Drafting the Future: GenAI in Patents

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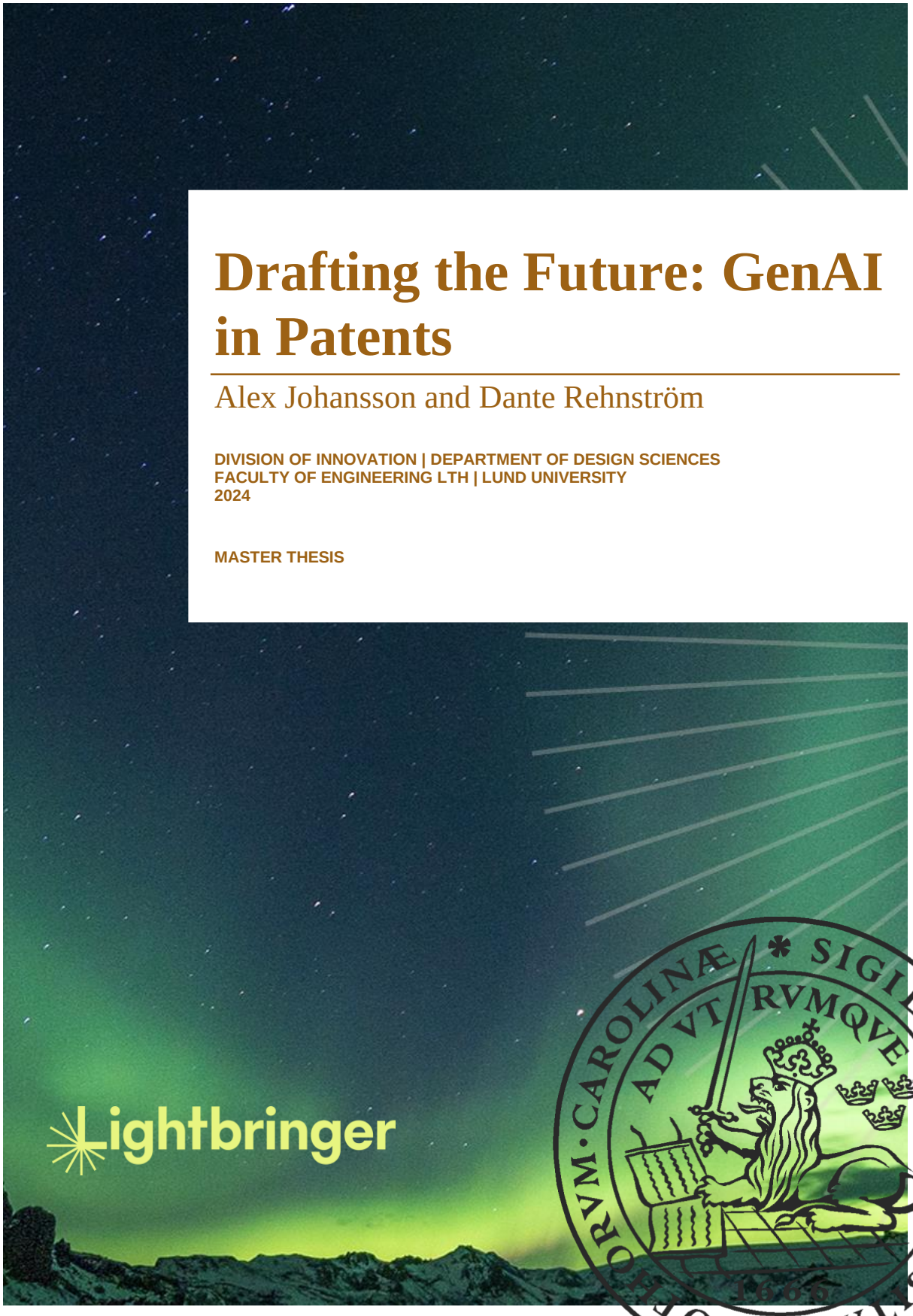

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Exploring Customer Value of Innovative Generative AI Solutions in Patent Application Processes

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Abstract

This master thesis exploratively investigates the customer value provided by innovative GenAI solutions, such as the studied Lightbringer tool, in the patent application process. The research primarily examines how different customer segments; IP firms, small-scale innovative firms, and large-scale innovative firms perceive the usefulness of GenAI technologies. Through a combination of semi-structured interviews and case study analysis, this study addresses three central research questions: what customer value is created, the obstacles and fears encountered by potential customers, and the firm characteristics that drive the usefulness of GenAI solutions in patent drafting.

The findings reveal that GenAI solutions enhance efficiency and quality in patent applications by automating routine tasks and improving accuracy, which are highly valued across all customer segments. However, concerns about the accuracy of AI-generated content and the handling of legal nuances present barriers to adoption. Furthermore, the study identifies distinct needs and preferences across customer segments, implying the need to deal with them separately for each customer segment.

This thesis contributes to the field by providing empirical evidence of GenAI:s impact on the patent application process and offers insights into the market dynamics and customer differences in this industry. The research suggests further examination of the gains and pains found in the study and the proposed gain creators and pain relievers as well as research into the integration of GenAI tools within broader IP management strategies and their longitudinal effects on patent quality and innovation cycles.

Keywords: Generative AI, patent applications, customer value, patent drafting, technology adoption

Sammanfattning

Denna masteruppsats undersöker utforskande kundvärdet som erbjuds av innovativa GenAI-lösningar, såsom det studerade verktyget Lightbringer, i processen för patentansökningar. Studien undersöker främst hur olika kundsegment; patentbyråer, småskaliga innovativa företag och storskaliga innovativa företag uppfattar nyttan av GenAI-teknologier. Genom en kombination av semi-strukturerade intervjuer och en fallstudieanalys adresserar denna studie tre centrala forskningsfrågor: vilket kundvärde som skapas, de hinder och rädslor som potentiella kunder stöter på, samt de företagskaraktäristika som driver nyttan av GenAI-lösningar i patentskrivning.

Resultaten visar att GenAI-lösningar ökar effektiviteten och kvaliteten i patentansökningar genom att automatisera rutinmässiga uppgifter och förbättra noggrannheten, vilket är högt värderat av alla kundsegment. Dock utgör oro över noggrannheten i AI-genererat innehåll och hanteringen av juridiska nyanser hinder för adoption. Vidare identifierar studien distinkta behov och preferenser hos kundsegmenten, vilket pekar på ett behov av att behandla varje kundsegment separat.

Denna uppsats bidrar till forskningsområdet genom att tillhandahålla empiriska bevis på GenAIs inverkan på patentansökningprocessen och erbjuder insikter gällande marknadsdynamiken och kundskillnader i denna bransch. Studien föreslår vidare undersökning av de vinster och smärtor som identifierades i studien, samt de föreslagna vinstskaparna och smärtlindrarna. Dessutom föreslås vidare forskning kring integrationen av GenAI-verktyg som en bredare strategi inom IP och dess långsiktiga effekter på patentkvalitet och innovationscykler.

Nyckelord: Generativ AI, patentansökningar, kundvärde, patentskrivning, teknikadoption

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The authors are equally thankful to Ola Wassvik, their supervisor at the case company, Lightbringer. Ola’s practical insights, thoughtful suggestions, and ongoing support have been essential to the successful completion of this thesis. His provision of valuable resources and timely feedback made the research process both productive and aligned with real-world needs. A special thanks also goes to the rest of the Lightbringer team. Their willingness to share their time, knowledge, and expertise significantly enriched this research.

The authors would also finally like to express their sincere appreciation to all the interviewees who participated in this research. Their candid responses and invaluable insights provided the foundation for the analysis. Without their willingness to contribute, this thesis would not have been possible.

Thank you all for making this thesis a reality.

Lund, May 2024

Alex Johansson & Dante Rehnström

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List of acronyms and abbreviations

AI	artificial intelligence
EPO	European Patent Office
FTO	freedom to operate
GenAI	generative artificial intelligence
IDF	invention disclosure form
IP	intellectual property
IPR	intellectual property right
LIF	large-scale innovative firm
LLM(s)	large language model(s)
PCT	Patent Cooperation Treaty
PRV	Swedish Intellectual Property Office
R&D	research and development
SaaS	Software-as-a-Service
SIF	small-scale innovative firm
VPC	value proposition canvas

1 Introduction

In the introduction, a description of the background, the problem at hand and the research questions as well as the purpose of the report are provided. Furthermore, the focus and delimitations of the study are discussed and finally the thesis outline is illustrated, to guide the reader.

1.1 Background

With the emergence of generative artificial intelligence (GenAI) solutions in various fields, questions about their disruptive force and usefulness emerge. With the release of ChatGPT and its successors, the use of Large Language Models (LLMs) exploded and there is no question about its already evident impact on business and society (Sætra, 2023). Generative AI has proven useful in a multitude of industries and applications such as everything from optimizing supply chains and forecasting demand to improving patient care (Minevich, 2023). Through its powerful capabilities of utilizing large datasets and identifying patterns in text and data the technology solution provides tailored and data-backed insights. Furthermore, the cognitive-like abilities of artificial intelligence (AI) and its ability to learn and reproduce human language and logic has also provided a solid foundation for further personalization of software, devices, and virtual assistants (Minevich, 2023).

The generative AI solutions' capabilities combined with immense quantities of niche industry data also enables algorithms and specific use cases for almost all industries (Minevich, 2023). One of those industries is the patent industry, where the nature of patent law makes it a unique use case for generative AI (Barnes, Rao, & Mills, 2023). Patent drafting merges technological knowledge, legal understanding and creative writing to create a simple yet nuanced patent application of complex technology (Barnes, Rao, & Mills, 2023). While the generative AI solutions are good at deferring to standards in for example law documents or language as well as precise explanations and technology data, issues are still raised concerning creative writing and handling legal nuances (Barnes, Rao, & Mills, 2023). Possible explanations for this can be that algorithms are too broadly trained which calls for specialized tools and solutions.

Some solutions and tools as such, with different use cases and approaches, have been introduced to the market to address this. One example is the Y-combinator

backed startup Solve intelligence, which have created an in-browser document editor with an AI copilot under the hood, which is now used by over 25 IP firms in US, Europe, Asia, and South America, generating a six-figure annual recurring revenue (Park, 2023). The AI solution can aid in identifying novelty and non-obviousness, critical elements of a patent application.

One of these patent generative AI solutions is the Swedish startup Lightbringer AB, later on referred to as "Lightbringer" or "the case company", which has taken to market an application that helps to automate the patent drafting process through various steps of AI-assisted detailing of the innovation and ultimately the generation of a complete patent application draft, through the use of Large Language Models and deep patent knowledge (Lightbringer, [ca. 2023]). Approximately a year since launch, the company has gained traction with both IP-firms and innovators on the Swedish market and is now looking to further expand and deepen their understanding and knowledge of customer needs and usefulness of their tool. This master thesis will thoroughly explore the provided customer value, usefulness, obstacles, and fears of using generative AI solutions like the one developed by Lightbringer through the focal lens of existing and potential customers.

1.2 Problem description

Lightbringer believes there is untapped potential in utilizing the new technological advancements in the AI space in the patent drafting process. To date, the tool facilitates the process of fleshing out, describing, drafting, and structuring everything from the initial decision from the inventor to patent all the way to the patent application being sent in (Lightbringer, [ca. 2024]).

The first phase in this process is the invention preparation phase which is traditionally conducted either via an invention disclosure form (IDF) and/or a meeting between the inventor and a patent attorney (Neustel Law Offices, 2023). Utilizing the Lightbringer tool instead enables the inventor to either conduct this phase independently with AI assistance or in cooperation with a patent attorney, which if chosen aims to facilitate faster and better cooperation and understanding between inventor and attorney (Lightbringer, [ca. 2024]).

The next phase is the patent preparation phase, where the two main tasks are (1) structuring, understanding, and fleshing out the patent and (2) drafting all required components of a patent application draft such as, but not limited to, claims, background, and figures. This phase is primarily conducted by a patent attorney and is carried out inside the app utilizing the AI features and structuring tools to enable faster drafting (Frietsch & Neuhäusler, 2019; Lightbringer, [ca. 2024]).

Simultaneously and after completion the patent application is reviewed in cooperation between inventor and attorney, where the tool enables co-reviewing of

the drafted patent application as well as an interface to follow the drafting progress. Depending on offering, help in filing is also available from Lightbringer. (Lightbringer, [ca. 2024])

As illustrated above, the Lightbringer tool involves both the inventor and the patent attorney in the patent drafting process. This means their solution is interesting to both companies looking to patent and patent attorneys looking to accelerate or structure their patent drafting. This culminates into two main customer groups: IP-firms partnering up with Lightbringer and innovative firms using Lightbringer to patent, the latter of which, from Lightbringer's side, can be divided into small- and medium-sized enterprises (SMEs) and Enterprises segmented by size of company and size of patent department. The rationale for basing the segmentation on size is (1) that size and organizational structure are characteristics that impact the patent work process in a firm and (2) to align with Lightbringer's previously defined segmentation and their need to understand their customer groups. This segmentation is sought to guide the research and provide insights into how the customer value, usefulness, obstacles and fears differ between firms of different sizes and if larger firms have potentially stricter needs that are not present in smaller firms or vice versa. These are therefore the three customer segments of interest: IP-firms, SMEs, and Enterprises. The definitions of these customer segments, in the context of this thesis, can be found in Table 1.1 and are based on the way Lightbringer thinks about them, where SMEs map to small-scale innovative firms (SIFs) and Enterprises to large-scale innovative firms (LIFs). Additionally, three different kinds of stakeholders are of interest – the Inventor, the Patent Attorney, and the Business Manager, defined in Table 1.2.

Table 1.1 Customer Segment Definitions

	Customer Segment Definition
IP-firms	Intellectual property consulting firms of all sizes, assisting other companies on project basis with the comprehensive range of tasks associated with intellectual property rights, from prior art search and drafting to filing, in this case focusing on patents.
Small-Scale Innovative Firms (SIFs)	Small-Scale Innovative Firms are firms with a consistent yearly revenue of less than 500 MSEK. On the other side of the spectrum, they also have the resources to file patents if needed, either through them generating revenue or being venture capital backed. They are, however, too small to have their own IP-department.
Large-Scale Innovative Firms (LIFs)	Large-Scale Innovative Firms are large (> 500 MSEK in consistent yearly revenue), mature firms with an in-house patent department. They've consistently filed multiple patents a year.

Table 1.2 Stakeholder Definitions

	Stakeholder Definition
Inventor	The Inventor is the employee responsible for inventing the technical solution that aims to be patented, and therefore has the initial knowledge of how the invention works. That knowledge must then be captured and ultimately conveyed in a patent application.
Patent Attorney	The Patent Attorney works with input from an Inventor, either in the organization or as a client, and has the ultimate responsibility to do prior art research, analyze and write a patent application, which is later filed.
Business Manager	The Business Manager is responsible for overseeing and organizing a company's operations and is involved in various aspects of management such as financial, operational, strategical, and developmental decisions. In relation to this thesis this is also the person that has the responsibility of ensuring protection for the organization's innovations and the processes related to that.

Lightbringer has since its launch amounted customers in mostly the IP-firm and SIF customer segments but as the long-term plan is to also obtain a substantial market share in the LIF segment, they are included in the study (Wassvik, 2024). The company therefore wants to acquire more knowledge that will help them understand their customers and how to tailor to them. Aspects that are of interest are further understanding of the customer value this tool provides, what obstacles or fears exist in attracting new customers and the customer characteristics that drive the usefulness of the tool. All of this is to be explored with the three customer segments mentioned above in mind. This knowledge will also prove beneficial from an academic standpoint as an explorative study of generative AI use cases and characteristics as well as provide a foundation for further research.

1.3 Research questions

The study focuses on answering/exploring these three research questions:

RQ1: What **customer value** (usefulness) could be created with the use of novel GenAI solutions, such as the Lightbringer application, for different customer segments (IP-firms, SIFs, and LIFs) in the patent application market, from the

perspective of different stakeholders (Inventor, Patent Attorney and Business Manager)?

RQ2: What **obstacles or fears** do different customer segments and stakeholders face in using GenAI solutions, such as the Lightbringer application in the patent application process?

RQ3: What are typical **firm characteristics** driving the usefulness of the Lightbringer application or generative AI solutions in the patent application process?

1.4 Purpose

The purpose of this master thesis is to bridge the gap between theoretical insights from academia and practical application of GenAI solutions in industry-specific contexts, particularly focusing on the patent application process and market as well as the case company Lightbringer. From an academic perspective the research aims to provide a thorough investigation into the usefulness, potential and limitations of GenAI, offering empirical evidence and a discussion on implications in the patent application domain. It seeks to establish foundational knowledge for further academic exploration not only into GenAI's role and disruptive potential in the patent application process market, but also act as a basis for scholarly inquiries into the broader applications and implications of generative AI.

On the practical and managerial front, the thesis aims to enhance the understanding of current customer segments in the patent application industry, especially in the GenAI usage context, by developing tailored value propositions with perspectives of different stakeholders in mind. This involves a deep dive into understanding customers and could further provide indications of customer segmentation and catering possibilities. Additionally, the thesis could provide content for the creation of marketing and sales material by mapping out customer value and characteristics for the case company and the industry at large.

By undertaking this exploratory study, both the academic community and the case company, Lightbringer, as well as the whole patent industry stand to gain significant knowledge that enriches the general understanding of their customer value and needs. Furthermore, understanding the tools and value they provide is a fundamental step towards further exploration of the phenomenon of GenAI solutions and their potential impact and disruption of numerous industries. The thesis therefore provides a combination of theoretical exploration and practical application.

1.5 Focus and delimitations

The focus of the study is primarily exploration of the Lightbringer application and implications of GenAI within the Swedish patent application market. The research is geographically limited to Sweden, with the case studies and majority of the research being conducted within this national context. However, Swedish companies can also apply for European patents, which can be done either through the Swedish Intellectual Property Office (PRV) or to the European Patent Office (EPO). Furthermore, given the general similarities of patent applications in Europe, the findings from the study are anticipated to be partially transferable to other jurisdictions and nations in Europe, therefore extending the relevance of the research beyond the Swedish market.

The thesis will examine three main customer segments previously mentioned: IP-firms, SIFs and LIFs. The delimitations for the SIFs are that they are post-funding or have begun generating revenue, since they are then deemed to have the necessary prerequisites in terms of patenting intentions and decision making in place to make up a viable customer and study object. Additionally, they don't have an in-house intellectual property (IP) department. As for the LIF customers, the focus of the study will be on companies with in-house attorneys as these are the most common and clear fit since the patent attorney perspective can be investigated as well as the patent department is more consolidated. The customer segment of IP-firms will be handled in its entirety. (Wassvik, 2024)

One final delimitation, to keep the size of the scope and study focused and manageable, is to investigate only parts of the process where the Lightbringer tool is applied when conducting investigations and interviews. Investigation of other parts of the process which Lightbringer doesn't handle, such as replying to notices or conducting searches, will not be exhaustively investigated. This delimitation and design ensure that the study investigates the application and potential of GenAI solutions in this part of process in a detailed and focused way.

1.6 Thesis outline

Table 1.3 below describes the thesis outline and content in each chapter.

Table 1.3 Summary of the content in each chapter

	Content
Introduction	In the introduction, a description of the background, the problem, the research questions, and the purpose of the report are provided. Furthermore, the focus and delimitations of the study are discussed, and the thesis outline is illustrated.
Methodology	In the methodology chapter, the research strategy and framework used are presented, followed by a rigorous walkthrough of the different phases of the research and an outline of the plan for upholding the research quality.
Theory	Firstly, the theory chapter provides a thorough walkthrough of the theoretical framework used. Secondly, it presents prior research and theory on relevant areas such as the patent application market and its processes, Generative AI, and firm characteristics.
Case Study - Lightbringer	This chapter about Lightbringer provides further relevant information about the case company as well as a walkthrough of the tool, with focus on GenAI-enabled features. Furthermore, the case study focus and purpose for the case company is detailed.
Results and Analysis	The results and analysis chapter consolidates and presents findings for each customer segment, stakeholder perspective as well as on an aggregated dimension. Furthermore, similarities and differences are analyzed.
Discussion	In the discussion chapter managerial implications, focusing on gain creators and pain relievers, are presented and characteristics driving usefulness discussed. Additionally, the thesis limitations, reliability and generalizability are lifted and the future development is discussed.
Conclusions	The last chapter of the report presents summarized answers to the research questions, explains the thesis contribution as well as provides suggestions for future research.

2 Methodology

In this chapter, the research strategy and design framework used are presented, followed by a rigorous walkthrough of the different phases of the research and an outline of the plan for upholding the research quality.

2.1 Research strategy

The goal of the research is to exploratively investigate the current customer value, usefulness, obstacles, and fears of adopting generative AI technology in the patent application process, and how that differs based on type of firm and stakeholder perspective.

A case study has been identified as the method-of-choice after examining the of Yin (2018) outlined conditions, which together determine what method is most pertinent to the desired research. The research doesn't require control over behavioral events and focuses on a contemporary phenomenon, further confirming the aforementioned choice (Yin, 2018).

The outlined problem description and research questions in combination with the novelty of generative AI and related solutions implied that an exploratory approach (Yin, 2018) was most suitable for the report. By determining the customer value of generative AI solutions in the patent drafting process (RQ1) the thesis aim to explore the obstacles and fears with the adoption of the technology in the patenting process (RQ2) as well as the characteristics driving the usefulness of a generative AI tool (RQ3).

After establishing an exploratory case study as the basis for the research strategy an embedded single-case study was chosen among the four design choices described by Yin (2018). The case study is embedded if also different subunits within the single-case are studied and conversely, if only "the global nature of an organization or of a program" is researched, the case study is deemed holistic (Yin, 2018). The thesis is done in collaboration with the single company Lightbringer, but within that single case, the different customer segments (subunits) of the company are investigated, making the single-case study embedded.

The different phases of the case study and its work process, which can be seen in Figure 2.1, have been based on the Yin (2018) framework, and how each phase looks like in this specific instance, are elaborated upon in the following segments.

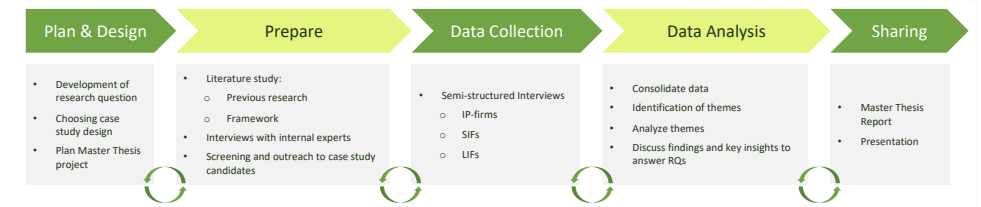

Figure 2.1 Different phases of the case study and the work process

2.1.1 Plan and design

The first step of the case study research process is the planning phase. After the problem statement was clearly defined an initial plan for the thesis was drafted. The first phase concluded with the authors deeming a case study the most appropriate way of exploring the topic and answering the research questions. This was based on the case company Lightbringer being able to provide a sufficiently large number of prospective customers within the different customer segments (subunits) to be interviewed. Additionally, interview objects with no prior knowledge of Lightbringer were easily identifiable to complement the other interviewees.

The case was defined by specifying the focus and delimitations outlined in Section 1.5. Further, the design of the study was decided in accordance with what was previously specified (an exploratory embedded single-case study). The strengths and weaknesses of this approach, and how the latter are mitigated, are described in Section 2.2.

Although the case study aims to exploratorily investigate the novel topic and the proposed research questions, Yin (2018) recommends that some statements relating to the theory should be articulated regardless of the magnitude of prior research and theory. Those include an explanation of the exploration scope (detailed in Section 1.5) and what the purpose of that is (detailed in Section 1.4) (Yin, 2018). In addition, the design should be tested to ensure that it upholds the quality required (Yin, 2018). This will also be further detailed in Section 2.2.

2.1.2 Prepare

To acquire enough knowledge on the research topic before the embedded single-case study was conducted, two main methods of obtaining the required expertise were used: (1) a literature review and (2) interviews with internal experts.

2.1.2.1 Literature review

According to Bryman and Bell (2011), a literature review is an excellent way of building a fundamental understanding of the topic to be studied, and its importance should be accentuated. Also, Yin (2018) emphasizes the significance of grasping the material before carrying out the case study. By examining previous literature, the probability of duplicating already conducted work diminishes. At the same time, the likelihood of formulating research questions which could add to the understanding of the topic increases (Yin, 2018). Thirdly, a case-specific reason was identified. Since generative AI within the patent application industry is a very novel topic, research on the separate areas, i.e. generative AI and the patent application process, also served as an inspiration for how to bridge the two fields when formulating the questions in the interview guides.

The search terms used for the literature study included, but were not limited to, "generative AI", "artificial intelligence", "patent application", "intellectual property", "patent drafting", "patent claims", "patent attorney", and "patenting process". These words were used both independently and combined in various constellations, e.g., "generative AI patenting process", to provide as relevant search results as possible. When reviewing the potential papers, an emphasis was put on recent studies, due to the novelty and changing landscapes of the topic. In addition to academic papers and books, other sources were consulted, such as governmental and official body websites, reports, and articles.

Furthermore, the literature study aimed to provide the theoretical framework(s) used in the thesis. The focus was not to reach a great number of frameworks or very complex ones, but rather one(s) which could be used to synthesize the empirical findings. Models which fit with the industry and research questions at hand, or could relatively easily be adapted to fit, were prioritized.

2.1.2.2 Preparatory interviews

To complement the literature study, interviews were conducted with senior personnel at Lightbringer, as well as with a close patent attorney partner working at an IP-firm using the Lightbringer tool. These interviews served as a way of acquiring knowledge not readily available from other sources, and consequently the foundation for the interview guides and the case study setup were partly a result of these conversations. Further, they provided valuable knowledge on the intricacies of the specific market within the scope of the research and the Lightbringer tool itself. The interviewees, their title, and the company they work for are detailed in Table 2.1.

Table 2.1 Internal interviews

Interviewee	*Title*	*Company*	*Date*
Andrew Stentiford	Partner and European Patent Attorney	Invent Horizon IP	18/01
Ola Wassvik	Chief Revenue Officer & Co-founder	Lightbringer	19/01
Dominic Davies	Chief Executive Officer & Co-founder	Lightbringer	30/01

Finally, a webinar on demand generation with David Blinow (Managing Partner at the B2B marketing agency The F Company) was attended on the 31st of January to deepen the understanding of what could be driving the customer value of products similar to the one studied in the thesis. This further contributed to the authors' setup and questions in the case study.

2.1.2.3 Case study screening

A screening of potential candidates (case study subunits) and subsequent interview guides were also created as part of the preparation phase. The interviewee candidate criteria were (1) that the interviewee works for an IP-firm, SIF or LIF and (2) that the interviewee is thoroughly involved in the patenting process, by e.g., describing an invention, drafting the application or patent decision-making. The screening was done in collaboration with Lightbringer, to ensure that the author's approach also fit the purpose for Lightbringer, but targets for the case study were established independently. The interviewee candidates were selected through (1) Lightbringer contact (2) searching the WIPO Patentscope database for firms who have filed patents recently and (3) potential referrals from conducted interviews. The potential interviewees that met the criteria above were classified according to Table 2.2 based on what customer segment the interviewee belonged to and what perspective the interviewee provided. No potential candidates were otherwise removed to minimize the author's potential impact on the reliability of the study. Six tailored interview guides were created in total, which can be found in Appendix A.

Table 2.2 Classification of interviewees

Customer segment \ *Stakeholder*	*Inventor*	*Patent Attorney*	*Business Manager*
IP-firms		X	
SIFs	X		X
LIFs	X	X	X

Conducting a pilot before the actual study is preferred (Yin, 2018) but was not done in this instance. The main reason being that it was deemed unnecessary to waste the interview of one subunit for that cause. Instead, the setup was evaluated and approved with the case company and the university supervisor beforehand. Furthermore, the questions were reviewed iteratively after the first interviews to adjust for any unforeseen problems, while the overarching theme and setup was kept the same. The distinction between users and non-users wasn't as clear as anticipated, and the questions meant for each segment were instead asked if the authors deemed them appropriate based on their response to the filter questions. Users and non-users were consequently not used as a segmentation variable going forward.

2.1.3 Data collection

There are several ways of collecting data and evidence from a case study (Yin, 2018). This thesis uses interviews as the basis for the analysis, and more specifically semi-structured interviews. Semi-structured interviews are a flexible way of conducting research and start from an interview guide, from which the interview can deviate depending on the flow of the interview (Bryman & Bell, 2011). The interview guide serves not as a limitation, but as a guideline for what is to be covered in the interview, and the interviewees were free to discuss additional areas as well as to dive deeper into certain parts.

Based on the aforementioned screening of case candidates an outreach was done with the goal of five interviewees from each customer segment and stakeholder perspective illustrated in Table 2.2 as well as 15 interviews in total. The outreach was done in parts, and the initial screening list was used. Candidates were picked at random, to provide a random-sample and minimize bias towards Lightbringer, until the goals were reached. However, since some of the interviewees originated from Lightbringer contact they might be overrepresented and provide biased views, either more negative or positive, based on prior Lightbringer experiences. It could potentially have a minor impact on the results, by skewing some of the answers, which is why a significant number of other companies also were included in the study. Due to the exploratory nature of the study, its effect on the outcome of the study should, however, be limited. In total, 17 interviews were held. Almost all of the interviewees came from the initial screening, but some were interviewed after they had been referenced in a previous interview. All the interviewees can be found in Table 2.3 which also displays their title, the company they work for, what customer segment they are part of, what perspective they represent, and the date the interview was carried out on. The interviewees had varying amounts of previous experience with GenAI solutions and the Lightbringer application.

Table 2.3 External interviews

Interviewee	*Title*	*Company*	*Customer Segment*	*Perspective*	*Date*
Filip Jörgensen	European Patent Attorney	Ström & Gulliksson	IP-firm	Patent Attorney	15/02
Annika Lundström	CEO	ReMinded	SIF	Business Manager & Inventor	19/02
Emmi Herterich	Associate Patent Attorney	Kransell & Wennborg	IP-firm	Patent Attorney	19/02
Anonymous	Anonymous	Anonymous	LIF	Patent Attorney	19/02
Carl Wikström	CEO	Synclair Vision	SIF	Business Manager & Inventor	20/02
Thomas Li	CTO	Chassis Autonomy	SIF	Business Manager & Inventor	20/02
Filip von Friesendorff	Vice President Group Patent	Alfa Laval	LIF	Business Manager	23/02
Olle Lindberg	Partner	Neij & Lindberg	IP-firm	Patent Attorney	27/02
Gunilla Larsson	Senior Patent Counsel	Tetra Pak	LIF	Patent Attorney	27/02
Ulf Wallin	European Patent Attorney	Husqvarna	LIF	Patent Attorney	28/02
Lars Svensson	CEO	Nordic Forestry Automation	SIF	Business Manager & Inventor	28/02
Nina Milanov	European Patent Attorney	Axis	LIF	Patent Attorney	28/02
Jonas Hagman	Founder	IP Steading	IP-firm	Patent Attorney	04/03
Anonymous	Anonymous	Anonymous	LIF	Patent Attorney	07/03
Ellen Stavbom	European Patent Attorney	BRANN	IP-firm	Patent Attorney	08/03
Jonas Jonsson	Manager, IP	ABB	LIF	Business Manager	13/03
Petra Szeszula	CEO	BrainZell	SIF	Business Manager & Inventor	26/03

All interviews were recorded, and extensive notes were taken by both authors in all cases. Due to confidentiality, some of the interviewees have been anonymized. Their customer segment and their perspective are nevertheless displayed.

2.1.4 Data analysis

The data collected from the interviews served as the basis for the subsequent data analysis. After each interview, the data was gathered by the authors and consolidated into notes online (through the use of Miro-boards) to allow for themes and subthemes to be detected. An adapted version of the Value Proposition Canvas was used to capture and structure the data for the analysis. The Value Proposition Canvas is further described in Section 3.1.

By summarizing the expressed gains, fears, and pains of using generative AI solutions in the patent application process a wide range of themes emerged. No themes within the scope were excluded since the emphasis of the thesis is to exploratively research the customer value, potential and limitations of applied generative AI technology.

The data from the separate interviews were aggregated to the three different customer segments and three different stakeholder perspectives, and then analyzed to find patterns, similarities and differences across the customer segments and stakeholder perspectives. Lastly, the analysis was performed on the data as a whole, further studying the gain creators and pain relievers, to ensure that the analysis didn't just pertain to the subunits studied and to allow for answering the research questions.

2.1.5 Sharing

Finally, the written report was completed with the addition of the findings and conclusions from the project and a thorough review to ensure the quality of the research. Presentations were given and other material for distribution and sharing was then created to complement the written report.

2.2 Research quality

There are ways of determining the credibility and quality of qualitative research although it's not possible to recreate the setup in the same way as in e.g., an experiment (Denscombe, 2014).

One way of determining the quality of the research design is by using common tests used in social science, since case studies are a part of that larger group. The four tests mostly used regard construct validity, internal validity, external validity, and reliability (Yin, 2018). The following is a walkthrough of these and the ways these have been dealt with throughout the project.

The first one is construct validity, concerning actually measuring what you intend to measure (Yin, 2018). To increase construct validity multiple sources of evidence should be used as well as letting the sources (interviewees) review a draft of the report (Yin, 2018). Both of these methods were used. Multiple interviews were conducted within each customer segment and stakeholder perspective, and everyone was given the opportunity to verify and comment on their contribution towards the final report.

Internal validity is most commonly discussed in relation to explanatory case studies, where the aim is to show a causal relationship (Yin, 2018). This is not the case for exploratory case studies, implying that this measure of quality could be deemed not relevant for this thesis.

External validity, or generalizability, refers to how the findings from the case study can be generalizable in a broader context (Yin 2018). The number of interviews per customer segment and perspective have been maximized, taking into account the timeframe and scope of the project. However, they only represent a small portion of the total addressable market of customers and limited conclusions can be drawn from the empirical findings. Instead, the findings can be indicative and steer further research efforts in a desirable direction.

Finally, reliability concerns the chances that the results will stay the same if someone else replicates the study at a later point in time (Yin, 2018). To improve reliability, thorough documentation of the process has been done. The interviews have been recorded and all the evidence pertinent to the thesis has been sustained. At the same time, it should be noted that it's virtually impossible to recreate an exploratory case study, but by rigorously stating the procedure, the reliability can be improved (Denscombe, 2014; Yin, 2018).

The main weakness of the chosen method for the case study, an embedded single-case study, is an inability to focus on the correct unit of analysis (Yin, 2018). When analyzing the subunits, it might be easy to get stuck and focus only on that level, although they are the subunits in the embedded single-case study (Yin, 2018). An extra emphasis has therefore been placed on ensuring that the analysis has been relevant and focused on the case and research questions at hand.

Furthermore, avoiding bias in regard to the selection is important also in qualitative analysis (Collier & Mahoney, 1996). Those choosing to participate in the study could be more likely to have a positive inclination towards the researched subject, inflicting a bias upon the results of the interviews. Additionally, the authors deem the chance of the interviewees expressing more positive views towards generative AI quite high, perhaps due to them not wanting to appear as falling behind in technological adoption, and that should also be taken into consideration when interpreting the results.

2.3 Research ethics

To ensure the integrity of the interviewees in the research, a few measures have been considered. The participation has been voluntary, and the interviewees have been given the possibility to withdraw from the study anytime. Additionally, the possibility to remain anonymous has been given to everyone that was interviewed. Finally, no non-anonymous direct references to the interviewees have been used in the results section.

During the data collection phase, both authors were present in all interviews and afterwards a thorough review of the notes was conducted to ensure that the data from the interviews was correctly documented. The interviewees were also given the opportunity to comment on their contribution to the thesis.

3 Theory

In this chapter, the framework used in the analysis is presented and the traditional patent application and drafting process is described. Additionally, the patent application market and its composition is detailed, complemented by a background on generative AI. Finally, indicative characteristics of patenting firms are outlined.

3.1 Value Proposition Canvas

The theory relating to "jobs to be done" is a very important aspect when looking at the customer value of a solution or an offering (Christensen et al., 2016). When creating an offering for a prospective customer, it's paramount that the solution effectively addresses their "jobs to be done", making the product desirable to them. One framework that includes customer jobs and the aspects needed for that job to be done is the Value Proposition Canvas (VPC) from Osterwalder et al (2014).

The Value Proposition Canvas consists of the value map and the customer profile. The value map depicts products and services, gain creators and pain relievers while the customer profile has three components: customer jobs, gains, and pains. By using the VPC, one can map out the gains and pains as well as potential gain creators and pain relievers to determine the customer value of a solution as well as the indicative usefulness. Does the solution address the most crucial pains? Does it deliver the desired gains? And what gain creators and pain relievers allow for that to happen? (Osterwalder et al., 2014)

The customer job relates to a task that needs to be performed. For instance, the job to be done in relation to patents might be to swiftly protect an invention before a competitor, and that is done through patenting. A gain is either an outcome or a benefit that the customer longs for and could be required, expected, unexpected or desired. A pain, on the other hand, is something that impairs the experience when trying to get a job done. (Osterwalder et al. 2014)

Gain creators and pain relievers aim to support in achieving the mapped-out gains and reduce the pains experienced. The final component of the value map, products and services, details the offering to its customers, i.e. the value proposition. (Osterwalder et al. 2014)

When using the Value Proposition Canvas as a framework for the analysis, a few adoptions have been made to better suit this study and support in answering RQ1 and RQ2, as can be seen in Figure 3.1. The pains have been separated into pains with the current method of operations for the interviewees, and pains with the adoption of GenAI solutions. Gain creators and pain relievers on the left side of the VPC are also separated into GenAI related and non-GenAI related. Due to the scope of the thesis, only the GenAI related gain creators and pain relievers will be studied. Additionally, less emphasis will be placed on ranking the different gains and pains, since the primary aim is to exploratively investigate themes, and not determine their relative importance.

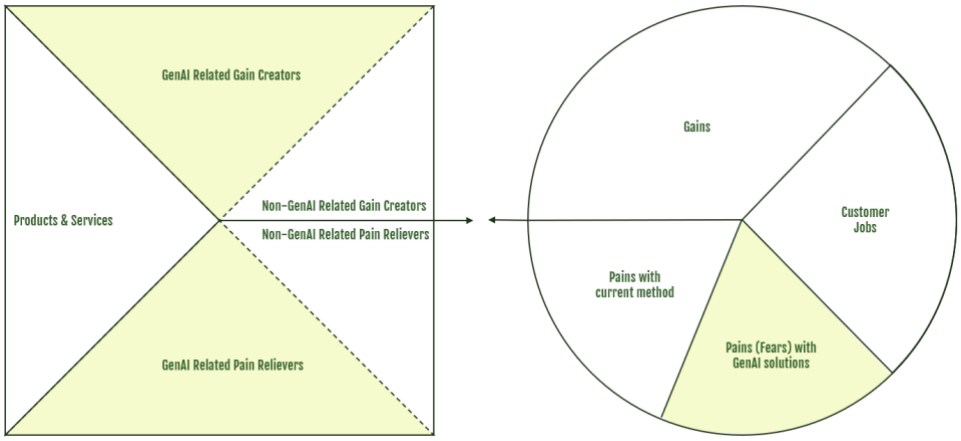

Figure 3.1. Application of Value Proposition Canvas, adapted from Osterwalder et al., 2014

3.2 Patent application and drafting processes

3.2.1 Patent application and role of patent attorney

A patent is an intellectual property right (IPR) that gives the holder the exclusive right to manufacture, sell, import, export, use and keep the invention in the jurisdiction where the patent is held. The fundamental idea behind patents is to provide exclusive protection of the inventions' use for up to 20 years and in exchange publicly publish the technical solution for others to build upon, therefore facilitating technological development for society (PRV, 2023c). A patent right differs to other IPR such as trademark or design, in that it protects the technological solution and not design aspects or brand names (PRV, 2023a). There are multiple motives to patent such as protection, attracting financing, and recruiting, where

protecting product technology and securing freedom to operate (FTO) are the most important and common (Holgersson & Granstrand, 2017).

For an invention to be patentable in Sweden, it must meet three requirements under the Swedish Patents Act. The first requirement is that the solution that is to be patented is novel, which means it has never in any media been mentioned or published before the date of filing. The next requirement is that there is an inventive step in the technology, which means that the new solution substantially differs from all prior art and is therefore non-obvious for those with sufficient knowledge in the field. The third and final requirement is that the invention is susceptible to industrial application, in its broadest meaning, which could be an industrial solution or that it can be produced industrially. In Sweden, and in other jurisdictions depending on the patent law, it is by default the inventor who owns the right to patent an invention, but this right can be transferred to another natural person or company, usually regulated through employer and employee agreements if the invention is created during work hours. (The Swedish Patents Act, n.d.)

Due to their more technical and complex nature, patents are more difficult to obtain than other IPR and therefore require deeper and more specialized knowledge both in the technical field as well as the legal scene, which is why PRV recommends using a professional patent agent. Studies have also shown that there is a positive association between the use of a patent attorney and likelihood of grant, and that the demand for a professional IPR attorney is the highest for patents out of all the IPRs (Heikkilä, 2021).

When choosing a patent attorney there are multiple factors to consider, such as trust, price, experience, and subject matter knowledge. What separates a great patent attorney from a good patent attorney is their ability to understand the wider implications of the patent in terms of IP and business strategy as well as understanding what the client wants and needs. A lot comes down to customer relations and understanding of IP strategy (Stentiford, 2024). In terms of the actual patent application, the ability to have some foresight, derived from experience, into what could be of importance in a future patent trial or infringement case and to include and handle this in the application is mentioned as important (Davies, 2024). Prior studies of success factors in patent attorneys also mention effectiveness, international exposure, and experience within technical field (Klincewicz & Szumial, 2022).

3.2.2 Patent application process

The traditional patent application drafting process typically starts off with an interaction between the inventor and the patent attorney, either simply via an invention disclosure form (IDF), a meeting, or both. An IDF is a confidential document written by the inventor that describes the invention for which patentability will be examined. During the interaction the patent attorney aims to understand the

core of the invention and receives potential drawings and other useful information to be used when drafting. This is the main information collection point, including a bit of back-and-forth communication, from which the patent attorney then starts drafting up an application. (Stentiford, 2024)

A patent application contains several components that must be included, which vary somewhat between jurisdictions. A Swedish application requires an application form, a description of the invention, one or more claims, an abstract, potential drawings and a filing fee (PRV, 2022b). The required parts are relatively similar to other jurisdictions (Stentiford, 2024). The description is made up of two parts. The first part is the general part, also referred to as the background section, where the problem the invention aims to solve is described as well as specifications of the current state of art, e.g. current solutions to the problem. The second part is the specific part, also referred to as the detailed description, where the invention is described in great detail through the providing of examples of how to carry out the invention. The description must be clear enough so that a person skilled in the art would be able to reproduce the invention using their common general knowledge. All necessary information must be provided, nothing can be left out intentionally. (PRV, 2023b)

The claims are the most important part of the application since they determine the scope of the patent protection and must be carefully and precisely written. A patent application can contain one or more independent claims with numerous corresponding dependent claims. The most comprehensive and broadly scoped claim is the independent claim, which aims to cover the general principles of the invention. More detail can then be added via the dependent claims that cover specific features, specifications, or variations of the invention. If the independent claims were to be deemed to broad, the application can then have the dependent claims to fall back on in exchange for a narrower protection. In general, claims must mention relevant prior art and describe the invention clearly. (PRV, 2022a)

The abstract is a short 150-word summary of the technical content of the application and is intended to assist an interested person to quickly grasp its content. If drawings are wanted or needed to explain the invention they should be drawn in a standard form, added, and clearly described in the specific part of the description. When all this is completed, the patent application should be sent to PRV along with an initial filing fee of 3000 SEK. (PRV, 2022a)

After filing, the application will be examined by the patent office and usually the attorney will reply to potential notices if needed. If all goes well the patent office will eventually grant the patent and an opposition period of 9 months will follow, where opposing parties can have their saying if the patent should stay granted. After 18 months the patent will always be published, even if it is not granted yet.

During the 12 months following the initial filing date, called the priority year, the applicant can claim priority on this patent application in other countries, meaning their novelty requirement won’t inflict on each other (PRV, 2022c). Other possible

filing tracks are a European Patent for European countries and through the Patent Cooperation Treaty (PCT) for streamlined filing in 150 countries globally (PRV, 2023d). Even after a patent is granted annual fees need to be paid and potential infringement cases handled.

3.2.3 Patent attorney drafting workflow

A patent attorney spends approximately three to four hours at the start of the patent application process to interact with the inventor and/or with the IDF to fully grasp the invention. This includes meetings and back-and-forth communication over calls, emails, or various other media. After this the patent attorney starts writing initial claims, which then are reviewed and ultimately approved by the inventor. The initial claims writing part of the process takes approximately two to four hours of the attorney's time. (Davies, 2024; Stentiford, 2024)

When initial claims have been approved the patent attorney begins the long process of writing the full application. Over approximately 10 to 15 work hours the attorney does prior art research, refines the claims, draws up figures (could be outsourced to professional draftsmen), writes the description and finally the abstract. This part of the process encompasses extensive analysis and writing. Finally, when the writing of the application is done it is co-reviewed with the inventor to ensure that the application covers what is to be covered and that everything looks correct. Final adjustments are made, and the application is filed.

Everything summed, a typical traditional process could normally take anywhere from 20 to 30 hours of active work from a patent attorney and a couple hours from the inventor. After the filing it would usually be the attorney's responsibility, in cooperation with the inventor, to reply to notices from the patent office. The patent attorney's workflow in a patent application drafting process is described in Figure 3.2. (Davies, 2024) (Stentiford, 2024)

Other aspects of patent attorney work outside of handling and writing patent applications can be to nurture customer relationships, provide other offerings such as freedom-to-operate (FTO) investigations or infringement cases as well as to advise on IP strategy.

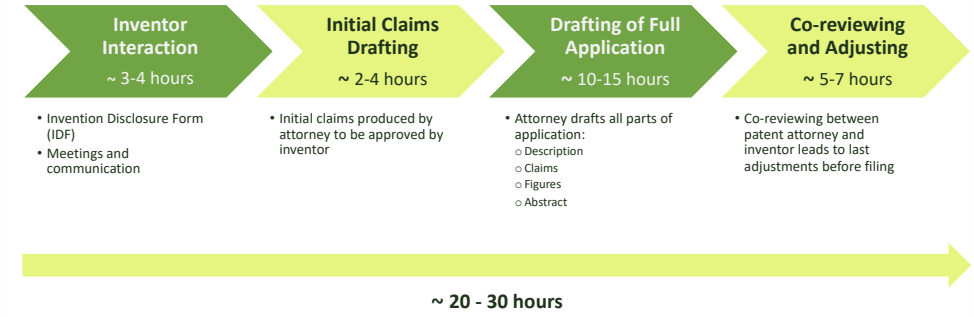

Figure 3.2 The patent attorney's workflow in a patent application drafting process

3.3 Patent application market dynamics and composition

3.3.1 Market dynamics

The Swedish patent application market is characterized by distinct engagement strategies based on the size and internal capabilities of firms seeking patent protection. The customer segmentation used in the thesis covers both larger and smaller innovative firms, thus making it comprehensive, not excluding any inventing firm. As can be seen in Figure 3.3, the market dynamics also distinguish SIFs and LIFs, since they show different purchasing and partnership behavior in relation to the IP-firms, further strengthening the segmentation choice. SIFs, who don't patent as often or have less IP budget, generally engage with IP-firms on a per-transaction basis, indicative of their need for external expertise without commitment of a long-term partnership. LIFs, on the other hand, exhibit split behaviors: those with in-house drafting capabilities and strategies tend to establish long-term partnerships with IP-firms, which they engage with on a more as-needed basis, leveraging their internal competencies while supplementing with external expertise for specialized needs or when demand for patent application spikes momentarily. This enables them to keep costs lower while not jeopardizing quality. LIFs without in-house patent drafting are more likely to form strong long-term partnerships with IP-firms, relying on these firms to handle the complexities and volumes of drafting applications. This structure and these market dynamics demonstrate a market where service customization and flexibility are crucial, with IP-firms adapting to varying needs of SIFs and LIFs based on their internal resources and strategic approach to IP protection. The illustrated market dynamics can be seen in Figure 3.3 (Wassvik, 2024; Stentiford, 2024)

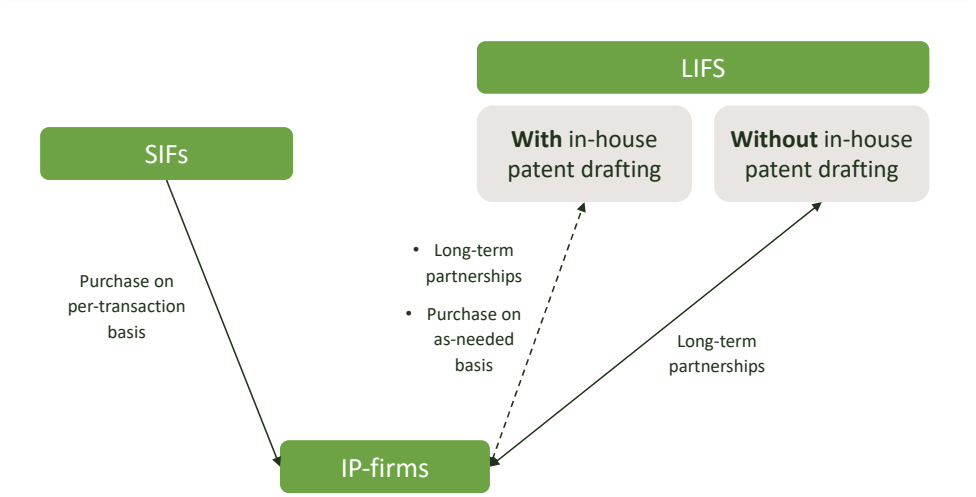

Figure 3.3 Illustrative structure of the market dynamics

3.3.2 Market composition

The composition of the patent application market is multi-faceted, incorporating a range of SIFs, LIFs and IP-firms interacting within the market dynamics illustrated in the previous section. SIFs, which are often at the forefront of innovation in sectors such as medical devices, biotechnology, electrical machinery, telecom, and machine tools, engage with IP-firms to protect their inventions, since these SIFs might lack the necessary in-house capabilities to do so (European Patent Office, 2024). LIFs, exemplified by companies such as Husqvarna, Stora Enso, Scania, Assa Abloy, Valmet, and Northvolt, file numerous patents annually and typically have more resources. They may have in-house capabilities for handling IP matters but still collaborate with IP-firms for strategic management of their extensive patent portfolios (WIPO, 2024). IP-firms themselves, including companies like AWA, Kransell & Wennborg, Ström & Gulliksson, Valea, Zacco, and Brann, offer a range of services from patent drafting to IP strategy, catering to both SIFs and LIFs (Managing IP, 2023). The market composition is illustrated in Figure 3.4 below. This market is thus characterized by a network of interactions where businesses of various sizes and specializations seek the expertise of IP firms to navigate the complex landscape of patent law and ensure their innovations are effectively protected.

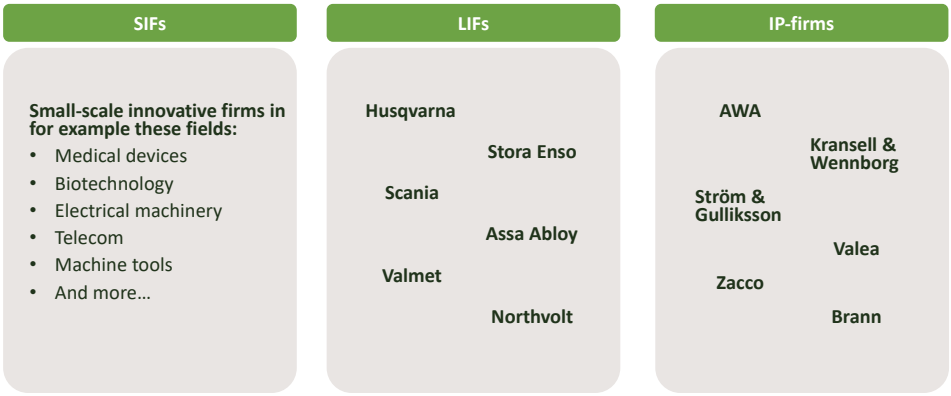

Figure 3.4 Illustration of the market composition

3.4 Generative AI

3.4.1 Generative AI description

Generative AI, or GenAI, is a type of deep-learning technology that leverages the combination of advanced statistics and large volumes of data to generate novel output through different types of models. By training these models on large data volumes, the models pick up on what is a probable output when given a specific prompt, enabling them to generate content based on, but not the same as, the training data. (Martineau, 2023)

With the emergence of transformers, also called foundation models, through a research paper in 2017, a new way of training models was described and later made ubiquitous. Transformers leveraged an encoder-decoder architecture in combination with attention, a technique for processing text. The encoder creates so called embeddings out of unprocessed annotated text, which then are decoded and together with prior output predict what word to generate next. The game-changing ability of transformers was the fact that it could increase the amount of data that the model could be trained on. A foundation model can be trained without a precise task in mind, therefore making a large amount of data available for pre-training. To then be able to perform an explicit task, the model can be fine-tuned on a much smaller set of training data adapted for that specific task. (Martineau, 2023)

Large language models, or LLMs, are part of this broader group of foundation models (Martineau, 2023). The continuous development and innovation of LLMs since 2017 have laid the foundation for the current capabilities of generative AI (Bowman, 2023). These capabilities include, but are not limited to, generation of coherent text and other content, summarization and translation (Martineau, 2023).

Examples include suggestions of words to use or fitting information or data into a predefined framework or template. The output is often influenced by the prompt, and being skilled at prompt engineering would enable users to fully utilize the capabilities of an LLM and therefore enhance the usefulness (Ruiz, 2023). The future possibilities of LLMs and generative AI are still debated and e.g., depend on future research (Bowman, 2023). As a result, when discussing the potential in relation to the patent application process stemming from generative AI, a focus on the technology's current capabilities is applied to allow for as nuanced of a discussion as possible.

In addition to the capabilities that current generative AI display, there are concerns about the technology. One of those concerns revolves around hallucination. Hallucination means that an LLM makes up facts, due to it generating the most statistically likely output, and believes them to be true, and that is particularly a problem where it is of utmost importance that the information provided is correct (OpenAI, 2023a). Another thing is bias, and that eventual biases in the training data translate into the output from the models (OpenAI, 2023b). Furthermore, data security is paramount when discussing generative AI, and associated risks should be mentioned as a concern (Amankwah-Amoah et al., 2024).

3.4.2 Generative AI in the patenting process

Leveraging generative AI in the patenting process has been studied, since the often time-consuming and complex process would benefit from the techniques and capabilities previously described (Christofidellis, 2023). Early work within the patent domain has focused on prior art and classification, among other areas, to speed up the pre-grant stage of the patenting process (Vowinckel & Hähnke, 2023; Jiang & Goetz, 2024). The ever-increasing landscape of prior art makes for a theoretically clear use case, since the process becomes more complex and time-consuming as the number of publicly available patents grows (Trappey et al. 2020) Some early commercialized products within this field have been released and adopted on the market, such as the tools provided by the Helsinki-based firm IPRally Technologies Oy (IPRally, 2024a). Their tool has been adopted by the likes of Unilever and Kongsberg Automotive (IPRally, 2024b).

Shifting focus towards the patent application process and drafting, there is optimism about LLMs usefulness (Jiang & Goetz, 2024). Lee and Hsiang (2020) claim to be the first to fine-tune one of OpenAI:s earlier models, GPT-2, for generation of patent claims in a research paper in 2020. More studies have since then been released on testing fine-tuned LLM:s for various parts of the patent application, such as patent claim generation, abstract generation, generation of text for figures and text completion (Jiang & Goetz, 2024).

The goal and usefulness of LLMs in patent drafting is preliminarily related to, and further investigated and elaborated upon within the scope of this thesis, the

efficiency of the application in combination with an increased quality (Jiang & Goetz, 2024). This tentatively stems from the previously described capabilities of generating texts, suggestion-providing and summarizing of text in combination with the possibility of training and fine-tuning the models to adapt to the specific language required in patent applications (Christofidellis 2023; Jiang & Goetz, 2024). The layout of a patent and the connection between the different parts make e.g., summarizing and generating text based on another part especially powerful. The abstract, description and patent claims are examples of parts heavily linked to each other. So-called multimodal methods could also assure that figures and the patent text are coherent, further cementing the potential advantage of utilizing LLMs within the patent domain (Jiang & Goetz, 2024).

However, some concerns and limitations have been highlighted in studies. The specific challenges related to the way a patent is written, with complex technical and legal phrases, is one relevant aspect (Jiang & Goetz, 2024). The fine-tuned LLMs therefore need to convincingly show the ability to handle this intricate combination when generating text to fully capture the potential usefulness within the patent application process. Additionally, the language needs to be correct and as precise as wanted by the patent attorney or inventor, to ensure proper protection and mitigate the risks of costly litigation later in the process. To combat the latter risk, one current option is quality-assurance and potential edits in the GenAI-generated draft from a patent attorney, suggesting that a complete GenAI-enabled automation of patent drafting isn't currently viable.

In addition to the case company Lightbringer, there are other GenAI commercial solutions available which are focused on the patent drafting process. Most of these do, however, need a complete set of patent claims as a starting point, therefore differing from the way Lightbringer works (Patent Theory, 2024; ClaimMaster, 2024). Y Combinator-backed Solve Intelligence also has a slightly differing concept, functioning as a Copilot in a document editor (Park, 2023). The Lightbringer tool is further described in Section 4.2.

3.5 Firm characteristics

Due to the explorative nature of the thesis only a few studies were used as inspiration in the analysis of firm characteristics driving the usefulness of GenAI solutions within the patent application process. A study by Huang and Cheng from 2015 delved into the patenting behavior of firms, particularly distinguishing between firms that consistently patent and those that do not. They introduced a framework hinging on two primary factors: capability and willingness, to analyze 165 Taiwanese ICT firms. Their work revolved around analyzing a number of variables or firm characteristics that would influence patenting behavior, from which inspiration can be drawn to begin exploring characteristics and behavior of GenAI

usage in the patent drafting process in this thesis. Variables such as firm size, research and development (R&D) efforts, human capital, novelty of innovation and external R&D collaborations could be useful to use as a base for exploration and discussion. Additionally, industry or sector, motive to patent as well as the firm's IP knowledge in-house could be interesting to keep in mind when exploring characteristics that could drive usefulness. However, when exploring characteristics, it's important to note that causal relationships between characteristics and usefulness generally can't be determined, but investigating the correlation between them could serve a purpose considering the thesis' exploratory approach (Christensen et al., 2016).

4 Case Study - Lightbringer

In this chapter, the case company Lightbringer is described in more detail to understand its position, offerings, and dynamics in the market. Furthermore, the GenAI tool Lightbringer is developing is described to lay a foundation for the continuation of the thesis. Particularly, the tool's GenAI capabilities are highlighted to showcase examples of GenAI usage. Finally, the case study focus and purpose in relation to the case company is presented.

4.1 Case company description

This section describes the company with information gathered from internal interviews with Lightbringer executives Ola Wassvik and Dominic Davies.

Lightbringer AB is a relatively young company founded in early 2023 but builds on ideas and models formulated over years of patent application work and testing for personal use by the CEO. With the emergence of the early versions of GPT and the following quick improvement of the LLM, the company could finally become a reality and take advantage of these strengths to build a web application that accelerates the patent application process through clever use of data structuring, prompting and GenAI. The company's founders boast diverse expertise in complementary fields, including patent law, software development, sales, and patent development, which enables them to merge perspectives and leverage the robust interdisciplinary potential of GenAI. Since its founding, the company has assisted in drafting a significant amount of patent applications with a diverse range of players on the market as well as initiated partnerships with numerous IP professionals. The long-term vision is to assist in automating a substantial portion of the IP department at LIFs as well as enable SIFs to file patents more easily while at the same time giving patent attorneys a tool to streamline their drafting activities.

The concurrent company business model revolves around providing a complete patenting service from inception to granted patent, leveraged by the unique features and GenAI capabilities of the tool Lightbringer provides. The tool is supported by a network of patent attorneys associated with Lightbringer, who help carry out the patent attorney work throughout the application and ensure the quality of the output.

The company provides two different offerings to IP-firms: a Software-as-a-Service (SaaS) subscription offering and a fulfillment partnership offering. The SaaS-subscription offering provides the IP-firm customer with access to the tool for a monthly or per-patent payment and the IP-firm is free to use it for any of its clients. The fulfillment partnership offering instead enables the IP-firm to handle the patent application for innovative firms that contact Lightbringer wanting help in writing a patent. Lightbringer then offers this service for a fixed price and will help the client come in contact with a fitting partner patent attorney which will handle the drafting within the Lightbringer application. Lightbringer and the partner patent attorney each get their cut of the fixed price.

This setup therefore opens up a new opportunity for SIFs looking to purchase patents on a per-transactions basis via Lightbringer's application and partnership with IP-firms. Additionally, in the same way as IP-firms, LIFs with in-house drafting capabilities can subscribe to only use the application as an in-house drafting tool. It is also to be mentioned that both SIFs and LIFs can consult IP-firms that are partnered up with Lightbringer and thereby indirectly take advantage of the application's strengths. Lightbringer's position, offerings and dynamics in the market is illustrated in Figure 4.1, fitting into the constellation described in Section 3.3.1.

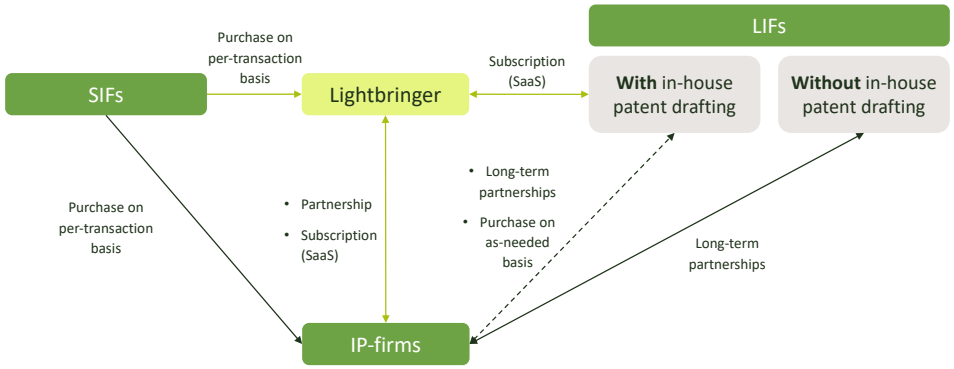

Figure 4.1 Illustrative structure of Lightbringer's target position, offerings, and dynamics on the market.

4.2 Lightbringer tool description

This section describes the tool in further detail and is based on information gathered on March 25, 2024, through exploration of the tool by the authors as well as demonstrations provided by Ola Wassvik. The authors of the thesis got full access to the application as well as consent to document it. In the cases where an example

patent application was needed it was arbitrarily chosen and no confidential information was provided.

4.2.1 Structure and workflow of the Lightbringer tool

The Lightbringer tool is comprised of three main parts: (1) Invention Preparation, (2) Patent Preparation, and (3) Patent Application, which can be seen in Figure 4.2.

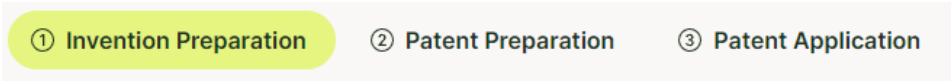

Figure 4.2 The three main parts of the Lightbringer application and process; (1) Invention Preparation, (2) Patent Preparation and (3) Patent Application

4.2.1.1 Invention Preparation

The first part of the process is the Invention Preparation, where the user, which can be the inventor, the patent attorney or both, inputs information about what problem the invention solves, the context of the invention, the invention itself and its details as well as any prior art that is known already. This is the information that will be used going forward with the application. There are some similarities to an IDF, but the tool's invention description is more extensive, and it uses GenAI to assist in the process, exemplified further in Section 4.2.2. In this part of the process the user can also attach drawings of figures that will be used in the draft as well as choose the filing options.

4.2.1.2 Patent Preparation

The second part, Patent Preparation, handles the main tasks of structuring and drafting the actual application. By utilizing a proprietary GenAI-assisted Lightbringer-created data structure the provided information is converted into text that is used when generating the patent draft. The tool is prompted to first generate claims and then the other parts of a patent application using information input so far. The generated content can then be edited and further worked with by the patent attorney. Here too, figures can be added to enhance the application.

4.2.1.3 Patent Application

The last part is the Patent Application, where the inventor or the company using Lightbringer's service to create a patent application can follow the drafting progress while the patent attorney works on it. When approved by the patent attorney, the inventor or the company is also invited to co-review the patent application and make necessary changes. Lastly, the filing options can be confirmed again.

After all the necessary parts are completed, the client can download a fully completed patent application draft that has been checked by a professional patent attorney and which can be filed with the chosen filing options.

4.2.2 GenAI capabilities of the tool

This section will cover features or areas where Lightbringer utilizes GenAI to enhance or accelerate the process of drafting a patent application. The main use cases revolve around suggestions, generation of new text, and summarization.

One of the first GenAI-enabled features the user can utilize are suggestions of details to add in the problem description, illustrated in Figure 4.3. The same feature is also available when explaining the invention and its details.

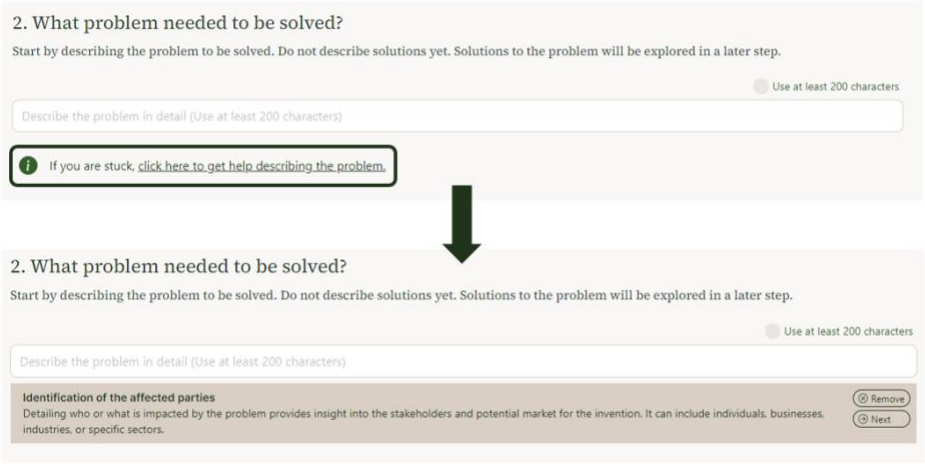

Figure 4.3 When help is requested, Lightbringer uses GenAI to deliver suggestions based on the text input on what to add or how to detail, in this case, the problem that was solved with the invention

The tool can also be prompted to write (generate) claims with the correct formatting and information needed based on the information provided. These claims can then, upon request by the user, be extended further by GenAI but also manually edited by the patent attorney working with the draft. If edits in the claims are made and the tool is then prompted to extend, it will use what is still left in the input area to generate more text. An example of a generation of claims is presented in Figure 4.4.

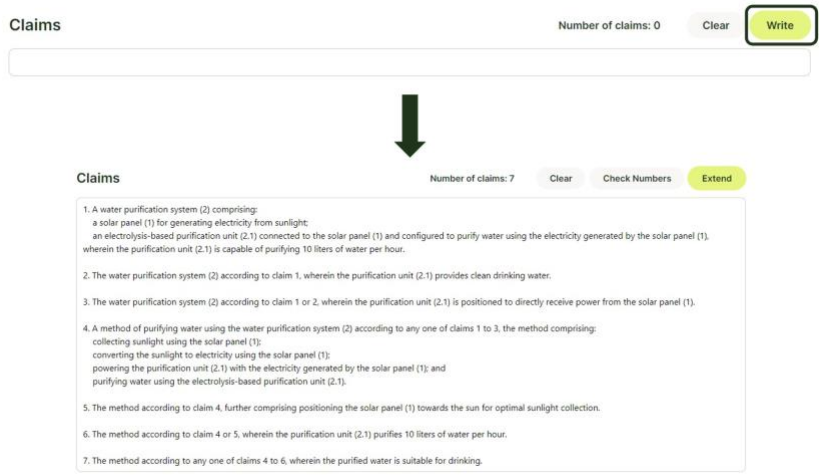

Figure 4.4 An example of claims generation in the Lightbringer tool

Similar to the claims generation, the other text parts of the patent draft can also be generated by GenAI after the claims are done and summarized by the application, see Figure 4.5.

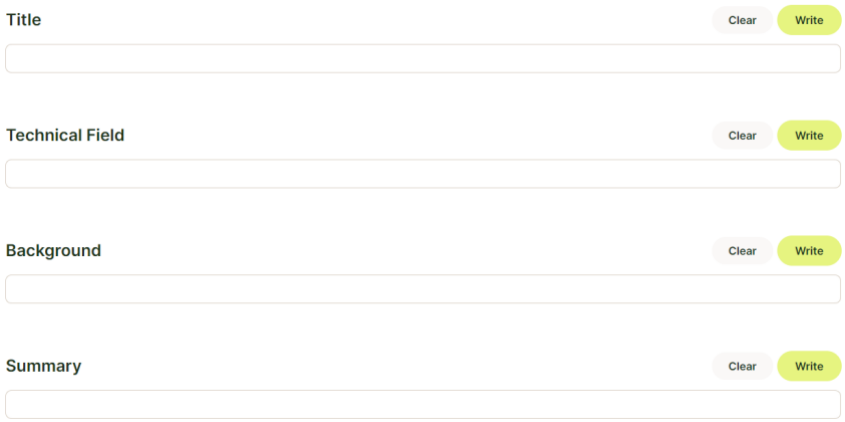

Figure 4.5 Examples of parts of a patent application that can be generated by the Lightbringer tool

On top of this, to prevent potential GenAI hallucination and ensure quality of the application, Lightbringer always provides a patent attorney with prior experience and knowledge to every case. This patent professional carries out the drafting process in the application and ultimately conducts quality assurance as well as

adjustments to the GenAI-generated draft, ensuring correctness as well as fit to customer requests.

4.3 Case study focus and purpose for Lightbringer

The case study will be centered around engaging with customer segments, of Lightbringer’s interest, through interviews. The aim is to gain a deeper understanding of customer value and input from interviewees with varying degrees of experience using GenAI tools or the Lightbringer application. By directly interacting with them, the authors intend to capture a broad spectrum of insights and experiences, which are instrumental in shaping the direction of further research but also Lightbringer’s operational and strategic choices. This hands-on approach ensures that the study remains closely aligned with the real-world needs and preferences, enabling Lightbringer, but also others, to tailor their solutions more effectively to meet their demands.

Lightbringer's involvement in this endeavor is particularly driven by a strategic focus on the three aforementioned customer segments, aiming to understand their unique needs and what creates customer value for them. Due to the complexity of LIFs, they are especially considered in the case study, as the authors aim to uncover specific needs and challenges faced by larger organizations, which often entail complex requirements and high expectations. Understanding the unique dynamics, value drivers and limitations enables Lightbringer to fine-tune its solution and offering, ensuring they are well-equipped to address the sophisticated needs of clients with different characteristics.

5 Results and Analysis

In this chapter, the findings from the interviews are consolidated and presented for each customer segment and stakeholder perspective, followed by an analysis of similarities and differences. Additionally, the aggregated view is presented.

In total, 17 interviews were conducted with participants representing different customer segments as well as stakeholder perspectives. The number of participants in each category is presented in Table 5.1 and Table 5.2. The sum in Table 5.2 exceeds 17 due to some participants representing multiple stakeholder perspectives. When analyzing their answers, careful consideration was taken to acknowledge the perspective they represented for each answer. The Value Proposition Canvas has been applied to consolidate the findings from the interviews, which are presented for each customer segment and stakeholder perspective. Similarities and differences between customer segments and stakeholder perspectives are analyzed, followed by a return to the aggregated view of the findings across all interviews.

Table 5.1 Interviewees classified according to their customer segment

IP-firms	SIFs	LIFs
5	5	7

Table 5.2 Interviewees classified according to their stakeholder perspective(s)

Patent Attorney	Inventor	Business Manager
10	5	7

5.1 Customer segments

The interviews with participants from the different customer segment yielded some segment-specific customer jobs (or jobs to be done), wanted and perceived gains as well as pains with the traditional patent application method and pains and fears with the use of GenAI solutions. In this section the themes identified from the interviews

have been consolidated into their respective customer segments and frequently mentioned (by more than 50% of the interviewees in that segment) gains and pains have been highlighted as key gains/pains with a yellow tag in the corresponding figures. The jobs, gains and pains highlighted in italics in the text correspond to 2nd order themes from interviews, displayed in the corresponding figure for each segment. The transition from the 1st order themes provided in the interviews to the presented 2nd order themes for each customer segment can be found in appendices B1-B3.

5.1.1 IP-firms

The 5 IP-firms have been randomly anonymized as interviewees A, B, C, D and E and mapped to their 1st order concepts in the table in appendix B1.

5.1.1.1 Customer jobs

The main customer jobs of IP-firms revolve around *serving clients* with IP and patent-related needs through their service offerings. The services provided include *managing the patent process* for its clients, which consists of meticulous tracking and interactions with different stakeholders such as inventors, clients, and patent office examiners. Another major service offered by the firms is *drafting patent applications* with high accuracy and consistent quality tailored appropriately to the customer, mentioned by all IP-firm interviewees. As part of that process patent attorneys conduct a large amount of *writing and analysis* which necessitate a high level of expertise and precision. Additionally, the IP-firms offer the service of *patentability assessments*. Lastly, they *provide strategic and legal advisory services* that navigate the complex IP and patent landscape, examples of which are FTO analyses, internationalization advice or infringement cases.

5.1.1.2 Gains

Discussions with interview objects have yielded both already realized gains and future desired gains with the introduction of GenAI solutions in the patent application process. One key gain with the introduction of this type of service for IP-firms, mentioned by all firms, is the potential for *improved quality and uniformity of patent drafts*. Interviewees A, B and D express that GenAI enables untiring checking of errors and implementation of meticulous detail and uniformity, a key for successful patent applications and something that could reduce human errors. With the introduction of GenAI solutions, *time efficiency* is an important gain for IP professionals, mentioned by most participants, since such applications can notably accelerate the time-intensive components of patent drafting through its analyzing, generating and summarizing capabilities. Participant A for example says having a generated text as a starting point brings time savings. The time savings of *streamlining repetitive work* with the use of GenAI can then be utilized either to serve even more clients or, as conveyed by firms A and B, to *focus on more creative*

and high-value tasks such as perfecting the important claims, researching prior art or elevating customer contact. A reduction in repetitive tasks is also mentioned to possibly increase employee health and job satisfaction, according to firm A. Time efficiency also relates to *cost efficiency* for IP-firms, which firms C, D and E express, where every hour saved on drafting is money saved on a project. However, IP-firm interviewees such as A, express a problematic dynamic going forward since the hours saved can no longer be billed to clients as hours spent on the project and must therefore either be compensated for with extra projects or other value-adding activities to offset the potential loss in revenue.

On the other hand, IP-firms D and E mention the possibility to leverage GenAI capabilities to create *additional offerings* of cheaper and simpler patents to access customers that otherwise either wouldn't have sufficient funds for a traditional offering or simply want a quicker and cheaper patent with less coverage or quality for strategic reasons or different motives to patent. Firm D furthermore also mentions the possibility for GenAI-driven drafting to enable *more transparent pricing* and almost a "fixed price" for a patent draft, giving customers a more comprehensive and transparent offer. This in combination with cheaper and faster GenAI-enabled drafting and added focus on IP strategy and patent portfolios could, according to firm D, enable the *creation of whole new business models* for companies who put less emphasis on the traditionally time-consuming process of writing and drafting patent applications and more on advisory.

Another gain mentioned with the introduction of GenAI solutions is the possibility to support existing workflows or create new support functions. One of which is expressed by firm A and B as the possibility for *quick translations* to other jurisdictions and languages where GenAI language-handling capabilities in combination with strict rules on formatting of applications in different jurisdiction can make a useful complement to extensive manual labor. Interviewee D also mentioned that GenAI can *help increase the understanding of an invention's patentability* and make inventors more involved in the process, through AI-assisted invention disclosure forms etc. Lastly, the quicker processing of drafting with the help of GenAI is mentioned to be able to lower the need for outsourcing and therefore give patent attorneys and IP-firms *more control over patent drafting*.

5.1.1.3 Pains with traditional method

The pains with the traditional method for the IP-firms revolve around specific steps or tasks within the process. The key pain expressed by the IP professionals is the *repetitive nature of tasks* which by firms A, C and E can often come down to having to write long paragraphs with quite monotonous characters and a tiredness of writing applications is expressed. Some tasks or sub-tasks are also seen as *boring and mundane* and do not feel very engaging or value-adding, according to firms B and D. These two pains are mentioned to potentially lead to loss of focus or job dissatisfaction among practitioners. Similarly, interviewee A mentions a pain with the amount of *manual work needed for international filings* and transferring patents

between jurisdictions, with tasks such as translation, administrative work and (re-) formatting mentioned as time-consuming. The *occasional need for outsourcing* is another pain mentioned by firm D, which can lead to inconsistencies and loss of control over quality and time. Lastly, IP-firm C also mentions a *lack of technological advancements* by using the traditional method and not trying out new tools and ways of working, which could also impact branding and ability to attract prospective talent who want to use modern tools.

5.1.1.4 Pains with GenAI solutions

IP-firms also express a multitude of pains and fears with using new GenAI solutions for patent drafting. Two key pains and fears expressed by all IP-firms are *quality and consistency concerns* and *AI loss of focus and hallucination*. Among interviewees at IP-firms A, B, C and D there is concern that current GenAI solutions won't be able to deliver the quality needed to make it utterly practical and that it won't be able to uphold enough consistency between applications. Additionally, a fear expressed by firms B and C is that the GenAI would lose focus on the core of the invention and start drifting or provide too broad and general suggestions. The fear of AI hallucination is also mentioned by C, that there would be errors in generated content that sound believable, therefore being hard to catch, ultimately impacting the quality and chance of grant. IP-firm B expresses concerns that the legal nuances and importance of specific terms in patent applications would be hard for GenAI to handle masterfully and that this would impact quality. Firm A even goes as far as saying that a patent-oriented LLM might be needed. Related to the quality concerns, firm A also expresses the fear that the lack of quality would lead to *time consuming proofreading* of GenAI-generated drafts which in turn would impact the ultimate usefulness and firm D stresses the importance of correct input for the model to work optimally.

The other key pain or fear associated with the new GenAI solutions, mentioned by all participants but firm C, who equates it to any other data-handling tool of today, is *confidentiality concerns*. Due to uncertainty regarding the intricacies of the inner workings of the new phenomena, especially the "learning or training" capabilities of LLMs and GenAI, there are general question marks and fears about the confidentiality of those applications among IP-firm professionals. This could pose a real barrier to adoption if not handled properly. With IP-firms being client-serving, there is, according to firm D, extra responsibility in handling clients' confidential data and being able to showcase that data security is being handled properly, something few are fully comfortable with doing at the moment.

Furthermore, interviewee C raises the issue of a potential *learning curve* as a fear with using the new solutions, something that revolves around having to both learn a new application as well as change their way of working. A few, such as firm B, also raise the issue of *traceability* when using GenAI solutions and the problem with not being able to trace how the solutions ended up with the answer it did, and how that could introduce difficulties later in the process. Others, such as firm D, have

concerns about the *longevity of tools* and their providers and mentioned that there is a need for some assurance that both the application and workflow they adapt to is around for the foreseeable future. Furthermore, both firm A and B expressed concerns about *pricing* and pricing models, pointing once again at the problematic dynamic raised in Section 5.1.1.2, where the price of the GenAI solution must also be offset. Concerns were also raised, by interviewee C, about the fear of a *changing patent attorney landscape* and the fear of losing jobs and changing tasks, where interviewee E speculated this could both consciously and subconsciously lead to slower adoption of the disruptive solutions. Lastly, IP-firm C expressed concerns about *limited usefulness in inventor interaction* and highlighted the need for human interactions and skillsets to accurately handle this, something the AI evidently lacks.

Figure 5.1 A consolidation of 2nd order themes of customer jobs, gains and pains expressed by IP-firm interviewees

5.1.2 SIFs

The 5 SIFs have been randomly anonymized as interviewees M, N, O, P, and Q and mapped to their 1st order concepts in the table in appendix B2.

5.1.2.1 Customer jobs

For SIFs, the jobs to be done for most firms revolve around *inventing, protecting the innovation early and quickly* as well as *making strategic decisions regarding intellectual property*. In addition to that, interviewee N highlighted that they also need to *ensure the uniqueness of their innovation*. Finally, when deciding to patent, interviewees P and O also mentioned the need to *manage and oversee the patent operations and processes*, regardless of how much is done in-house versus outsourced, to ensure they maximize their chances of success. Related to that is the job of monitoring competitors' products and patents to keep up with shifts in the market.

5.1.2.2 Gains

Several benefits, or gains, with the introduction of GenAI solutions in the patent application process have been identified across the SIF interviews. *Time reduced in bringing innovation to market* is one of the key gains expressed by all firms with the usage of a GenAI solution. By leveraging GenAI, the complete process from the first interaction to a filed patent application has been significantly cut down. This matters for SIFs, having only one or a few inventions, since it's key to secure early protection for the invention that lays the foundation for their business idea. Related to this gain are also two other important ones, *a flexible process workflow* and *reduced complexity of the patent process*. By having a smoother interface and helpful support from GenAI, interviewee N mentions that the inventor from the SIF can more easily handle the communication with the patent attorney, improving the process workflow and ultimately contributing to a reduction in total time spent on the application. The previously daunting process also gets more manageable as a result. These three gains lay the foundation for another one, the possibility to *focus on more important tasks* as a business manager, explicitly pointed out by interviewees M, O and P. Oftentimes the inventor and business manager are the same person at SIFs, and consequently he or she needs to manage numerous tasks at the same time as the patenting process. With the additional GenAI enabled support in the patent process, more time can be spent on strategic and operational questions, while still getting the job done (protection of the innovation early and quickly). Interviewees Q and O claim that the *resources* (time and energy) *spent on tedious steps* therefore are reduced.

Another important gain for all SIFs that have been interviewed is *cost savings in the application process*. SIFs often operate under tight financial constraints, and the substantial decrease in costs by using Lightbringer compared to a traditional patent application process has been highlighted as key. It can enable companies that

otherwise wouldn't have the resources to apply for a patent to actually file one as well as give SIFs the possibility to pursue a portfolio of patents instead of single applications. An *increased willingness to patent more* is therefore another recognizable gain, brought up by interviewee M. The lower costs associated with a patent and a subsequent filing can also open up opportunities for SIFs that otherwise wouldn't exist. Interviewee Q highlights examples such as signaling and *access to previously inaccessible investors* and networks.

Further, the *improved invention description*, due to suggestions from GenAI has been a widespread benefit according to interviewee M, N, O and P. GenAI can enable the application to be more comprehensive by (1) prompting the inventor with suggestions to include that the inventor knows about but hasn't brought up in the draft and by (2) proposing alternatives that the inventor hadn't thought about, which could be useful in a patenting context.

Finally, a few other gains for SIFs have been put forward. Interviewees P and N lift *improved communication* between the inventor and patent attorney as a result of both non GenAI related factors such as an improved user interface and a more transparent process, and GenAI related factors relating to the suggestion and generation of text. *Increased ownership for the inventors* at larger SIFs has also been mentioned as a benefit of using a GenAI solution by interviewee O. The required knowledge of the patenting process is reduced compared to a traditional process, and therefore the engineers can manage more of the process themselves, without having to involve their manager to the same degree.

5.1.2.3 Pains with traditional method

The pains that have been considered as key with the traditional process for SIFs all tie to each other; that it's a *time consuming, costly,* and *complex process,* each mentioned explicitly by more than a majority of the interviewed firms. The process being time consuming is problematic due to the importance of quickly securing protection of an invention, and the complexity might discourage founders and inventors from pursuing a patent, if the initial barrier feels too high. Adding to this, since the traditional process is based on billable hours, a more time-consuming process is proportional to higher costs. Interviewee Q also mentioned that with *limited transparency*, the costs might be apparent first after the filing is completed, further adding financial uncertainty for SIFs. Another pain put forward by interviewee O is that the *limited resources*, in terms of human capital, *are not utilized optimally* when the business manager needs to navigate the complexities of the patent process instead of focusing on more commercially beneficial tasks.

Furthermore, interviewee O mentions that inventors at SIFs also *dislike the patenting process*, finding it boring and tedious. They thrive when they research and develop new concepts or products, not when filing paperwork or communicating back and forth with patent attorneys. In addition to interviewee O, interviewee P also *perceives that communication as inefficient*, due to the different roles and

backgrounds among the communicators. Overall, firm P mentioned that the process feels out of touch and old-school, further adding to the frustration.

5.1.2.4 Pains with GenAI solutions

Looking at the pains and fears of using GenAI solutions, all SIFs mention *confidentiality and data security concerns* together with the *fear of AI hallucination and worse quality*. Confidentiality relates primarily to leakage of the invention by external LLMs. As previously argued, this poses a very significant fear for SIFs due to their scarce number of inventions available for commercialization. Interviewee P highlights that potential AI hallucination and therefore wrong or faulty information in the patent application could not only worsen the quality but lead to a patent not being granted. If the patent isn't granted or the process is significantly prolonged due to quality-issues, some of the gains are eliminated or reduced.

Furthermore, concerns have been raised by interviewee Q about the GenAI solution not being *adaptable enough to cover all fields of specialization*, considering patent applications deal with novel and innovative material. Relating to this, if the *LLM isn't trained on recent enough data and information* there is limited usefulness in certain sectors in which the development has been rapid in recent years or even months. GenAI needs to be able to handle the complexities of a novel invention to serve useful for those SIFs.

Additionally, the *pricing* of the GenAI solution has been expressed by firm O as a potential pain point – if the costs exceed the traditional method of hiring a consultant. Interviewee N also ponders how the usage of GenAI can lead to limited *transparency and traceability* of the output from LLMs, possibly leading to SIFs not being able to fully understand the reasoning behind parts of the application.

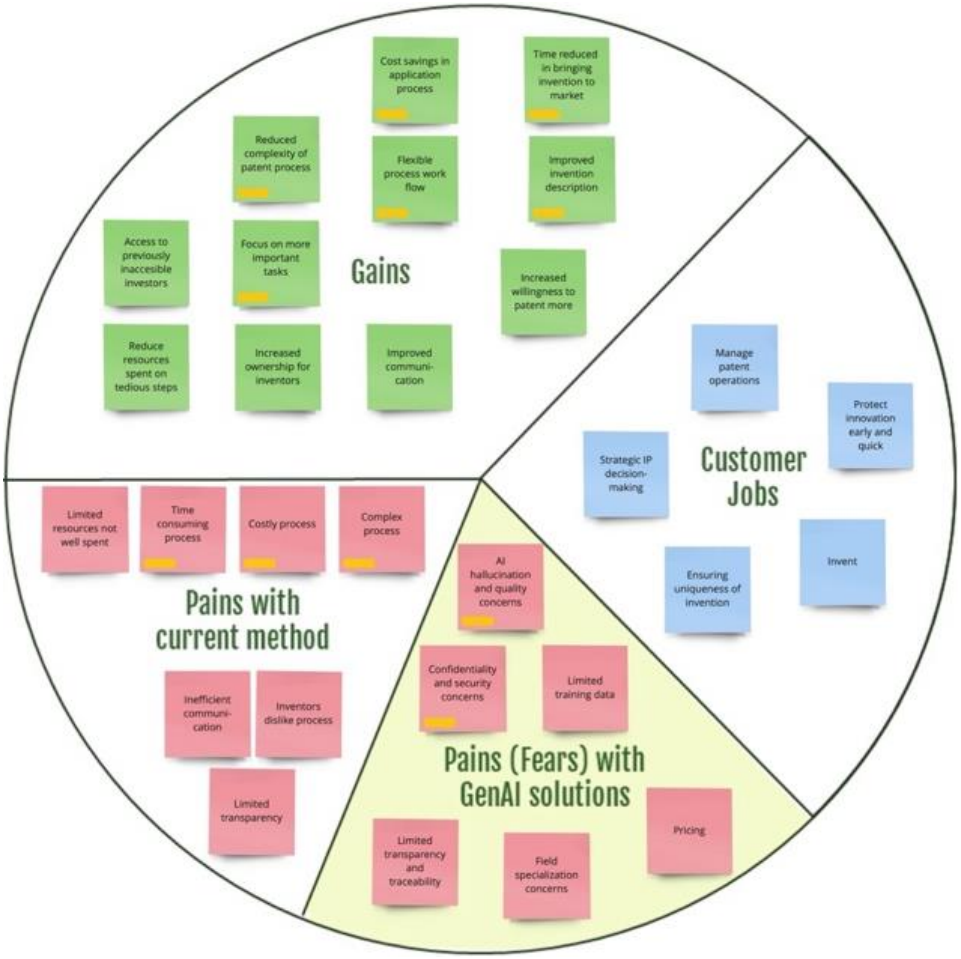

Figure 5.2 A consolidation of 2nd order themes of customer jobs, gains and pains expressed by SIF interviewees

5.1.3 LIFs

The 7 LIFs have been randomly anonymized as interviewees F, G, H, I, J, K and L and mapped to their 1st order themes in the table in appendix B3.

5.1.3.1 Customer jobs

For LIFs, the main customer jobs of the IP-department revolve around *protecting innovation* through effective intellectual property management. This includes, as mentioned by most interviewees, *drafting patent applications* to protect novel inventions and *managing the patent operations and processes*, ensuring that it aligns with the company's business strategy and market position. Lifted by firm F and H,

LIF interviewees are also responsible for *identifying and gathering inventions from inventors* within the organization, which involves a significant amount of interaction and communication to accurately capture the inventive concepts. As pointed out by firm I, a big portion of the work consists of communicating with different stakeholders such as inventors, product managers and external agents. Furthermore, the customer jobs involve *patent related assessments* such as infringement, FTO and patentability to avoid legal disputes and ensure freedom to operate in the marketplace. These assessments must be thorough and up-to-date to effectively navigate the legal complexities of intellectual property.

5.1.3.2 Gains

The adoption of GenAI solutions promises a multitude of gains for LIFs. The key gains revolve around the operational aspects of IP drafting and management. With the enhanced *time efficiency* of GenAI solutions, articulated by all LIF interviewees, and handling of repetitive tasks which leads to *decreased repetitiveness* for the firms' employees, LIFs can in turn *focus on more important activities* such as invention gathering, portfolio management and patent coverage. In many ways related, important for LIFs and mentioned by most interviewees, *cost efficiency* is another major gain, as the reduced need for manual work on repetitive tasks and the time reduction can lead to significant savings. Additionally, *scalability* is highlighted by firm K and L, where the same level of resources can handle an increasing volume of work and can especially be used to handle backlogs and spikes in the demand for patents, with hopefully limited loss of quality. This could be crucial for numerous IP departments on tight budgets and with low headcount. According to interviewees G, I and J, the scalability gains also go hand in hand with *more control over patent drafting*, as there is a decreased reliance on external agents, thus keeping sensitive information and learning in-house, leading to increased consistency of drafts. Furthermore, LIF interviewees F, G, I and J mention *increased drafting quality* as a key gain, because of GenAI:s ability to ensure consistency and reduce formal and human errors. This is further expanded on by interviewee I who expressed that the *"learning" capabilities of GenAI* solutions can over time accelerate and boost quality by adapting to company best practices and prior patents.

The use of GenAI solutions also poses some quality-of-life gains for LIF customers. According to interviewees F and G, GenAI can provide *seamless integration of individual draft* sections such as better and smarter handling of figures which can be enabled by GenAI's ability to generate and analyze images. Furthermore, it could enable changes in one part to seamlessly transfer to another, enhancing the cohesion and consistency of the documents. Especially mentioned is the ability to make edits and generate text from the claims to descriptions. The possibility of *quick translations* and the ability to easily generate versions of documents for different jurisdictions is also lifted by firm H. GenAI-usage can also, according to participant L, foster *closer contact with inventors*, who can be more directly involved in the patenting process and be GenAI-assisted in explaining their inventions, possibly

leading to higher motivation and increased innovation. Due to the hastiness of text generation and sufficient quality of GenAI-assisted drafts, interviewee G also mentions a *lower patenting threshold* which, especially for some strategic motives to patent such as keeping competitors alert can be highly beneficial. Lastly, LIF interviewee I also mentions being a *modern and attractive employer*, by using modern and effective tools, as a gain associated with the use of GenAI solutions.

5.1.3.3 Pains with traditional method

The traditional method of patent drafting entails several pains for LIFs. The process is, according to interviewee H, often bogged down with *"boring" repetitive tasks* that offer little in terms of strategic value and can lead to job dissatisfaction and loss of focus. Interviewee I expresses that there is often *limited time for in-house drafting*, forcing LIFs to outsource to different agents. This can, according to participant L, in turn introduce *consistency concerns* which can sometimes compromise the uniformity and quality of the patents due to different agents working with different standards. Outsourcing can also lead to a loss of direct control over the patenting process and *limited control over time management*, mentioned by interviewee H. Interviewee G especially mentions the pain of *spikes in demand of patents* needing to be handled via outsourcing. Furthermore, according to participant F, it can be a struggle to accurately *identify and gather inventions from* inventors and get them to articulate the core of their invention.

5.1.3.4 Pains with GenAI solutions

While GenAI solutions offer compelling advantages, they also come with new pains and fears for LIFs. There is a concern that if *AI loses focus* on the core of the invention, the resulting patents might not be as robust, potentially requiring substantial manual corrections. *Quality concerns*, such as the accuracy of the content and how the AI might handle nuanced legal terminology as well as keeping a continuity throughout the application are mentioned by a majority of interviewees. This could result in trust issues with the technology and could, according to interviewee J, lead to *substantial proofreading* undermining the value of the tools.

Confidentiality is another key concern mentioned by all interviewees; the proprietary nature of inventions means that any leak or misuse of sensitive data could have grave consequences for LIFs. Switching to a new GenAI solution may also, according to participants H and I, incur *high switching costs and effort* to adapt to new workflows, which may be particularly challenging for larger companies with established procedures and complex systems.

Moreover, there's a fear expressed by interviewee G about the *longevity of tool suppliers*. LIFs worry about investing in a GenAI solution only to find that the supplier might not be in the market long term, raising questions about support and updates for the tool as well as access to prior applications. Concerns about GenAI *adaptability to specific writing styles* of attorneys or company terminology and standards are also highlighted by participants F and G. Additionally, interviewee K

mentions that a shift to using GenAI solutions could *automate fun tasks* which could lead to slower adoption of the technology. Furthermore, the emergence of GenAI solutions is mentioned by participants I and J to possibly incur a *loss of learning opportunities* for junior staff, since more is automated, and could ultimately affect the professional development of patent attorneys and quality of patent applications going forward. Additionally, interviewee K expresses concerns that a *prompting skillset* might become critical, which is an important part of using GenAI. Lastly, there is some skepticism from firm participant K regarding *pricing* and questions about where potentially high prices are derived from. Many think of LLMs, such as ChatGPT, as a free service and therefore overlook where prices or costs are derived from for GenAI tools and their providers.

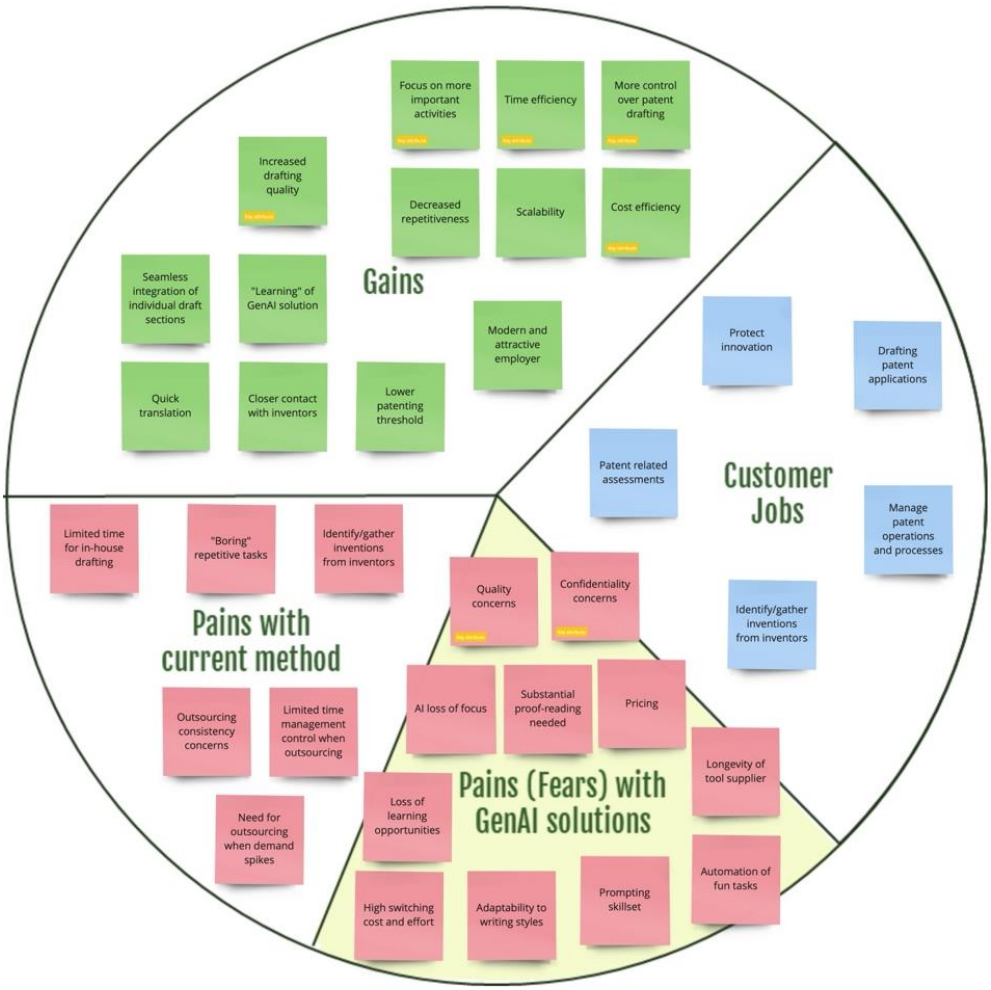

Figure 5.3 A consolidation of 2nd order themes of customer jobs, gains and pains expressed by LIF interviewees

5.1.4 Similarities and differences between customer segments

In this section analysis of similarities and differences between the different customer segments is conducted, occasionally through the identification of common themes.

5.1.4.1 Customer jobs - similarities and differences

When analyzing the customer jobs of IP-firms, LIFs, and SIFs they all share a common core objective: protecting innovation through patent processes. This entails in some way drafting patent applications and conducting different patentability assessments as well as other patent related assessments. Each segment, however, approaches this goal differently. LIFs integrate patent operations with their broader business strategies, emphasizing internal coordination and external communication when expertise or handling of volume is needed. IP-firms, serving as external specialists, focus on precision and expertise in drafting patents and providing strategic legal services for their clients. SIFs, more often constrained by resources, prioritize swift protection of innovations and strategic management of patents, often balancing in-house activities with outsourcing as well as dealing with financial restrictions. These distinctions highlight varying operational scopes and strategies across the segments, reflecting their unique organizational needs and market positions.

5.1.4.2 Gains - similarities and differences

The introduction of GenAI in the application process presents both shared benefits and distinct advantages for the three customer segments. These groups want to use GenAI to address unique challenges, but also share common gains in the dimensions of efficiency improvements, cost reduction, quality and consistency, scalability and control, and strategic opportunities.

Efficiency improvements

Efficiency gains are universally appreciated across all three segments, although applied differently and with a slightly different objective in mind. IP-firms want to utilize GenAI to expedite the process' time-consuming and monotonous tasks, enabling them to serve more clients or devote more resources to complex tasks. For SIFs, on the other hand, the efficiency boost is critical for speeding up the entire process to secure early protection for their key inventions. LIFs benefit similarly to IP-firms from higher drafting efficiency in that they can focus more on other in-house tasks that are important for the company such as invention gathering or strategy, but additionally also benefit from a faster patent process similarly to SIFs.

Cost reduction

Cost reduction is another significant gain, particularly impactful for SIFs and LIFs. SIFs, often limited by financial constraints, find that the reduction of the overall cost of patent applications enabled by GenAI allows them to allocate resources more efficiently. Sometimes it also simply means that they are able to afford to patent

their inventions. LIFs utilize this similarly but take it even further with the increased efficiency and reduction of manual tasks leading to lower operational costs, allowing for budget reallocation inside the organization to e.g. facilitate innovation or expanding protection. Evidently, cost reduction seems to be an important factor in the decision to adopt solutions like these for the two segments. However, for IP-firms, the cost savings are more problematic, a reduction in hours spent on drafts, which can be seen as cost savings, also means a reduction in hours billed and needs to be offset by other revenue-generating activities. Therefore, the cost reduction does not make for as clear of a gain for IP-firms as for the other customer segments.

Quality and consistency

Both IP-firms and LIFs emphasize quality improvement as an important gain, but with somewhat different strategic focus. LIFs prioritize inter-applicational consistency and similar terminology in the patent portfolio as well as adaptation to their writing style, something that is not as important for IP-firms who serve different clients. For IP-firms, the desired quality gains are instead centered around reducing human errors, staying within formalities, and using AI to generate starting text and examples that help to elevate drafts. IP-firms put extra emphasis on quality improvements as an important gain to adopt GenAI solutions, linked to their problematic time/cost saving dynamic elaborated upon earlier. In contrast, SIFs don't stress increased quality as an important gain, but do however mention that the quality should at least be comparable to that of a traditionally drafted application and that granting of the patent still is paramount.

Scalability and control

Scalability provided by GenAI is particularly prized by LIFs, who need to manage large portfolios and batches of patents efficiently. This capability could allow them to handle fluctuations in demand with minimal compromise on quality or turnaround times. While IP-firms express some of the same benefits and being able to scale their operations and manage more clients, it's not as heavily emphasized. In the same way as LIFs, even though SIFs do not see scalability as critical due to their small size, they appreciate the fact that GenAI can help them handle increasingly larger parts of the process without having to outsource.

Strategic opportunities

GenAI also facilitates some new strategic opportunities, but differently for the three segments. The quickness and cost efficiency of GenAI lowers the patent threshold, which enables LIFs to better handle low-importance patents and build on those strategies, and SIFs to pursue patent portfolio building and potential access to new investors. Additionally, for the IP-firms it enables new offerings and business models which could be more important going forward, and something SIFs and LIFs can indirectly benefit from too.

5.1.4.3 Pains with traditional method - similarities and differences

In the context of the traditional method, SIFs see it as ineffective, inefficient, and complex and while LIFs and IP-firms in general like the traditional approach they also identify several pains in terms of tedious and monotonous tasks. On top of this, LIFs also see problems with scarcity of time and resources leading to outsourcing, which results in additional pains such as loss of control over consistency, time, and in-house knowledge.

5.1.4.4 Pains with GenAI solutions - similarities and differences

The pains and concerns regarding GenAI solutions can also be categorized and analyzed through a couple of common themes: quality and consistency, confidentiality and data security, adaptability and specialization, operational and financial implications, and human interaction and professional development. These pains and concerns affect the customer segments slightly differently.

Quality and consistency concerns

A common concern across all segments is regarding the potential quality and consistency of GenAI in patent applications. IP-firms are particularly apprehensive about GenAI's ability to handle the nuanced legal terminology necessary for successful patent applications and the high quality they require, fearing errors such as AI hallucination or drifting. Similarly, though not as strongly, SIFs worry about the quality of GenAI outputs affecting the grantability of their patents, particularly as they often depend on a limited number of critical patents. LIFs also echo this concern, emphasizing the need for accuracy in capturing the core of inventions and maintaining continuity throughout the application, which if not addressed, could undermine trust in GenAI solutions and affect usefulness.

Confidentiality and data security

Confidentiality is another critical concern, with all groups expressing fears about data leaks or learning algorithms that could potentially expose sensitive information. SIFs and LIFs are worried about the severe consequences of any proprietary information or inventions becoming public. IP-firms have the same concerns about their clients' data and information and express extra responsibility in ensuring and assuring that this is handled properly to keep their clients' trust going forward.

Adaptability and specialization

The ability of GenAI solutions to adapt to specific fields and handle complex novel innovations is questioned by SIFs, who are concerned about the relevance and currency of the data LLMs are trained on. LIFs also worry about the adaptability of GenAI solutions to company-specific writing styles and standards. Together they express fears about the AI being inflexible and too stationary.

Operational and financial implications

Operational concerns include integrating GenAI solutions into existing workflows and the change management required to accomplish this, with LIFs especially worried about high switching costs and efforts needed to change their complex systems. Both IP-firms and LIFs express concerns about the longevity of tools and tool providers, fearing future disruptions of operations and loss of access to data and prior applications. Financially, there is common concern about the pricing and pricing models of GenAI tools, how they fit into each of the customer's business models and how the tools compare to other free or cheap tools such as ChatGPT.

Human interaction and professional development

The potential reduction in human interaction due to automation of parts of the process poses some concern. IP-firms are not convinced that GenAI solutions would work well for inventor interactions. Both IP-firms and LIFs also express worries that automation of tasks will lead to less training opportunities for both junior and more experienced attorneys, thus long-term eroding the professional development and training needed to draft and quality assure high-quality patents.

5.2 Stakeholder perspectives

The different stakeholders' customer jobs, wanted and perceived gains as well as pains with both the traditional patent application method and the use of GenAI solutions don't differ from the previously presented findings from the customer segments. This is due to the interviewees only being divided into new segments while the answers remain the same. Consequently, further detailed descriptions of the customer jobs, gains and pains can be found in Section 5.1. The descriptions for the stakeholder perspectives are instead focused on explaining for which customer segment each perspective corresponds with while laying the foundation for the analysis of similarities and differences between the three stakeholder perspectives.

5.2.1 Patent Attorneys

For Patent Attorneys, the views are represented by interviewees from both IP-firms and LIFs. While fundamentally performing the same job, the customer jobs, gains and pains can differ and subsequently all Patent Attorney views are gathered in Figure 5.4.

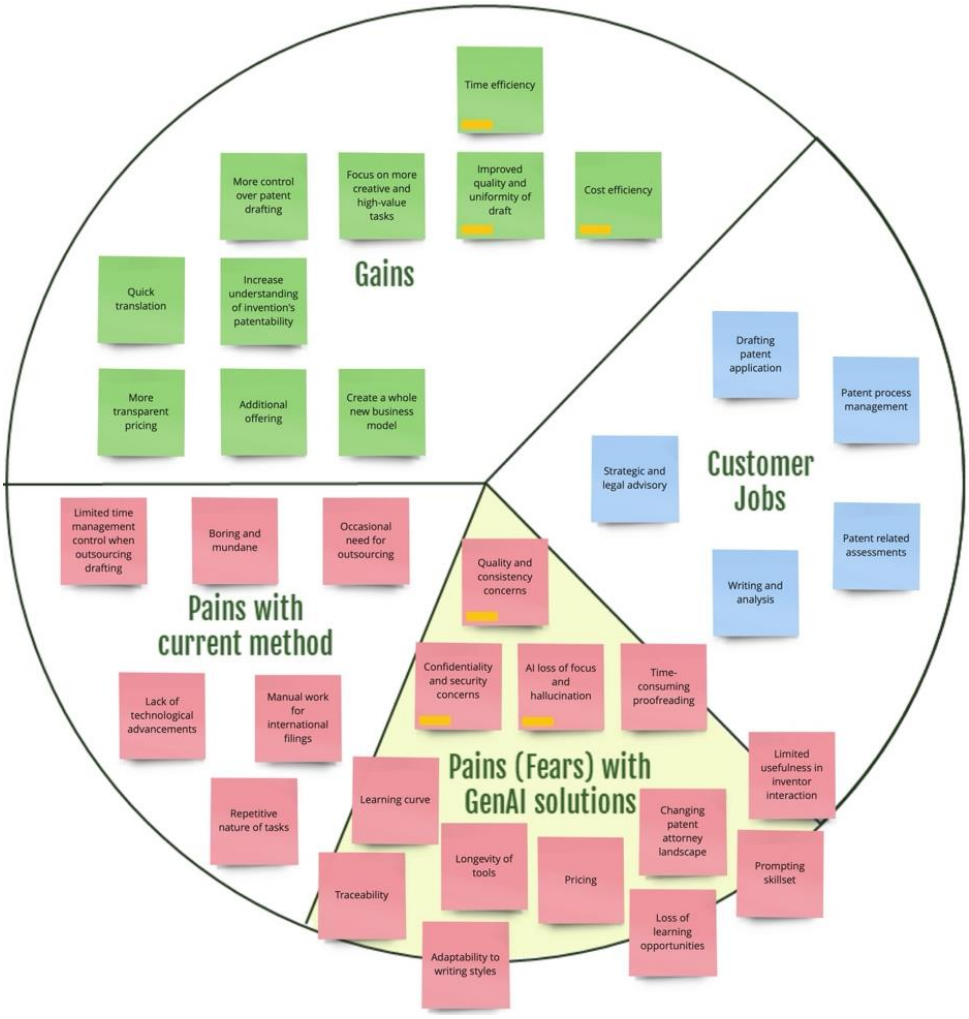

Figure 5.4 A consolidation of 2nd order themes of customer jobs, gains and pains expressed by Patent Attorney interviewees

5.2.2 Inventors

All interviewed Inventors are from the SIF customer segment, but only the views representing the Inventor perspective are described in Figure 5.5, therefore differing slightly from Figure 5.2, in which also the Business Manager perspective from the SIF interviewees is included.

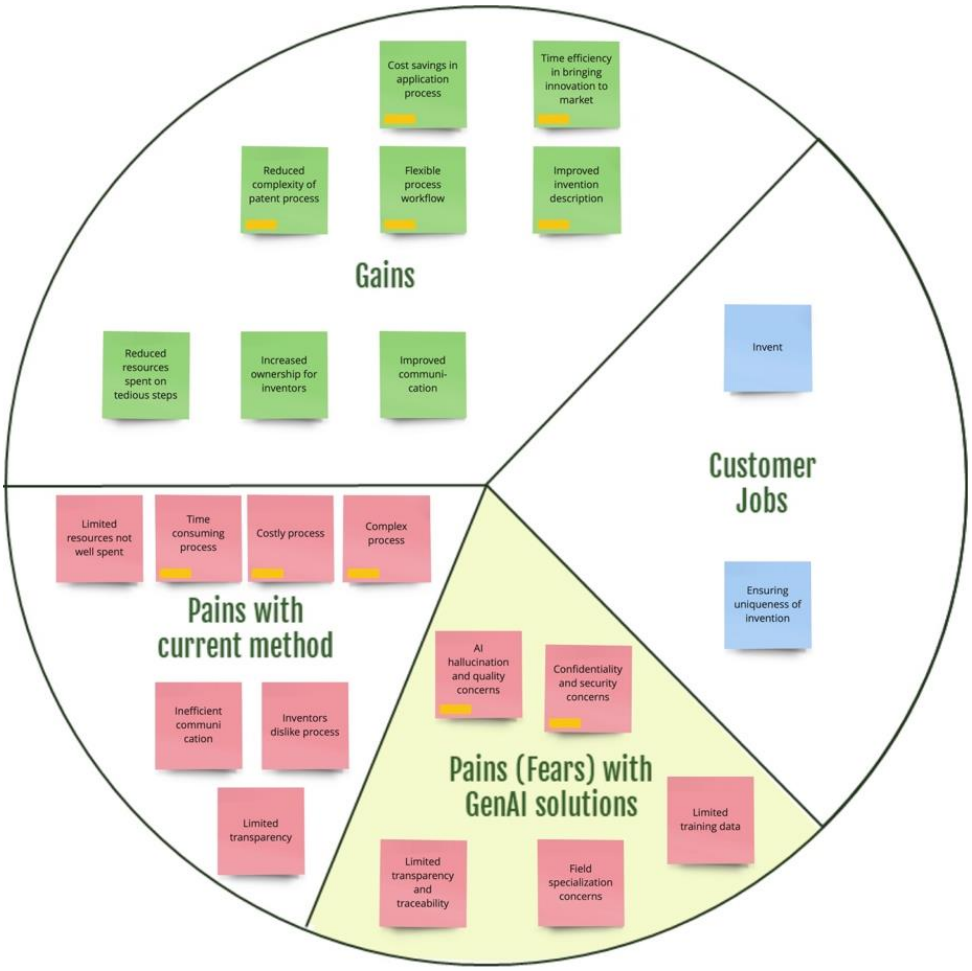

Figure 5.5 A consolidation of 2nd order themes of customer jobs, gains and pains expressed by Inventor interviewees

5.2.3 Business Managers

The Business Manager perspective consolidates thoughts and opinions from both SIFs and LIFs. The aforementioned omitted customer jobs, gains, and pains in Figure 5.5 from the interviews with SIFs are included as well as the findings from the two interviews with Business Managers from the LIF customer segment.

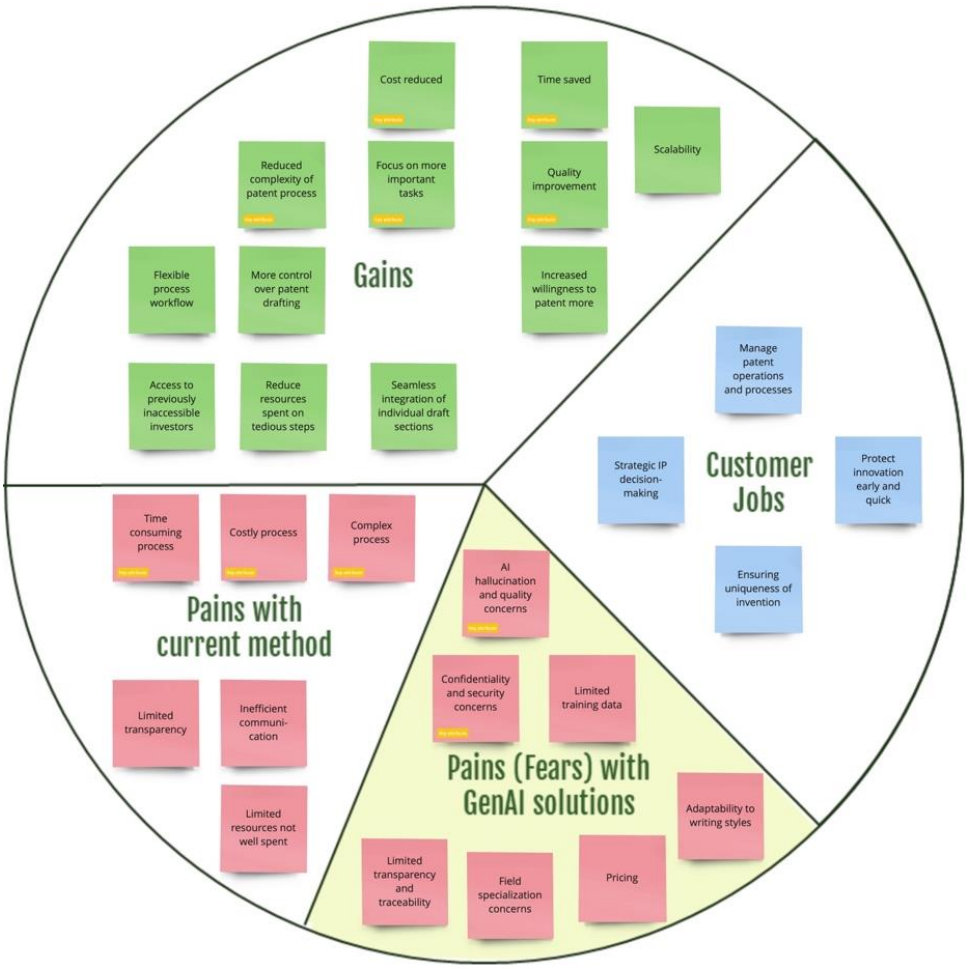

Figure 5.6 A consolidation of 2nd order themes of customer jobs, gains and pains expressed by Business Manager interviewees

5.2.4 Further insights from stakeholder perspectives

In addition to the similarities and differences between the different customer segments, additional insights can be found when looking at the other angle and analyzing the stakeholder perspectives. Consequently, this section will focus on further insights that haven't been put forward in Section 5.1.4.

Scalability and increased control are valuable gains for Business Managers. It enables them to distribute resources in ways that otherwise wouldn't have been possible, e.g., to decrease the backlog of inventions ready for patenting. For Inventors, this benefit is limited, while Patent Attorneys at LIFs can see the benefits from a more streamlined and scalable environment. The Patent Attorneys at IP-firms see other gains as more prominent, but increasingly more control and an ability to scale up isn't an inherently negative aspect.

Another gain enabled by the usage of a GenAI solution are strategic opportunities. Once more, this is something that Business Managers value (both at SIFs and LIFs). It enables them to pursue a different and more aggressive IP strategy. The Inventors' lack of focus on strategic questions inherently makes this a less valuable gain for them. The Patent Attorneys at IP-firms mention that the usage of a GenAI solution can add to their business model and strategy, enabling new business models as well as additional offerings and more transparent pricing.

The traditional patenting process is associated with inefficiency and complexity for Inventors. They really dislike the process, which is far from where their passion lies. From the Business Manager perspective, it much depends on the customer segment you belong to. For SIF Business Managers, the primary frustration relates to the fact that their limited resources, in terms of time and money, are not well spent. LIF Business Managers have a different view compared to SIF Business Manager, since their processes are at a different scale. But also they recognize that the current method and some outsourcing leads to less control than desirable.

Questions about pricing and integration primarily fall to the Business Manager, and therefore they also emphasize the importance of dealing with those potential pain points when implementing a GenAI solution. The switching cost and change of processes, e.g., the distribution of in-house versus outsourcing at LIFs could be another pain point that increases the hesitancy to adopt a new solution. Patent Attorneys highlight this potential change from their current way of working as well. For SIF Business Managers this is generally not a concern since they usually don't have any established ways of working with patents and can therefore be very flexible.

5.3 Aggregate dimension

In Figure 5.7, the findings from all interviewees across all segments and perspectives are aggregated. The transition from 2nd order themes to the aggregate dimensions can be found in appendix B4.

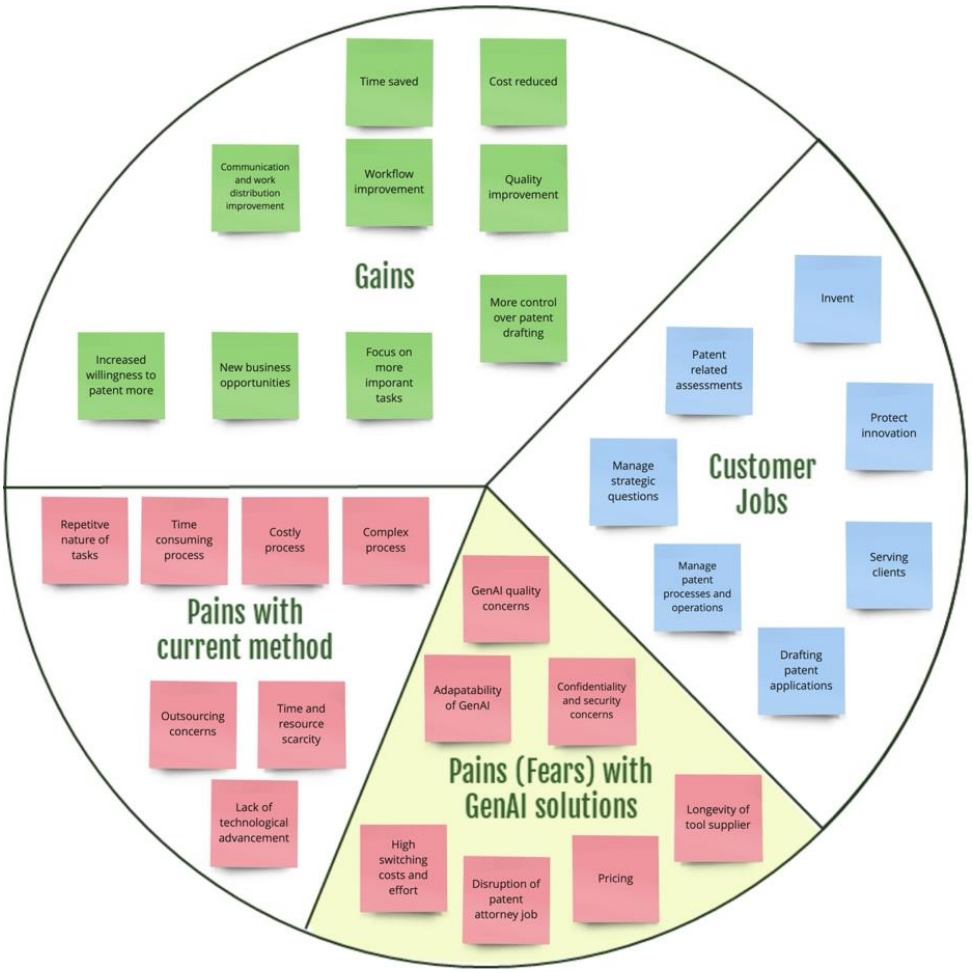

Figure 5.7 A consolidation of aggregated themes of customer jobs, gains and pains expressed by all interviewees

6 Discussion

In this chapter, the managerial implications of the study are explored, focusing on gain creators and pain relievers for the identified gains and pains. Additionally, firm characteristics that drive the usefulness of GenAI solutions are discussed. Ultimately, the thesis is placed within a broader context by addressing the limitations, reliability, and generalizability of the study as well as the potential future development.

6.1 Managerial implications

This section will focus on proposing gain creators and pain relievers leading to or relieving the aggregate gains and pains found. The gain creators and pain relievers mapped to the aggregate dimension pains and gains will also subsequently map to, and cover, 2nd and 1st order themes. The analysis of gain creators and pain relievers is done to better understand how the identified themes can be created/mitigated, thus improving the understanding and subsequent exploratory evaluation of the usefulness of GenAI solutions within the patent application process. The evaluation is based on investigation of the pains and gains, as well as insights from the interviews and the interviewees' feedback on Lightbringer features. The analysis and proposed measures are primarily conducted from the perspective of the GenAI tool providers, such as Lightbringer, as it is in their interest to realize the benefits and alleviate the challenges.

6.1.1 Gain creators

Starting with the gain creators, there are four main gain creators that both have direct and indirect effects on creating the gains found in the study. The gain creators as well as the gains they map to are displayed in Figure 6.1. The gain creators are linked not only to inherent capabilities of GenAI but also to the design and additional support provided by tool providers and other stakeholders.

Fixed Pricing

The implementation of GenAI can help establish a consistent pricing structure and less unexpected costs, which likely reduces uncertainty and complexity in the process.

GenAI-Enabled More Streamlined and Simpler Process

The use of GenAI streamlines and simplifies the process in combination with extended tutorials and explanations of the process. GenAI helps with automating complex tasks and makes existing procedures less convoluted, thus enhancing the workflow and the ability to distribute work appropriately.

Smart and More Interactive GenAI-Supported Tool

Building an AI tool that is not only smart in processing information but also interactive, could lead to ease of use and potentially enhanced user engagement. Such tools can adapt to user input and improve the overall experience, speed of use and collaboration.

Suggestions, Summaries, and Text Generated by AI

This gain creator specifies the AI's capabilities to provide content-related support, such as making suggestions, creating summaries, and generating text, which if used right can assist users in tackling the complexities of the different parts in the patent application, describe inventions properly, and reduce the time spent on these tasks.

GenAI-Untired Checking and Formatting Precision

This gain creator highlights the tireless and precise nature of checking and formatting enabled by the implementation of GenAI, resulting in an improvement in accuracy and consistency in the output, possibly leading to a reduction in errors.

These gain creators have a direct effect on the gains located centrally and to the right in Figure 6.1. The gains "cost reduced" and "time saved" also indirectly serve as gain creators, helping to realize further gains, as can be seen in Figure 6.1.

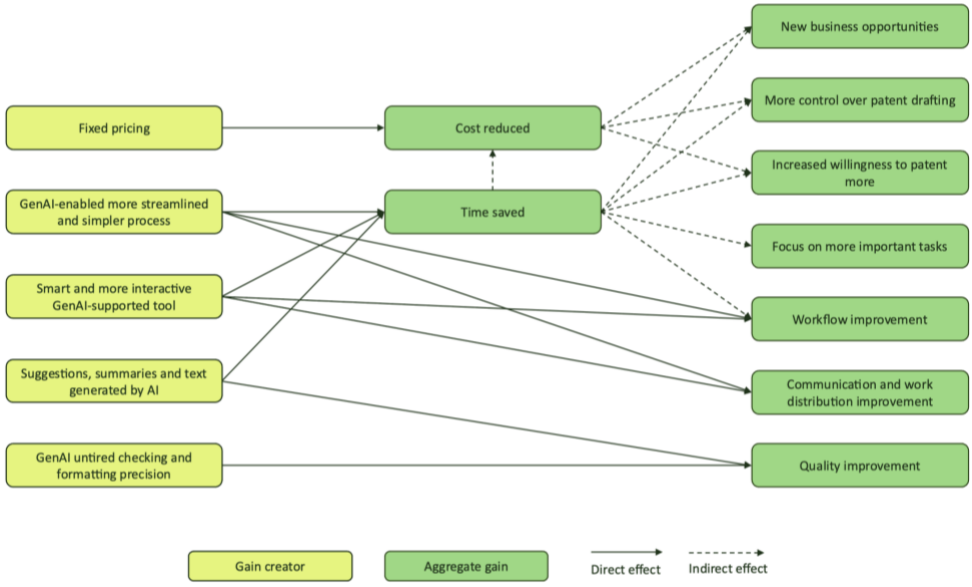

Figure 6.1 Proposed gain creators for the aggregated gains identified in the study

6.1.2 Pain relievers – traditional method

The proposed pain relievers in Figure 6.2 instead help mitigate some of the pains experienced by customers in the patent application market. The first four factors, similarly to how they lead to gains explained in section 6.1.1, are also pain relievers in how they help mitigate and reduce pains of the complex, time consuming and costly traditional process. Furthermore, two additional pain relievers have been identified that alleviate further pains:

Boosted Drafting Speed to Better Manage Volume

The implementation of GenAI solutions and the use of tools boosting productivity and drafting speed could allow organizations to better handle large volumes and spikes in demand without having to outsource.

Reduce Barrier of Entry to GenAI Solutions

In an attempt to reduce the pain of missing out on technological advancements, GenAI tool providers can try to reduce the barriers of entry to their solutions and make it less daunting to get onboard and try them out, for example through free testing or educational content.

Finally, relieving the pains of a costly and time-consuming process also indirectly leads to reducing the pain of time and resource scarcity that companies experience.

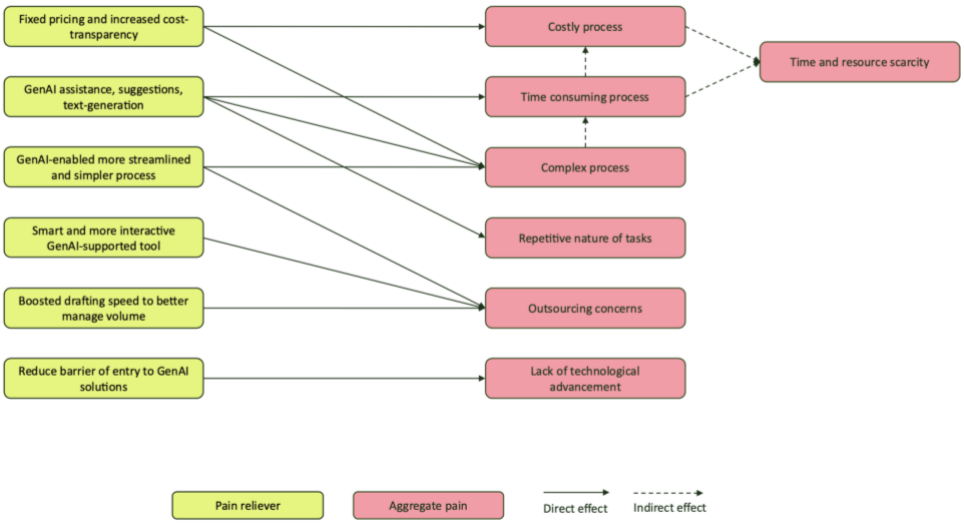

Figure 6.2 Proposed pain relievers for the aggregated pains with the traditional method identified in the study

6.1.3 Pain relievers - GenAI solutions

These proposed pain (fear) relievers instead focus on reducing or mitigating the identified pains or fears with the introduction of GenAI solutions and can be found in Figure 6.3. On the left side in the figure, six pain relievers are listed:

Patent Attorney Quality Assurance

This aims to address concerns about the quality of GenAI, ensuring that the output meets the high standards expected in legal settings and could be an interim solution until even stronger GenAI capabilities emerge.

Updated and Extensive Training Data and LLMs

This pain reliever addresses the adaptability and quality concerns of GenAI, indicating that through technical solutions and more current and comprehensive training, the system can stay up to date with industry changes.

Learning of GenAI Solution

This pain reliever points to potential learning capabilities of a GenAI solution that could be implemented universally for the tool provider. It can also serve specific clients by leveraging their internal databases and patents, to consistently improve the quality of the GenAI solution over time.

Ensure Customers Remain Informed and Can Adapt Swiftly

To address the fear of job disruption and longevity concerns, the tool suppliers can ensure their customers remain informed about new features, capabilities, use cases and their financial integrity so that they can adapt accordingly.

Clear Roadmap for Implementation

Creating clear roadmaps for implementation can reduce the pain associated with high switching costs and effort, providing users with a clear plan for adopting the GenAI system, particularly useful for bigger and more complex organizations.

Transparent and Fixed Pricing

A clear and transparent communication of prices and costs as well as the introduction of fixed pricing can help relieve the pains or fears associated with high and uncertain pricing of the tools and services. It can also help shed light on the costs associated with providing the service.

Certifications and Clear Communication

To address some confidentiality and security concerns, proper certifications and transparent communication about the inner workings of solutions as well as data handling should be in place.

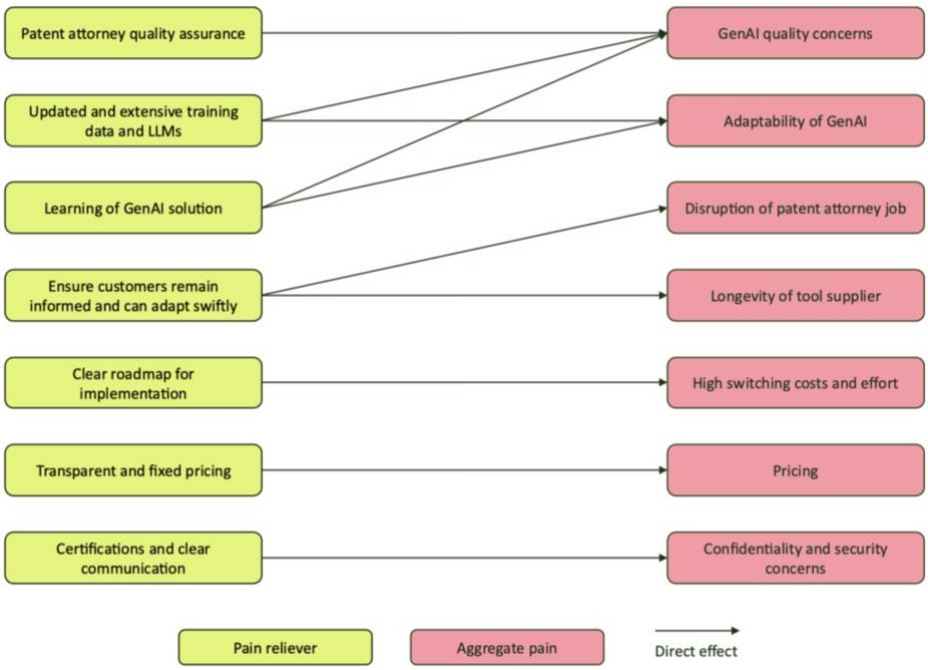

Figure 6.3 Proposed pain relievers for the aggregated pains with GenAI solutions identified in the study

6.2 Firm characteristics driving usefulness

The interviews provided some additional insight into which firm characteristics might influence the usefulness of generative AI solutions, such as the Lightbringer application. These characteristics will be indicative and exploratively discussed based on the non-exhaustive information from the study. Many of the identified factors map to those found in prior studies on patenting behavior, while some are new and more case-specific (Huang & Cheng, 2015). As mentioned by Christensen et al. (2016) the causal relationship of these factors can't be exactly determined but through interpretation of the results and discussions with interview objects the authors make an attempt at exploratively understanding what factors could have an impact on driving the usefulness of GenAI solutions.

Firstly, firm size seems to be one variable of interest. Smaller firms with less resources indicatively benefit from e.g., the time saved and cost reduced to a larger extent compared to larger firms, thus enabling them to patent (more) and obtain all the additional benefits from that. The difference in being able to file zero or one patent is far larger than the difference between filing 100 and 110 patents.

Another variable that can be related to firm size, but doesn't necessarily have to be, is the in-house IP knowledge. The study suggests that firms with limited competence in-house regarding IP can achieve some additional gains, enabled by GenAI. Those include, but are not limited to, a less complex and intimidating process supported by the GenAI tool, an increased willingness to patent and better invention descriptions in the application.

Additionally, the R&D effort of the firm has been deemed an important characteristic. All the interviewed firms are similar in that regard, i.e. they spend a relatively large portion of their resources on innovation. This observation strengthens the apparent assumption that a GenAI solution within the patent application process is highly beneficial for firms that engage in extensive R&D.

The industry sector and motives to patent were mentioned in section 3.5 as potential characteristics worth exploring, but the insights from the study in these areas remain rather inconclusive.

The proposed firm characteristics driving the usefulness of GenAI align to a large extent with the authors' definition of small-scale innovative firms. At the same time, this doesn't mean other types of firms with different characteristics wouldn't benefit from a GenAI solution within the patent application process. However, the potential advantages are particularly well suited to the characteristics of the firms mentioned. As can be seen in the result and analysis chapter, firms from all customer segments with varying characteristics report additional value in using a GenAI solution that meets their wanted gains.

6.3 Limitations, reliability, and generalizability

The results from this thesis don't significantly differ from tentative findings and proposals from previous research and studies. As mentioned in Section 3.4, Jiang and Goetz (2024) highlight the efficiency and possibility for increased quality, both of which have been extensively discussed within the gains part of the results and analysis section. As Christofidellis (2023) and Jiang and Goetz (2024) mention, the generation, suggestion, and summarization of text, serve as creators of these potential gains, similarly as discussed in this thesis. However, more granular, and indirect gains have also been identified within this thesis, and further research could serve useful for confirmation of these as well as the transferability of them to e.g., other jurisdictions and geographical regions.

Related to the pains and fears of GenAI solutions, Jiang & Goetz (2024) bring up the challenges with complex technical and legal phrases in patents and how this needs to be managed for the GenAI solution to fully prosper. Additionally, fears such as data security (Amankwah-Amoah et al., 2024) and hallucination also exist generally, regardless of field. This thesis strengthens the proposal that these are the main pains and fears for professionals within the patenting field, while proposing some sector-specific additional pains and fears that could be further researched.

Some limitations in the thesis have been identified. Firstly, the case study results are reliant on the selection of interviewees to be as relevant and representative as possible. To mitigate this concern, the study has included multiple customer segments and stakeholder perspectives to create as comprehensive an information base as possible. The drawback with this is that the number of participating interviewees per segment decreases, but the study nevertheless has five or more interviewees from each segment, increasing the credibility of the results.

Another limitation relating to the screening process is the possibility that there is a selection bias. If people that generally have a positive view towards GenAI choose to participate in the interviews, the negative aspects might not be as thoroughly covered. However, during the outreach, the response rates from firms with no current adoption of GenAI solutions was no worse than for firms which have used a GenAI solution. One other concern is that the interviewees might convey a more positive outlook on GenAI than what is in fact true, in an attempt to seem up to date with technological shifts.

Additionally, the impact from the authors needs to be discussed. During qualitative interviews, the interviewers can both consciously and subconsciously affect the interviewee and consequently the answers given. However, the authors' framework and clearly devised interview guides contributed to each interview to be conducted in the same manner as the others. The authors' interpretation of the answers given was also checked, and each interviewee was given an opportunity to comment on their contribution ahead of the publication, to ensure that no faulty information was

reported. Both authors conducted all interviews together, further adding certainty to the findings.

Reliability concerns, and whether the results would be the same if someone else replicates the study, have been mitigated as previously described through the selections of interviewees as representative as possible. The result should therefore not differ substantially if others surveyed the same thing. However, it must be noted that a larger number of participants would have increased the reliability, but the limited scope and timeframe of the thesis made it hard to achieve. Furthermore, the topic of the study is fairly novel, and the attitude could therefore change pretty swiftly, meaning that the results in this thesis capture the thoughts and attitudes in this specific point of transition. Thorough documentation of the process has been done in this thesis, enabling others to replicate the study if they so wish.

Stepping back to assess generalizability, one might identify learnings and similarities somewhat applicable across various industries and GenAI use cases. General gains such as time efficiency, cost reduction and the possibility of focusing on more value-creating tasks are desirable across a lot of industries, and especially those with laborious writing tasks. At the same time, the pains and fears with GenAI solutions shouldn't differ too much either, since the results from the study indicate that the key fears aren't specific for only the patent application industry. However, there are certain gains and pains which are sector-specific, and it isn't unreasonable to think that most industries also would have these sector-specific benefits and challenges. Those would need a study in that particular field to be determined. The combination of the general and industry-specific gains and pains would then indicate the overall usefulness of adopting GenAI solutions in that field.

Considering the generalizability and learnings from this thesis, there is indication that the high-quality requirements within the patent industry could lead to similar benefits and limitations in other sectors with strict quality demands, for examples multiple legal fields working with for example precise contracts or legal feuds. The legal industry's emphasis on precision, accuracy, and adherence to regulations and formatting aligns with the patent industry's focus, suggesting potential transferable learnings. For instance, both fields could leverage generative AI for generating, summarizing, and managing complex documents.

Conversely, text-producing industries or tasks with less strict quality demands, such as content creation or internal tasks, could experience similar gains to the patent industry but with fewer pains. In these sectors, the need for rigorous proofreading and extremely precise wording may not be as needed, allowing for streamlined content generation. However, some other pains and fears such as data security or adaptability could still be apparent.

Finally, one learning that might be relevant to other industries as well, is the fact that the addition of a GenAI solution in the process might require changes to the current process to reap all the benefits that could be associated with this technological shift. As could be seen in Figure 4.1, Lightbringer not only supplies a

GenAI solution, but also wants to change the market dynamics, to enable the GenAI solution to be leveraged in the best way possible.

6.4 The future of patent applications

Looking forward, the results and analysis imply that ubiquitous use of GenAI in the patent application process is something desirable and doesn't lie too far into the future. There are already companies using the technology to great effect and if the current pace of technological development continues, there is no reason not to believe that the wanted gains within each customer segment can be fully realized within the near future.

Additionally, as has been mentioned in the interviews, once a firm changes from the traditional method to a GenAI enabled process, the likelihood of reverting is low. The same goes for patent attorneys, when they integrate a functioning GenAI tool into their daily routine, they will be reluctant to switch back, further strengthening the thesis that larger adoption is imminent. Once GenAI-supported patent filings reach critical mass, a swift shift among the remaining traditional users is likely, provided the anticipated improvements in e.g., quality, time efficiency and cost efficiency are realized. When the remaining traditional users realize that a GenAI-supported process has become the new normal, there might be an urgency to act due to the fear of becoming obsolete. Given this, it's reasonable to believe that a streamlined process built around GenAI capabilities could become the industry standard within five years.

While it's difficult to predict the exact timeline of the adoption in the industry, these are a few out of several arguments supporting a quick speed of adoption, assuming minimal regulatory barriers in the near future and appropriate dealing with the identified pains and fears with GenAI solutions. SIFs are likely to be the first ones to adapt fully to a GenAI enabled process due to them having very low or no switching costs at all. Ubiquitous adoption among IP-firms could also be very imminent, while LIFs probably will be the slowest due to integration aspects, switching costs and potential need for organizational restructuring.

The firms providing GenAI solutions also seem to initially cater their solutions to different types of firms. Some firms, such as the previously mentioned Solve Intelligence, have established themselves among IP-firms. Lightbringer, in turn, have initially focused on creating a new process centered around the new technology and the requirements of primarily SIFs. All firms aim to eventually reach all customer segments, but their go-to-market strategies differ. Their way of shaping the future, introducing new processes and business models could come to revolutionize an old-school industry, but their initial approach to customer segments and the way their GenAI is integrated vary in a unique way and will be crucial in paving the path for creating long-term customer value.

7 Conclusion

In the final chapter, summarized answers to the research questions are provided along with a presentation of the thesis contribution and suggestions for further research.

7.1 Answers to research questions

The goal of the thesis was to answer three research questions. These have been explored and discussed throughout the report but will be summarized in this section.

RQ1: *What **customer value** (usefulness) could be created with the use of novel GenAI solutions, such as the Lightbringer application, for different customer segments (IP-firms, SIFs, and LIFs) in the patent application market from the perspective of different stakeholders (Inventor, Patent Attorney and Business Manager)?*

The usage of GenAI solutions, like the Lightbringer application, can create widespread customer value across all segments by enhancing time efficiency of drafting and potentially lead to lower costs and better use of resources. Specifically for large-scale innovative firms (LIFs), GenAI contributes to increased scalability of patent operations and improved control over patent processes with their integrated approach. Small-scale innovative firms (SIFs) can utilize the benefit of reduced patenting costs as well as simplification of the process to enable them to file which can facilitate access to investors and provide stronger coverage for their crucial innovation. For IP-firms, the desired value of GenAI additionally is to increase the quality and consistency of patent applications and that it could foster the development of new business models and offerings.

Additionally, some value is also created in relieving the pains of the traditional patenting process, a costly, complex, and time-consuming process which also occasionally requires outsourcing. Moreover, from the perspective of different stakeholders, all stakeholders have expressed the value creations above, but indicatively Business Managers are those who particularly benefit in terms of scalability and control as well as strategic decision-making, while Inventors are

those who see the most value in simplifying the process to streamline their involvement in patent processes.

RQ2: *What **obstacles or fears** do different customer segments and stakeholders face in using GenAI solutions, such as the Lightbringer application in the patent application process?*

Universal obstacles or fears that all customer segments experience are confidentiality and data security concerns of the GenAI solutions as well as quality and consistency concerns regarding the output. Additionally, adaptability and specialization concerns of GenAI solutions regarding scientific fields and writing styles have been raised. Business Managers also ponder about the operational challenges and financial implications of integration, and the potential reduction in human interaction further complicate the adoption, impacting professional training and development within the patent drafting process. Lastly, concerns have been raised about the changing ways of working combined with the longevity of tool providers, with Patent Attorneys fearing job displacement.

RQ3: *What are typical **firm characteristics** driving the usefulness of the Lightbringer application or generative AI solutions in the patent application process?*

The usefulness of GenAI solutions in the patent application process, such as the Lightbringer application, is indicatively influenced by several firm characteristics. Smaller firms, typically resource-constrained, derive significant benefits from the cost savings and time efficiencies provided by GenAI, enabling them to enhance their patenting capabilities. In-house IP competence could be another critical factor; firms with limited IP expertise find GenAI particularly advantageous as it simplifies the patenting process. Additionally, firms heavily invested in R&D find GenAI solutions highly beneficial, aligning with their intensive innovation activities. Results regarding industry, sector, and patenting motives offer less conclusive insights.

7.2 Thesis contribution and suggestions for future research

From the academic standpoint, this thesis contributes an increased understanding of what pains and gains could be for firms adopting GenAI solutions, through an exploratory qualitative study in the patent application market. This builds a foundation for future research within the topic, and the exploratory findings can e.g., be verified or further analyzed. Additionally, the thesis suggests some other

learnings that other industries could consider as well as information about how GenAI disruption could unfold, and what thoughts are present during that period.

Regarding contributions to practical application, the thesis provides insight into how companies in the patent application industry can utilize GenAI solutions to potentially augment their work and what obstacles are present in the market. For GenAI solution providers it also gives indication of the specific anticipated value creation and needs of different customer segments and stakeholders, allowing them to cater to different customers. Creating differentiated offerings and solutions could in turn contribute to their long-term success.

The exploration of GenAI applications in the patent drafting process, particularly through the Lightbringer tool, has laid a foundational understanding and exploration of its potential and limitations. To build on this exploratory study, future research could adopt a descriptive or quantitative approach to more precisely measure the impact of GenAI on efficiency and quality of patent applications across various industries as well as confirm the indicative gains and pains found in the study. The proposed gain creators and pain relievers could be further researched and consequently confirmed or denied. Furthermore, replicating this study in different geographical markets or other segments of the intellectual property industry could provide broader validation of the findings and insights. Learnings could also be taken from this study of an industry in transition/disruption, with its associated gains and fears, and be applied to other industries or further investigated in this or other realms.

Additionally, investigating the long-term customer value of GenAI tools and their integration into existing IP ecosystems could provide valuable information on their operational and strategic viability. This could include studying the adoption of such technologies in firms with varying scales of operations and their effect on the patent application lifecycle as well as the adoption timeline and roadmap.

References

Amankwah-Amoah J., Abdalla S., Mogaji E., Elbanna A., Dwivedi Y. (2024). The impending disruption of creative industries by generative AI: Opportunities, challenges, and research agenda. *International Journal of Information Management*, 102759, ISSN 0268-4012. doi:10.1016/j.ijinfomgt.2024.102759.

Barnes, D. H., Rao, W., & Mills, A. W. (2023). Patents laws and regulations report 2024 watching out for lurking hazards when drafting patent applications; using Generative Artificial Intelligence. Retrieved February 10, 2024, from https://iclg.com/practice-areas/patents-laws-and-regulations/04-watching-out-for-lurking-hazards-when-drafting-patent-applications-using-generative-artificial-intelligence

Bowman, S. (2023). Eight Things to Know about Large Language Models. arXiv:2304.00612v1 [cs.CL]

Bryman, A., & Bell, E. (2011). *Business Research Methods*. Oxford: Oxford Univ. Press.

Christensen, C., Hall T., Dillon K., and Duncan D. (2016). Know Your Customers' "Jobs to Be Done". *Harvard Business Review 94*, no. 9 (September 2016): 54–62.

Christofidellis, D. (2023). Accelerating scientific discovery using domain adaptive language modelling (Doctoral dissertation, Queen's University, Belfast, United Kingdom). Retrieved March 16, 2024, from https://pureadmin.qub.ac.uk/ws/portalfiles/portal/469343646/phd_thesis_dimitrios.pdf

ClaimMaster. (2024). Retrieved March 17, 2024, from https://www.patentclaimmaster.com/patent-application-drafting.html

Collier, D., & Mahoney, J. (1996). Insights and pitfalls: Selection bias in qualitative research. *World Politics, 49*(1), 56–91. doi:10.1353/wp.1996.0023

Denscombe, M. (2014). *The good research guide: For small-scale social research projects*. Maidenhead, Berkshire, England: Open University Press.

European Patent Office. (2023). SIF Case Studies. Retrieved March 15, 2024, from https://www.epo.org/en/learning/learning-resources-profile/business-and-ip-managers/innovation-case-studies/SIF-case-studies

Frietsch, R., & Neuhäusler, P. (2019). The role of the patent attorney in the filing process. *Springer Handbook of Science and Technology Indicators*, 875–888. doi:10.1007/978-3-030-02511-3_35

Heikkilä, J. (2021). The demand for IPR services - to use or not to use a professional representative. *International Journal of Intellectual Property Management*, *11*(3), 316. doi:10.1504/ijipm.2021.117180

Holgersson, M., & Granstrand, O. (2017). Patenting motives, Technology Strategies, and open innovation. *Management Decision*, *55*(6), 1265–1284. doi:10.1108/md-04-2016-0233

Huang, K.-F., & Cheng, T.-C. (2015). Determinants of firms' patenting or not patenting behaviors. *Journal of Engineering and Technology Management*, *36*, 52–77. doi:10.1016/j.jengtecman.2015.05.003

IPRally. (2024a). Retrieved March 17, 2024, from https://www.iprally.com/

IPRally. (2024b). Customer case studies. Retrieved March 17, 2024, from https://www.iprally.com/case-studies

Jiang, L., Goetz, S. (2024). Artificial Intelligence Exploring the Patent Field. arXiv:2403.04105v1 [cs.AI]

Klincewicz, K., & Szumiał, S. (2022). Successful patenting—not only how, but with whom: The importance of patent attorneys. *Scientometrics*, *127*(9), 5111–5137. doi:10.1007/s11192-022-04476-6

Lee J-S., Hsiang J. (2020). Patent claim generation by fine-tuning OpenAI GPT-2. *World Patent Information*, Volume 62, 101983, ISSN 0172-2190, doi:10.1016/j.wpi.2020.101983.

Lightbringer. [ca. 2023]. *About* [LinkedIn Page]. Retrieved February 10, 2024, from https://www.linkedin.com/company/lightbringerapp/

Lightbringer. [ca. 2024]. Patents For Growing Startups. Retrieved February 10, 2024, from https://www.lightbringer.com/for/startups

Managing IP. (2023). IP Starts Sweden Jurisdiction Rankings. Retrieved March 15, 2024, from https://www.ipstars.com/Jurisdiction/Sweden/Rankings/8534#rankings

Martineau, K. (2023). What is Generative AI?. Retrieved March 16, 2024, from https://research.ibm.com/blog/what-is-generative-AI

Minevich, M. (2023). The dawn of AI disruption: How 2024 marks a new era in Innovation. Retrieved February 10, 2024, from https://www.forbes.com/sites/markminevich/2023/12/14/the-dawn-of-ai-disruption-how-2024-marks-a-new-era-in-innovation/?sh=5989bf08141c

Neustel Law Offices. (2023). Invention disclosure form. Retrieved February 10, 2024, from https://neustel.com/invention-disclosure-form/

OpenAI. (2023a). GPT-4. Retrieved March 16, 2024, from https://openai.com/research/gpt-4

OpenAI. (2023b). How should AI systems behave, and who should decide?. Retrieved March 16, 2024, from https://openai.com/blog/how-should-ai-systems-behave#OpenAI

Osterwalder, A., Pigneur, Y., Papadakos, P., Bernarda, G., Papadakos, T., & Smith, A. (2014). Value proposition design. *John Wiley & Sons*.

Park, K. (2023). Solve Intelligence helps attorneys draft patents for IP analysis and generation. Retrieved February 10, 2024, from https://techcrunch.com/2023/11/28/solve-intelligences-ai-solution-helps-attorneys-draft-patents-for-ip-analysis-and-generation/

Patent Theory. (2024). Retrieved March 17, 2024, from https://patenttheory.com/

PRV. (2022a). Write the application. Retrieved March 15, 2024, from https://www.prv.se/en/patents/the-advanced-patent-guide/write-the-application/requirements-for-patent-application/patent-claims/

PRV. (2022b). Write the application. Retrieved March 15, 2024, from https://www.prv.se/en/patents/the-advanced-patent-guide/write-the-application/

PRV. (2022c). Priority and filing date. Retrieved March 15, 2024, from https://www.prv.se/en/patents/the-advanced-patent-guide/before-applying/requirements-for-patents/priority-and-filing-date/

PRV. (2023a). Differences between the rights. Retrieved March 15, 2024, from https://www.prv.se/en/knowledge-and-support/prv-school-online/differences-between-the-rights/

PRV. (2023b). Swedish Patent Application. Retrieved March 15, 2024, from https://www.prv.se/globalassets/dokument/english/patent/forms/ansokan_om_svenskt_patent_en.pdf

PRV. (2023c). What is a patent? Retrieved March 15, 2024, from https://www.prv.se/en/patents/basic-patentguide/what-is-a-patent/

PRV. (2023d). Swedish Patent Application. Retrieved March 15, 2024, from https://www.prv.se/en/patents/the-advanced-patent-guide/apply-in-other-countries/

Ruiz, A. (2023). Introduction to prompt engineering. Retrieved March 16, 2024, from https://www.nocode.ai/introduction-to-prompt-engineering/

Sætra, H. S. (2023). Generative AI: Here to stay, but for good?. *Technology in Society*, 75, 102372. doi:10.1016/j.techsoc.2023.102372

The Swedish Patents Act. (n.d.). Retrieved March 15, 2024, from https://wipolex-res.wipo.int/edocs/lexdocs/laws/en/se/se001en.pdf

Trappey A., Trappey C., Wu J-L., Wang J. (2020). Intelligent compilation of patent summaries using machine learning and natural language processing techniques. *Advanced Engineering Informatics*, Volume 43, 101027, ISSN 1474-0346, doi:10.1016/j.aei.2019.101027.

Vowinckel, K., Hähnke, V. (2023). SEARCHFORMER: Semantic patent embeddings by siamese transformers for prior art search. *World Patent Information*, Volume 73, 102192, ISSN 0172-2190, doi:10.1016/j.wpi.2023.102192.

WIPO. (2024). PATENTSCOPE Database. Retrieved March 15, 2024, from https://patentscope.wipo.int/search/en/search.jsf

Yin, R. K. (2018). *Case study research and applications: Design and methods*. Los Angeles, California: SAGE.

Appendix A Interview Guides

Appendix A contains the different interview guides for the different stakeholder perspectives (Inventor, Patent Attorney, and Business Manager) at the different customer segments (IP-firms, SIFs, and LIFs).

A.1 Fundamental Interview Guide

The interview guide contained the same fundamental questions regardless of the customer segment and stakeholder perspective that the interviewee represented in combination with an additional tailored segment. The following questions were the same across all interview guides:

Filter Questions:

- Is your company currently using the Lightbringer application?
  - If yes:
    - Will your company be using the Lightbringer application for your next patents?
  - If no:
    - Has your company been demoed the Lightbringer application?
      - If no:
        - Do you know that AI-solutions for patent drafting exist and what the main features of them are?

- Would you consider yourself a patent attorney, a business owner / business manager, or an inventor (multiple perspectives are possible)?

Comfort question:

1. Could you give a brief introduction to your role as well as your background?

Jobs to be done:

1. What functions or tasks are part of your job?
   Probes: come up with ideas, innovate, make money, file patents

2. *For non-attorneys*: In relation to patents, what are your main tasks?

3. What is your perspective on GenAI use for your tasks and needs related to the patent application process?
   - *Which of your jobs to be done/needs do you think a generative AI solution can solve?*
   - *Which don't you think a generative AI solution can solve?*

Gains/benefits:

4. What benefits do you want to get out of using a GenAI solution for patent draft? *Probes: faster drafting, better collaboration, lower costs, less repetitive*

5. *For users:* What specific features in the Lightbringer application do you find most useful/ create the most value for you? *Probes: generation of examples on problem solution, generation of claims, generation of background, etc.*

6. How would you assess/measure the usefulness/benefits of using a GenAI drafting solution (KPIs, etc.)?

7. *Non-users:* What aspects would increase the likelihood of the implementation of a GenAI patent drafting solution? *Probes: free testing, pricing model, referrals*

8. Out of all these potential gains, rate them according to how important they are to you from 1-5, where unnecessary (1), nice to have (3), crucial (5), when considering a GenAI patent drafting tool? Elaborate on your rating.
   - Increased drafting quality
   - Time efficiency
   - Cost efficiency
   - Better collaboration
   - Increased transparency
   - Streamlined workflow

- Increased scalability
- Can focus on more fun/important tasks
- Others (either nice to haves or crucials)

9. Considering all the gains mentioned above, what would stop you from using the application? *Probes: integration with existing systems, learning curve, habits, not common practice in the industry*

Pains/fears:

1. What aspects of the patent application process do you find most time-consuming or inefficient? Why do you see them as that? *Probes: Identifying and describing innovations, drafting claims, preparing and organizing documentation, drawing figures*

2. *For users:* What pains do you still identify when using Lightbringer to draft patents? What potential solutions do you see to these shortcomings?

3. What concerns/fears do you have about the effectiveness or drawbacks of using GenAI tools like Lightbringer for patent applications? Why do you have those concerns? *Probes: Completeness of the draft, accuracy of generated content, flexibility in handling complex patent*

4. Are there any specific fears related to the use of generative AI in the patent application process that you feel or that you've heard from others in your organization? Can you elaborate on these fears?

5. Out of all these potential pains/fears, rate them according to how severe they are in your opinion on 1-5, where not a concern (1), moderate (3), extreme (5)? Elaborate on your rating.
    - Confidentiality/data security issues
    - New way of working/learning curve
    - Time it takes to correct the GenAI-draft
    - Pricing
    - System integration
    - Lack of human involvement / traceability
    - Ethical AI-concerns

- Other

A.1.1 Interview Guide for LIF Patent Attorney

These additional questions were added to the interview guide for LIF Patent Attorneys:

1. *For users:* How has your way of working with inventors/other stakeholders changed with using Lightbringer?

2. *For users:* How were your initial concerns about integrating an AI tool like Lightbringer into your patenting process validated or mitigated?

3. What will the implementation of the Lightbringer tool look like in your ecosystem? → what do you envision the effect to be in the ecosystem (e.g., less bottlenecks, more patents filed, more focus on innovative efforts)

A.1.2 Interview Guide for LIF Business Manager

These additional questions were added to the interview guide for LIF Business Managers:

1. How do considerations about system integration impact your decision to adopt tools like Lightbringer?

2. What impact has or could Lightbringer or a similar GenAI solution have on your company's innovation cycle and time-to-market for new inventions?

3. In terms of corporate IP strategy, how does Lightbringer or a similar GenAI solution align with your goals for intellectual property protection and portfolio expansion?

A.1.3 Interview Guide for LIF Inventor

These additional questions were added to the interview guide for LIF Inventors:

1. How can Lightbringer or a similar GenAI solution facilitate communication and collaboration with relevant stakeholders for you? How does it help to bridge the technological gap between you and the patent attorney?

A.1.4 Interview Guide for IP-firms Patent Attorney

These additional questions were added to the interview guide for LIF Inventors:

1. What are your thoughts on the pricing model of a generative AI solution for patent drafting?

2. *For users:* Can you share insights into how Lightbringer has been received by your clients, especially in terms of their expectations and satisfaction?

A.1.5 Interview Guide for SIFs Business Manager

These additional questions were added to the interview guide for SIFs Business Managers:

1. *For users:* How has the Lightbringer application influenced your innovation management and decision-making process for filing patents?

2. *For users:* What improvements or enhancements in Lightbringer would make it more aligned with the needs and constraints of SIFs?

A.1.6 Interview Guide for SIFs Inventor

These additional questions were added to the interview guide for SIFs Inventors:

1. How can Lightbringer or a similar GenAI solutions facilitate communication and collaboration with relevant stakeholders for you?

2. *For users:* How has the use of Lightbringer impacted your perception of the accessibility and complexity of the patent application process?

3. *For users:* What additional features or support within Lightbringer could further enhance its usefulness for inventors in SIFs?

Appendix B Categorization of 1st and 2nd Order Themes

B.1 Categorization – IP-firms

The 5 IP-firms have been randomly anonymized as interviewees A, B, C, D and E and mapped to their 1st order themes in the table below.

2nd Order Themes	*1st Order Themes (mentioned by firm(s))*	*Description*
Drafting patent application	• Drafting patent applications (A, B, C, D, E)	Customer Job
Serving clients	• Serving clients (A, B, C, D, E)	Customer Job
Patent process management	• Handle patent processes (C, D, E) • Patent searches (B) • Opposing patents and defending clients (A) • Patent process management (A) • Responding to legal notices (A, C)	Customer Job
Strategic and legal advisory	• Focus on filing the "right" patents and portfolio management (C, D) • Strategy and infringement advisory (C) • Strategic and legal advisory (A)	Customer Job
Patentability assessment	• Patentability assessment (B) • Assessment and filing (A)	Customer Job
Writing and analysis	• Thinking and analysis (C) • Writing and analyzing patent-related documents (A)	Customer Job
Time efficiency	• Time efficiency (D, E) • More time efficient drafting with mass of text starting point (A) • Automate non-analytical steps to save time (C) • Speeding up the process (B)	Gain (Key)

Cost efficiency	• Cost efficiency (B) • Costs saved through less hours wasted on repetitive tasks (C) • Costs are directly linked to time efficiency (C, D, E)	Gain (Key)
Improved quality and uniformity of draft	• Achieve uniform and high quality (D) • More complete applications / drafts through GenAI suggestions (E) • Improved description part (C) • Templates and checking with AI (B) • Quick richness of detail (A) • Mass of text as starting point (A) • Increased drafting quality (A)	Gain (Key)
Streamlining repetitive work	• Reduction in repetitive work (A) • Streamlining repetitive work (B) • Consolidation of patent documents to produce claims (A)	Gain
Focus on more creative and high-value tasks	• Focus more on creative and high-value tasks (A, B)	Gain
Create a whole new business model	• Create a whole new business model (D)	Gain
Additional offering	• Additional offering of cheaper and simpler patents (E)	Gain
More transparent pricing	• Possibility to offer more transparent pricing (D)	Gain
Quick translation	• Quick translation to other jurisdictions and languages (A, B)	Gain
Increase understanding of invention's patentability	• Help inventor understand their own invention's patentability (D)	Gain
More control over patent drafting	• Possibility to write the application on one's own instead of outsourcing it to an agent (D)	Gain
Repetitive nature of tasks	• Monotonous tasks (C) • Tired of writing patents (E) • Repetitive nature of writing a lot of applications and responses (A)	Pain – Traditional (Key)
Boring and mundane	• Boring (D) • Mundane and exhaustive (B)	Pain – Traditional
Manual work for international filings	• Manual work needed for international filings is high (A)	Pain – Traditional

	• Translation, administrative work, formatting (B)	
Lack of technological advancements	• Risk of falling behind technological advancements (C) • Branding concerns – not using modern tools (C)	Pain – Traditional
Occasional need for outsourcing	• Outsourcing of drafting sometimes needed (D)	Pain – Traditional
Quality and consistency concerns	• Concerns about consistency in e.g., terms used (E) • Consistency in terms of quality and that no hidden errors exist (E) • Quality and consistency concerns (C) • Potentially reduced quality due to limitations of GenAI tool (A) • Too complex language and legal nuances for AI to handle (B)	Pain – GenAI (Key)
Confidentiality concerns	• Confidentiality concerns (D, E) • Confidentiality and security concerns (A, B)	Pain – GenAI (Key)
AI loss of focus and hallucination	• AI can lose focus on the core of the invention (C) • AI generating errors (B)	Pain – GenAI (Key)
Learning curve	• Learning curve of using new tools and workflows (C)	Pain – GenAI
Traceability	• Traceability of how GenAI comes to its conclusions is not clear (B)	Pain – GenAI
Longevity of tool	• Are the companies who own the tools around in a year? (D)	Pain – GenAI
Pricing	• Pricing (B) • Too high pricing and configuration concerns (A)	Pain – GenAI
Changing patent attorney landscape	• Changing disrupted patent landscape (C) • Fear of losing job leading to negative to change (E)	Pain – GenAI
Limited usefulness in inventor interaction	• Limited usefulness in inventor interaction (C)	Pain – GenAI
Time consuming proofreading	• Input must be correct for the model to work optimally (D) • Time consuming correction and proofreading of AI-generated drafts (A)	Pain – GenAI

B.2 Categorization – SIFs

The 5 SIFs have been randomly anonymized as interviewees M, N, O, P and Q and mapped to their 1st order themes in the table below.

2nd Order Themes	*1st Order Themes (mentioned by firm(s))*	*Description*
Manage patent operations	• Handles technology and protection of it (P) • Keep costs of patents low (P) • Competitor product/ patent monitoring (O)	Customer Job
Protect innovation early and quick	• Quickly protect new innovations (O) • Protect invention early (N) • Protect innovation early and quick (M) • Protect innovation (P, Q)	Customer Job
Invent	• Invent (M, N, O, P, Q)	Customer Job
Ensuring uniqueness of invention	• Ensuring uniqueness of innovation/patent (N)	Customer Job
Strategic IP decision-making	• Setting up patent strategy (O, P) • Decide if to patent or keep as trade secret (Q)	Customer Job
Time reduced in bringing invention to market	• Time efficient process from start to finish (N, O, P) • Time efficiency in bringing invention to market (M, Q)	Gain (Key)
Cost savings in application process	• Cost efficiency – you get a good patent application for a good price (N, O, P, Q) • Cost savings in application process (M)	Gain (Key)
Reduced complexity of patent process	• Simplified and accelerated process (P) • Reduced complexity in process (M, N) • Less exhaustive interactions (N)	Gain (Key)
Flexible process workflow	• More streamlined process (especially initially) (O) • Flexibility in process workflow and time management (N) • Flexibility of the tool (M)	Gain (Key)

Improved invention description	• Improvement in quality of description due to suggestions from GenAI (P) • Help specify and narrow down invention when prompted with alternatives (O) • Support in generating description in draft (N) • Generate alternatives when writing to get a solid foundation (M)	Gain (Key)
Focus on more important tasks	• Focus on more important tasks as CEO/CTO (M, O, P) • Inventors want to avoid being entangled in long patent processes (O)	Gain (Key)
Increased willingness to patent more	• Capability to patent more than with traditional method (P) • Increased willingness to apply for more patents (M)	Gain
Reduced resources spent on tedious steps	• Reduce repetitive tasks (Q) • Reduce resources spent on tedious steps (O)	Gain
Increased ownership for inventors	• Increase ownership for engineers/inventors in the patent process with increased understanding (O)	Gain
Improved communication	• Better collaboration (P) • Improved communication between inventor and patent attorney (N)	Gain
Access to previously inaccessible investors	• Possibility for cheaper and quicker patents can give access to previously inaccessible investors (Q)	Gain
Complex process	• Long process (M) • Complex process (M, Q) • Complexity of traditional process (N) • Out of touch and old-school process (P)	Pain – Traditional (Key)
Costly process	• Expensive (M) • Cost of traditional process (N) • Too costly for some startups (Q)	Pain – Traditional (Key)
Time consuming process	• Time consuming (M, P) • Time is the only thing you can't scale in a startup (O)	Pain – Traditional (Key)
Limited resources not well spent	• Limited resources such as human capital are spent inefficiently (O)	Pain – Traditional
Limited transparency	• Limited transparency of patent attorney work (Q)	Pain – Traditional

Inventors dislike process	• Inventor dislikes process (boring and tedious) (O)	Pain – Traditional
Inefficient communication	• Inefficient communication between people with different roles and backgrounds in patent process (O, P)	Pain – Traditional
AI hallucination and quality concerns	• Fear of AI hallucination and worse results (P) • High standard is needed for GenAI tool to be smooth enough (P) • AI hallucination, especially ones that are hard to catch (Q) • Accuracy of the LLM (O) • AI tends to repeat itself in different sections (M) • Abstract thinking and relating concepts hard to handle for AI (N)	Pain – GenAI (Key)
Confidentiality and security concerns	• Confidentiality and security concerns (M, P) • Data security (O, Q) • Data protection concerns (N)	Pain – GenAI (Key)
Limited training data	• Not trained on recent enough data and information (Q) • Not up to date on research (Q)	Pain – GenAI
Limited transparency and traceability	• Limited transparency and traceability of how GenAI comes to conclusions (N)	Pain – GenAI
Field specialization concerns	• Focus or field specialization not yet there (Q) • Handling of very specific fields or research areas (Q)	Pain – GenAI
Pricing	• Pricing – needs to be cheaper than hiring a consultant (O) • Pricing very important for SIFs (M)	Pain – GenAI

B.3 Categorization – LIFs

The 7 LIFs have been randomly anonymized as interviewees F, G, H, I, J, K and L and mapped to their 1st order themes in the table below.

2nd Order Themes	*1st Order Themes (mentioned by firm(s))*	*Mapping*
Protect innovation	• Protect innovation (G, L)	Customer Job
Drafting patent applications	• Drafting patent applications (F, H, I, J, K)	Customer Job
Manage patent operations and processes	• Head patent department in several regions (G, L) • Handle patent process (J, K) • Take final responsibility of patent applications (H) • Lead patent team (G) • Operational and financial decisions (G) • Improving global patent processes and work (L) • Communication with product managers and other internal stakeholders as well as external agents (I)	Customer Job
Identify/gather inventions from inventors	• Identify/gather inventions from inventors inside the firm (F) • Communication with inventors (H)	Customer Job
Patent related assessments	• Infringement (F, J) • Responding to notices (F) • FTO and patentability assessment (F)	Customer Job
Time efficiency	• Time efficiency (H, J, K, L) • Time efficiency is crucial (G) • Time efficiency on initial draft (I) • Enhancing speed of draft (F)	Gain (Key)
Cost efficiency	• Cost efficiency (F, H, J, L) • Relates to time efficiency gains (G) • Important but not as much as time saved (G)	Gain (Key)

More control over patent drafting	• Increased control by bringing more activities in-house (G, I, J) • Improved control over applications (H, L)	Gain (Key)
Increased drafting quality	• Increased quality by not making human errors (J) • Improving some quality aspects of the application (I) • Increased quality (F, G) • Reducing formal errors in patent applications (F)	Gain (Key)
Focus on more important activities	• Focus on more value-creating activities (G, J) • Focus on more interesting tasks (H) • More time for analysis (F)	Gain (Key)
Decreased repetitiveness	• Decreased repetitiveness (I) • Decrease repetitive tasks (G)	Gain
Lower patenting threshold	• Increased patent protection (through mass filings) (G)	Gain
Scalability	• Streamlining the drafting application process (I) • Scalability (K, L) • Decrease backlog and "queue-time" (L)	Gain
Modern and attractive employer	• Being an attractive employer by using modern and effective tools (I)	Gain
"Learning" of GenAI solution	• Having a tailored solution is useful (I) • "Learning" capabilities of GenAI can help shape workflows and quality going forward (I)	Gain
Closer contact with inventors	• Closer contact with inventors (L)	Gain
Seamless integration of individual draft sections	• Better and smarter handling of figures (G) • Changes in one part transfers to others (e.g., from claims to description) (F) • Support in making variations / alternatives of inventions (G)	Gain

Quick translation	• Easily create versions for e.g., different jurisdictions and languages (H)	Gain
"Boring" repetitive tasks	• "Boring" repetitive tasks (H)	Pain – Traditional
Identify/gather inventions from inventors	• Capturing innovators' ideas / getting them to articulate the actual innovation can be difficult and time consuming (F)	Pain – Traditional
Outsourcing consistency concerns	• Drafting outsourced to different agents (L)	Pain – Traditional
Limited time for in-house drafting	• Not enough time to draft in-house (I)	Pain – Traditional
Limited time management control when outsourcing	• Limited time management control when outsourcing drafting (H)	Pain – Traditional
Need for outsourcing when demand spikes	• Having to outsource when demand spikes for patents (G)	Pain – Traditional
Confidentiality concerns	• Confidentiality concerns (G, I, J) • Confidentiality and security issues (F) • Data security and ownership concerns (L) • Data security concerns (H) • Data security concerns and IT department pushback (K)	Pain – GenAI (Key)
Quality concerns	• Need sufficient quality to be implemented (K) • Quality and trust in AI (L) • Repetitive same mistakes get frustrating (J) • Loss of conceptual thinking by AI and consequently continuity throughout the application (H) • Repetitive low-quality errors (G)	Pain – GenAI (Key)
AI loss of focus	• AI-draft drifting away from the core invention (F) • Fear AI loses focus (G)	Pain – GenAI
Loss of learning opportunities	• Less and worse learning opportunities for junior staff with extensive AI use (I) • Loss of drafting training for patent attorneys (I)	Pain – GenAI

Pricing	• Skeptical to high prices and also where do you derive the (high) costs (K)	Pain – GenAI
Substantial proofreading needed	• Substantial proof reading needed (J)	Pain – GenAI
High switching cost and effort	• Clumsiness in introducing new ways of working in large organizations (I) • Barriers to change way of working and hand over responsibility (H)	Pain – GenAI
Automation of fun tasks	• Extinction of fun part of the job leading to subconscious bias against it (K)	Pain – GenAI
Longevity of tool supplier	• Longevity of tool supplier (G)	Pain – GenAI
Adaptability to writing styles	• Not adaptable enough to writing styles or company (G) • Not tailored to individual writing styles (F)	Pain – GenAI
Prompting skillset	• Needs to be skilled at prompting (K)	Pain – GenAI

B.4 Categorization – Aggregated

Aggregate Dimension	*2nd Order Themes*	*Mapping*
Drafting patent application	• Drafting patent application	Customer Job
Serving clients	• Serving clients	Customer Job
Manage strategic questions	• Strategic and legal advisory • Strategic IP decision-making	Customer Job
Manage patent processes and operations	• Patent process management • Manage patent operations • Manage patent operations and processes • Writing and analysis • Identify/gather inventions from inventors	Customer Job
Invent	• Invent	Customer Job
Protect innovation	• Protect innovation • Protect innovation early and quick • Ensuring uniqueness of invention	Customer Job
Patent related assessments	• Patentability assessments • Patent related assessments	Customer Job
Time saved	• Time reduced in bringing invention to market • Time efficiency	Gain
Cost reduced	• Cost savings in application process • Cost efficiency	Gain
Workflow improvement	• Reduced complexity of patent process • Reduce resources spent on tedious steps • Scalability • Decreased repetitiveness • Streamlining repetitive work • Quick translation	Gain

Quality improvement	• Improved invention description • Increased drafting quality • Seamless integration of individual draft sections • Improved quality and uniformity of draft • "Learning" of GenAI solution	Gain
Communication and work distribution improvement	• Improved communication • Closer contact with inventors • Increase understanding of invention's patentability • Increased ownership for inventors	Gain
Increased willingness to patent more	• Increased willingness to patent more • Lower patenting threshold	Gain
Focus on more important tasks	• Focus on more important tasks • Focus on more important activities • Focus on more creative and high-value tasks	Gain
More control over patent drafting	• More control over patent drafting	Gain
New business opportunities	• Additional offering • More transparent pricing • Create a whole new business model • Access to previously inaccessible investors • Modern and attractive employer	Gain
Repetitive nature of tasks	• "Boring" repetitive tasks • Identify/gather inventions from inventors • Repetitive nature of tasks • Manual work for filings • Boring and mundane	Pain – Traditional
Outsourcing concerns	• Outsourcing consistency concerns • Limited time management control when outsourcing • Need for outsourcing when demand spikes	Pain – Traditional
Time and resource scarcity	• Occasional need for outsourcing • Limited time for in-house drafting	Pain – Traditional

Lack of technological advancements	• Lack of technological advancements	Pain – Traditional
Costly process	• Costly process • Limited resources not well spent	Pain – Traditional
Complex process	• Complex process • Limited transparency	Pain – Traditional
Time consuming process	• Time consuming process • Limited resources not well spent • Inventors dislike process • Inefficient communication	Pain – Traditional
GenAI quality concerns	• AI hallucination and quality concerns • AI loss of focus and hallucination • Quality and consistency concerns • Limited transparency and traceability • Substantial time consuming proofreading • Limited usefulness in inventor interaction	Pain – GenAI
Confidentiality and security concerns	• Confidentiality and security concerns	Pain – GenAI
Pricing	• Pricing	Pain – GenAI
Longevity of tool supplier	• Longevity of tool supplier	Pain – GenAI
High switching costs and effort	• High switching costs and effort	Pain – GenAI
Disruption of patent attorney job	• Changing patent attorney landscape • Loss of learning opportunities • Automation of fun tasks • Learning curve of GenAI tools • Prompting skillset	Pain – GenAI
Adaptability of GenAI	• Adaptability to writing styles • Field specialization concerns • Limited training data	Pain – GenAI

Appendix C Work distribution

Both authors worked collaboratively on all parts of the thesis. All research, preparation, screening and interviews were conducted together. The data was consolidated and analyzed collectively to ensure correctness. The report was written collaboratively and co-reviewed all throughout the work process. The authors also contributed equal parts in preparing and presenting the final work at company and university presentations.