagiarism, because it became evident while reading the answers that some of the respondents might have mixed the two terms or do not make a distinction from one to another. The survey invitation email and the survey questions were proofread by some
researchers and the questions revised to make the survey more clear. However, a few comments were made by my researcher friends that the terminology was somewhat hard to understand even with the definitions. It is possible that some of the respondents found the survey questions too hard to understand or felt that filling the survey too time demanding, and thus, did not complete the survey. Two survey invitation receivers commented on typos or mistakes in the invitation email, which were corrected. However, these typos and mistakes were only minor and probably did not affect the response rate negatively. It might have been a good idea to include both Finnish and an English versions of the survey, because some of the terminology, such as the term misappropriation (anastus), might have been easier for Finnish speaking respondents to understand. It probably would have been possible to combine the data from two surveys into one in Webpopol.

The survey was designed so that it contained compulsory multiple choice questions regarding the main topic of the survey, voluntary open questions where the respondents could further elaborate the multiple option answers as well as optional multiple choice regarding the title and affiliation of the respondent. This way the survey could be completed quickly if the respondent did not have much time on their hand or if the topic was not particularly relevant to them. The title and affiliation were chosen as optional to protect the anonymity of the respondent if they wished so. This option probably did not make much difference to, for example PhD candidates, but for respondents holding a higher position and who represent a smaller portion of university staff, might want not to disclose their title. The survey was also set as anonymous, meaning that, even the person collecting the survey data cannot identify the respondents from their answers.

Sending an email reminder regarding filling the survey would have probably increased the response rate. However, this would have been a huge task, because the emails were send manually. Furthermore, since some universities hinted that sending such a survey email to their researchers in the first place could be seen as spamming, reminder emails were not send. Overall, the response to the survey was positive, only one respondent asked how their contact information had been found.

### 6.4.2. Survey Responses

**The respondents.** Altogether, 193 academics responded to the survey. Most responders were willing to disclose their university affiliation (Figure 7). However, the exact number of responders if not known, since the responders had the option to choose
multiple affiliations. It is typical that a researcher might be employed by multiple different universities during their academic career. For example, Aalto University has a policy that a post-doctoral researcher should hold position in another university than their “home university” from which they defended or that the researcher should spend at least six months at another university before returning to their “home university”. Almost a quarter of the respondents were from Aalto University, followed by University of Helsinki and Tampere University. The lowest amounts of answers were received from University of Vaasa and Åbo Akademi. The results seem to correlate with the number of researcher staff contacted from each University. The respondents also had the possibility to choose the option “other” and provide more details regarding their affiliation. The other option was chosen by five respondents. In addition, from the information gathered from the survey, it was revealed that one responder has been affiliated with three different Finnish universities and two respondents have been affiliated with a foreign university in addition to a Finnish university.

![University affiliation of the respondents.](image)

Out of the 193 respondents, 189 disclosed their positions at the university (Figure 8). Almost a third of the responses came from doctoral candidates (30 %), closely followed by post-doctoral researchers (26 %). Professors and assistant/associate professors also took part in the survey actively. The survey was mainly targeted for university staff who
fall under the act of University Inventions Act, but a few responses were also received from master’s students.

Figure 8. The position of the respondents at the university.

Figure 9. Overview of misappropriation of research ideas.
**Experiences of misappropriation.** The majority of the respondents (61%) had not experienced misappropriation of their research ideas personally or had not heard misappropriation experiences from their colleagues or acquaintances (53%) (Figure 9). Respondents were asked to specify who had conducted the misappropriation by choosing from a list of options. The respondents had the possibility to choose multiple options. In both cases, misappropriation was mainly conducted by colleagues, and collaborators and supervisors were also identified as the top offenders. Misappropriation does not seem to be that common in the peer-review processes, however the experiences seem to vary between personal and non-personal experiences.

**Personal experiences of misappropriation of research ideas due to the following party/parties**

<table>
<thead>
<tr>
<th>Party/Parties</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colleague misconduct</td>
<td>57%</td>
</tr>
<tr>
<td>Collaborator misconduct</td>
<td>29%</td>
</tr>
<tr>
<td>Supervisor misconduct</td>
<td>24%</td>
</tr>
<tr>
<td>Co-author misconduct</td>
<td>18%</td>
</tr>
<tr>
<td>Other (please specify in the next section)</td>
<td>17%</td>
</tr>
<tr>
<td>Reviewer misconduct (grant applications)</td>
<td>8%</td>
</tr>
<tr>
<td>Peer-reviewer misconduct (journal)</td>
<td>5%</td>
</tr>
<tr>
<td>Peer-reviewer misconduct (conference)</td>
<td>0%</td>
</tr>
</tbody>
</table>

$n = 76$, selected answers = 120

**A colleague or an acquaintance had experienced misappropriation of their research ideas due to the following party/parties**

<table>
<thead>
<tr>
<th>Party/Parties</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colleague misconduct</td>
<td>48%</td>
</tr>
<tr>
<td>Supervisor misconduct</td>
<td>26%</td>
</tr>
<tr>
<td>Collaborator misconduct</td>
<td>24%</td>
</tr>
<tr>
<td>Co-author misconduct</td>
<td>16%</td>
</tr>
<tr>
<td>Other (please specify in the next section)</td>
<td>14%</td>
</tr>
<tr>
<td>Peer-reviewer misconduct (journal)</td>
<td>12%</td>
</tr>
<tr>
<td>Peer-reviewer misconduct (conference)</td>
<td>4%</td>
</tr>
<tr>
<td>Reviewer misconduct (grant applications)</td>
<td>9%</td>
</tr>
</tbody>
</table>

$n = 91$, selected answers = 141

Figure 11. The identified parties who had conducted misappropriation in both personal and non-personal experiences.
In order to gain more insights into experiences of misappropriation, the respondents were offered the opportunity to provide more details of their experiences in the form of an open answer. Almost all of the respondents (70) who indicated that they had personally experienced misappropriation decided to share their stories and many respondents (65) also shared the experiences of their colleagues or acquaintances. The answers were read through carefully and the several topics arose from the answers giving insight into the experiences. In most cases, the respondents stated that their research ideas had been presented as someone’s own, but did not specify further. Other recurring themes in both personal and non-personal experiences included issues related to research grants, authorship disputes and plagiarism. Some researchers reported that grant money had been applied using someone else’s ideas or the grant was used to fund someone else’s research. The authorship disputes related mainly to the order of the authors as well as missing names from the author or acknowledgement section.

Only four experiences had direct links to trade secrets and patents. The first case relates to collaboration between university and a commercial partner. The second case relates to unintentional disclosure of information, which seemed to lead into destruction of the novelty of a potential patent application. The third case, in turn, is an example of inventorship dispute, in which the parties did not agree on their contribution. The fourth case involved a company started by university researchers and related to a dispute over ownership of research findings as well as a settlement between the company and the university. The scarcity of IP related matters in the experiences indicate that even though researchers experience misconduct, it does not seem to relate to IP rights often.

“I am a professor, who is also active as an R&D manager in industry. I have multiple experiences where confidential, potentially patentable information has been used by commercial partners despite the existence of non-disclosure agreements. These breaches of confidence related mainly to... in some case, the... were not only used in breach of confidence but filed for patents by the other parties. The partners were invariably large US-based hi-tech industries, in which cases the costs of litigation would have been prohibitive.”

“In a co-operative project I was told of an idea. That idea was discussed in a conference paper by me. Later the the "farther of the idea" told that this conference paper prevented patenting of the idea.”
“One in a patent application, where the two collaborators slowly and steadily pushed me out of my idea, claimed higher percentage in the royalty, nearly all of it and then pushing me out of the project.”

The responses revealed the researchers are not always sure what counts as misappropriation and in many cases the respondents did not have definite proof of misappropriation. In same cases research groups working within the same research idea may study the same topics by coincidence. Some respondent’s also voiced that there seems to be grey area or two sides two the story and that sometime it is hard to say who came up with the idea.

“I answered yes but the proper answer would have been that I suspect it. These things are difficult to prove because many people get same ideas at the same time.”

“I answered ‘yes’, but I have not definitive proof of this. It is extremely difficult to prove, but one can have strong sense of these things. I believe I have subject to several smaller scoops.”

“Furthermore, a kind of the crucial issue here is that the line between supervisor’s and postgraduate’s ideas are not clear. For example, I wasn’t working with this new concept at all before (or even after) the PhD student started his thesis work. Thus, while I presented the idea, I cannot say surely whether it was mine or not -- without the student’s contributions, I wouldn’t even be aware of the development in this new concept area.”

"Näistä on hyvin vaikea sanoa, onko ideavarkaus vai onko vain ajankohtainen tutkimusaihe.”

The respondents were also encouraged to share the consequences the misappropriation. Bad experiences have created mistrust among researchers and affected some researchers willingness to share their findings with others or collaborate with certain colleagues. In many cases, the consequences were seen as mild, but some researchers reported that misappropriation had negative consequences on their career and motivation. Some researchers also felt that they have not been able to report misappropriation or that the issues have been left unsolved. However, one researcher also voiced that actions such as taking someone’s research idea is not always a bad for science.
"The supervisor has influenced on my career as I have been dependent of the supervisor's recommendations, there has not been a possibility to report this anywhere. I have not been collaborating with these professor. I also had burn out based on these experiences. This has nearly ended my academic career, I have been able to continue in other research unit for short periods."

"The general consequence is that one learns not to discuss any ideas before one has carried out the research oneself. Definitely negative impact on collaboration."

"I have never raised these issues with the persons, but avoided cooperation after these happened. broadly speaking the experience is downscaling motivation to research work and makes one wonder how common these type of experience actually are."

"In none of the cases the issue was solved. There seems to be no protocol of how to deal with these problems and the easiest way is simply not to collaborate with the defecting persons. Also, in some cases, quite a lot of time has passed before one realises that a misconduct has happened."

"When people have lacked their own ideas, they have taken mine. But, in fact, even though this is in principle wrong, it doesn't really matter, since in science "owning" things should in my opinion not be possible. Consequently, e.g. patenting research findings is in my view slowing down progress."

**Impact of misappropriation on collaboration, innovation and patenting.** The respondents were asked to voice their opinion for three statements (Figure 12). The first statement aimed to investigate whether misappropriation is a common phenomenon in Academia. The results show that researchers have varying opinions on misappropriation. However, the majority of the respondents either disagreed (37 %) or disagreed strongly (12 %) the statement. Many respondents also seemed to be neutral towards the topic. The second statement related to the impact fear of misappropriation has on collaboration. In this case, the majority seemed to either agree (32 %) or strongly agree (25 %) that fear of misappropriation affects collaboration negatively. The third statement related to the effect of fear of misappropriation on innovation and patenting. In this case, the majority agreed (29 %) or strongly agreed (12 %) that fear of misappropriation has negative effects on innovation and patenting. However, 10 % of the respondents felt that they could not provide an answer while 24 % remained neutral. This might indicate that patenting is not as familiar or as relevant to the responders as for example collaboration.
Figure 12. Perceptions on misappropriation and its effect on collaboration, innovation and patenting.
The respondents were also asked if someone else’s actions have prevented them from patenting an invention, and provide more information about the experience. Figure 13 shows that only 5% of the respondents, in this case only 10 respondents reported that someone else’s actions have prevented them from patenting. In most cases, a researcher from the same university or a collaborator was the party was seen to inhibit patenting. The open answers provide the most useful information with regard to patent prevention. One respondent suggests that the actions that prevent patenting are often caused by accidental disclosures instead of intentional actions. Another suggest that the university lawyer missed the deadline for the researchers to file a patent, but did not provide more details of the deadline.

“A lack of understanding of destroying novelty by undertaking some sort of communication in the public domain is widespread, and this has led on occasions to the inability to file a patent. This does tend to occur in academia, usually not with mal-intention.”

“The university lawyer was negligent in her job that she missed the deadline for us to file.”
“We have faced a case where a collaborator made a patent application on our idea which even prevented us making an invention notice in our own University.”

6.4.3. Survey Outcome

Due to the low response rate, very accurate conclusions cannot be drawn from the outcomes of the survey. However, it is clear that the topic was found interesting based on the number of open answers and comments received, as well as the number of respondents interested in a further interview. Even though misappropriation and research misconduct seem to occur in academic settings in various forms, it is mostly related to matters such as authorship, which are more related to research ethics than IP. The results indicate that there might be some incidents, which relate to trade secrets or patents, however, based on the survey, IP related issues do not seem to be a severe problem in Finnish universities. The nature of the incidents mentioned in the survey responses suggests that most of the IP related issues could be overcome by increasing the awareness of IPRs as well as communicating and agreeing on potential protection and commercialisation measured beforehand.
7 CONCLUSIONS AND RECOMMENDATIONS

This thesis has provided a broad overview on the nature of academic research, and, how universities balance their missions of conducting research, disseminating the research findings and generating a social impact. Academic research is collaborative in nature and it is common for researchers often discuss their research ideas during various situations including coffee breaks, team meetings, seminars and international conferences. The exchange of ideas may foster the formation of scientific breakthroughs, but it simultaneously sets the researchers in a vulnerable position. Researchers also disclose their research ideas and plans during journal and grant application peer-review processes, which have been established to assure high quality publications and research, but again set the researcher vulnerable and at the mercy of the reviewers, whose identity is not often revealed. The race for high quality publications and securing funding, which is part of the nature of academic research, might create incentives for cheating. The rush to publish as well as the potential information leaks may make the TTOs task of protecting and commercialising the research findings hard. The researchers are advised to submit an invention disclosure, which starts the official evaluation and commercialization process. If the researchers inform the university early on of their findings, the universities can provide information regarding what to disclose and what not to disclose, when an NDA should be used and what would be the suitable time to publish.

The most important forms of IP in academics research are copyrights and patents. The ownership of the IP in an academic setting is different than normal employment contracts as the ownership depends mainly on the funding source. The universities start the evaluation by determining the ownership of the IP, after which the patentability and commercial potential are evaluated. The ownership of IP can be transferred from researcher to university or visa versa. However, the university must own the IP in order to protect it and commercialise it. However, the universities compensate the researchers if net revenue is created. Universities commercialise research findings mainly by licensing or selling research findings or IP. Their aim is not to gather a big portfolio, but rather guide the early phase inventions and research findings to companies, which can then take the invention into the next level. University findings are often early phase inventions, and these kinds of cases, it is beneficial to mature the invention or finding during a commercialisation project, such as Business Finland’s TUTLI project before commercialization. The TUTLI project often lead to a formation of a spinout company.
The most common IP related problems in academic research include lack of IP know-how, which may lead to unintentional disclosures of confidential information, and the consequent loss of trade secrets, premature disclosures, which may destroy the novelty of an invention, authorship disputes concerning publications and inventorship disputes related to patents. The different legislations, which affect for example, the patentable subject matter or the grace period during which a patent could still be filed after disclosure, force universities to formulate different kinds of IP strategies for different kinds of inventions. Furthermore, some forms of research misconduct may also have implication on university IP, even though they are commonly considered as research ethics matters. Universities provide researchers guidelines and training on both research integrity and IP. However, the resources of Finnish university TTOs are often more limited compared to the ones operating in the US, since the funding they receive is often not linked to their performance. Many of the abovementioned issues could be resolved or reduced if the universities would invest more in educating the researchers about the significance of IP and university the technology transfer processes. Another issue universities face is missed potential of the research they are not aware of. University researchers produce a vast amount of high quality articles, but only a few percentages of that research is submitted to TTOs as invention disclosures. Universities should try to form strategies for maximising the societal benefit of research. Universities could learn from the policies of the innovative universities and they could perhaps form strategic partnerships with successful universities.
REFERENCES


SOURCES OF LAW

International Framework

Berne Convention
Rome Convention
Paris Convention
Strasbourg Agreement Concerning the International Patent Classification
Patent Law Treaty (PLT)
Budapest Treaty
TRIPS agreement
Patent Cooperation Treaty (PCT)
WIPO Copyright Treaty

EU Legislation

Directive 2016/943/EU
Directive 98/44/EC
Directive 2001/29/EC
Directive 2009/24/EC
Directive 96/9/EC,
Directive 2016/943/EU

Finnish Legislation

Patents Act (550/1967)
Copyright Act (404/1961)
Trade Secrets Act (595/2018)
Universities Act 558/2009
University Inventions Act 369/2006

U.S. Legislation

US patent legislation (35 U.S.C.)
Copyright Act of 1976 (17 U.S.C.)

The Defend Trade Secrets Act (DTSA)

Has anyone ever stolen your research ideas or results, or has someone else’s actions prevented you from patenting your inventions?

I am a master’s student at Hanken School of Economics. I am conducting a study for my master’s thesis related to the phenomenon of idea theft (formally known as misappropriation, which is a form of research misconduct) in Academia. In addition to a literature research, I would like to conduct a small survey (and possibly some interviews) to find out whether idea theft is a common phenomenon in Academia and what kind of consequences misappropriation of research ideas has on collaboration, innovation and patenting.

Research usually involves sharing research ideas with other researchers through collaboration with researchers from the same department or university or from different local and foreign universities. Research ideas can also be shared when writing grant applications and while networking at conferences. At best, this can lead up to a fruitful collaboration and scientific breakthroughs, but at worst the researcher might end up getting ‘scooped’, i.e. their research ideas are stolen by a colleague, a collaborator, a peer-reviewer or someone else who has access to unpublished data. Someone else’s actions can even prevent a researcher from patenting their innovation if the novelty aspect is destroyed. Furthermore, the fear of scooping might reduce the willingness for collaboration and thus affect innovation negatively.

If you want to help me with my master’s thesis, please to participate in a short anonymous survey by clicking on the hyperlink below (please also see the consent message): https://www.webropolsurveys.com/S/79586E53ACAE7B92.par

If you also wish to be interviewed, please email me at eveliina.jutila@student.hanken.fi. The interviews will be referred to as titles, e.g. Doctoral Candidate 1, Professor 1 or as Respondent 1, Responded 2, if wished. As this is a sensitive matter, the names and contact information will be deleted from the data. The interviewees will also have the possibility to view their interview transcripts and to withdraw their interview before the thesis is published.

Kind regards,

Eveliina Jutila
Hanken School of Economics
Department of Commercial Law
Master's Degree Programme of Intellectual Property Law
eveliina.jutila@student.hanken.fi
+358504005170
Consent message

“I hereby give my consent to processing my personal data, as obtained from the survey I am about to respond to, for the purpose of scientific research. My personal data will be processed securely according to the data protection policy and ethical guidelines of Hanken School of Economics. The legal ground for processing my data is my consent and the Finnish Data Protection Act.

Moreover, I understand and consent to that

1. data that directly identifies me personally will not be visible in any results or publications based on the data;
2. such part of the data that directly identifies me personally (e.g., [name, email address, address, or similar]) will be erased [within four weeks of my response], before any analysis of the data is conducted;
3. data that do not directly identify me personally (e.g., answers to survey/interview questions without identifying information) will be stored [for one year] for the purpose of conducting scientific research analyses;
4. up until [four weeks after my response], I can withdraw my consent and have the research team erase my personal data, or request the research team to show, disclose, or correct my data;
5. after the period of [four weeks after my response], I will not be able to ask the research team to show, correct, or erase my personal data, or withdraw my consent to participate in the research. This is because after the research team has erased the data variables that directly identify me personally, they cannot identify and extract my data from the overall dataset any more;
6. as an exception to 2) above, such verbal/textual descriptions which I give as responses in this study (e.g., by typing in, or speaking on audiorecording) and in which I may myself express my name or other information that may directly identify myself, will not be erased from the collected data after the period of [four weeks after my response]. You may therefore want to avoid expressing your own name or identity in your responses
7. as an exception to 2), the personal data based on which I was contacted (e.g., email address) will not be deleted after the period of [four weeks after my response]. Such contact information will be stored in a separate contact information file in which no other personal data (including my responses) are included nor linked to. The purpose of storing these data is to enable messages directly related this research to be sent to me. These data will also be erased after [four weeks] and will not be given or disclosed to any parties outside the research team nor used for secondary purposes.

Your contact information was received/sample for this study from the University website.

A description record of the data processing activities of this research is available on request at eveliina.jutila@student.hanken.fi. If you have further questions regarding the research or if you want that your personal data are to be erased or corrected, please contact eveliina.jutila@student.hanken.fi. If you have complaints or other questions related to the processing of your personal data for this purpose, contact the data processing officer of Hanken School of Economics, dpo@hanken.fi”
Onko joku joskus varastanut tutkimusideasi tai –tuloksesi, tai onko jonkun muun toimet estäneet sinua patentoinnasta innovaatiotasi?


Olla olevan linkin takaa löytyy lyhyt aiheeseen liittyvä anonyymi englanninkielinen kysely, johon voit osallistua, jos haluat osallistua graduun liittyvään tutkimukseen. Kyselyn avoimiin kohtiin voi myös halutessaan vastata suomeksi. Lue myös suostumusviesti ennen kyselyn vastaamista.

https://www.webropolsurveys.com/S/79586E53ACAE7B92.par

Jos haluat, että sinua myös haastatellaan aiheeseen liittyen, voit laittaa minulle sähköpostia osoitteeseen eveliina.jutila@student.hanken.fi. Puhtaaksikirjoitetut versiot haastattelulista lisätään graduun litteisiin. Koska kysyessä on arkaluotoinen aihe, haastateltoivien nimää tai yhteistietoja ei mainita graduussa. Haastateltoivien viitataan joko tittelilää, kuten Tohtorikandidaatti 1 (jos tähän annetaan lupa) tai yksinkertaisesti Vastaaja 1. Haastateltoivilla on myös oikeus nähdä puhtaaksikirjoitetut versiot haastattelulistaan ja he voivat halutessaan pyytää haastatteluun liittyvän datan poistoa ennen graduun julkaisua.
Suostumusviesti


Lisäksi hyväksyn että,

1. tietoja, josta henkilöllisyyteni voi tunnistaa, ei paljasteta tai käy ilmi tutkimuksen tuloksissa tai julkaisuissa
2. se osa tiedosta, jossa henkilöllisyyteni voi suoraan tunnistaa (esim., [nimi, sähköpostiosoite, osoite tms.) poistetaan [neljän viikon kuluessa vastauksestani] ennen tietojen analysointia;
3. tiedot, joista henkilöllisyttä voin suoraan tunnistaa (esim. kyselyt tai haastattelut) säilytetään [4 vuosi] tieteellisästi jatkoanalyseja varten, mukaan lukien tiedon, joka on antanut tunnistettava tiedot on poistettu (kohta 2. yllä), tutkimusryhmä ei enää näitä tutkistaa ja erotella minun tiedotani tietokannasta;
4. voidan poistaa tietojani tutkimusryhmää pois esimerkiksi

Yhteystieto täätä tutkimusta varten saatati siihen yliopistosi sisuulta.

Selosteen käsittelytoimistoon on pyynnöstä saatavilla eveliina.jutila@student.hanken.fi. Mikäli sinulla on kysymyksiä tai haluat ottaa yhteyttä eveliina.jutila@student.hanken.fi. Mikäli sinulla on kysymyksiä tai haluat valitettavaksi käsittelystä, ota yhteyttä dpo@hanken.fi.”
Idea theft in Academia

1. I hereby give my consent to processing my personal data, as obtained from the survey I am about to respond to, for the purpose of scientific research. My personal data will be processed securely according to the data protection policy and ethical guidelines of Hanken School of Economics. The legal ground for processing my data is my consent and the Finnish Data Protection Act.*
   ○ Yes

2. Have you personally experienced misappropriation of your research ideas? *
   According to the Finnish National Board on Research Integrity (TEKN): "Misappropriation refers to the unlawful presentation of another person’s result, idea, plan, observation or data as one’s own research." Examples of misappropriation include stealing the unpublished research idea of another researcher/research group, for example, during collaboration, while reviewing an article or a manuscript or a grant application, and proceeding with the idea as their own.
   ○ Yes
   ○ No

3. If you answered "Yes" to Question 2, please select the suitable option(s) from the list.
   - Colleague misconduct
   - Collaborator misconduct
   - Co-author misconduct
   - Supervisor misconduct
   - Reviewer misconduct (grant applications)
   - Peer-reviewer misconduct (journal)
   - Peer-reviewer misconduct (conference)
   - Other (please specify in the next section)

4. If you answered "Yes" to Question 2, you can further elaborate on your experience(s) in this section (optional).
   You can, for example, describe your experience(s) in further detail, discuss whether the issue was resolved or not, and what kind of consequences misappropriation has had on you and your Academic career. Quotations of the answers may be used in the thesis. You may add your title, i.e. Doctoral candidate, Professor etc., if you wish (optional).

5. Has someone you know, perhaps a colleague or an acquaintance, experienced misappropriation of their research ideas? *
   ○ Yes
   ○ No

6. If you answered "Yes" to Question 5, please select the suitable option(s) from the list.
   - Colleague misconduct
   - Collaborator misconduct
   - Co-author misconduct
   - Supervisor misconduct
   - Reviewer misconduct (grant applications)
   - Peer-reviewer misconduct (journal)
   - Peer-reviewer misconduct (conference)
   - Other (please specify in the next section)
7. If you answered "Yes" to Question 5, you can further elaborate on the experience(s) of your acquaintance in this section (optional).

You can, for example, describe your experience(s) of your acquaintance in further detail, discuss whether the issue was resolved or not, and what kind of consequences misappropriation has had on your acquaintance and their academic career. Quotations of the answers may be used in the thesis. You may add the title of your acquaintance, i.e. Doctoral candidate, Professor etc., if you wish (optional).

8. Have someone else's actions prevented you from patenting your invention? *

For example, by destroying the novelty aspect of your invention by publishing information related to the invention.

- Yes
- No

9. If you answered "Yes" to Question 8, please select the suitable option(s) from the list, e.g. whose actions prevented you from patenting your invention.

- Researcher from the same university
- Researcher from a different university
- Co-author
- Collaborator
- Supervisor
- Other (please specify in the next section)

10. If you answered "Yes" to Question 8, you can further elaborate in this section (optional).

11. Answer the following statements by choosing the appropriate answer *

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Not applicable</th>
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<tr>
<td>Misappropriation of research ideas is a common phenomenon in Academia</td>
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<td>Fear of misappropriation of research ideas affects collaboration negatively</td>
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<tr>
<td>Fear of misappropriation affects innovation and patenting negatively</td>
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</tr>
</tbody>
</table>
12. What is/was your position at the university (optional)?

- Bachelor’s student
- Master’s student
- Research assistant
- Teaching assistant
- Doctoral candidate
- Post-doctoral researcher
- Teaching researcher
- Special researcher
- University researcher
- Lecturer/Senior Lecturer
- Assistant/Associate Professor
- Professor
- Department head
- Dean
- Rector
- Other

13. Which university are you associated with (optional)?

- Aalto University
- University of Helsinki
- University of Eastern Finland
- University of Jyväskylä
- University of Lapland
- Lappeenranta University of Technology LUT
- University of Oulu
- Tampere University of Technology
- University of Tampere
- University of Turku
- University of Vaasa
- Åbo Akademi University
- Other

14. If you wish to be further interviewed on the subject, you can leave your contact details below (optional). You can also contact me via email to be interviewed evelina.jutila@student.hanken.fi

Name

Lastname

Email

15. If you would like to provide additional feedback or comments, use the space below. Thank you for your participation!