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Exploring the Challenges Faced by Examination Phase of Intellectual Property (IP) Life Cycle: A Pilot Study

Manish R. Potdar[1], Dr. Babasaheb Mohite[2]

[1]PHD Scholar & Associate Vice President, LTIMindtree, Pune (India)
[2]Associate Professor, ZEAL Institute of Business Administration, Computer Application & Research, Pune, India

ABSTRACT

This pilot study delves into challenges during the 'Examination' phase of the Intellectual Property (IP) life cycle, focusing on complexities in IP search. By addressing limitations in existing databases and the dynamic nature of technology, the study aims to comprehend their impact on decision-making. Employing qualitative interviews and developmental research over 16 weeks, the study identifies challenges, explores their specific aspects, and establishes a foundation for future research.

Innovators underscore the crucial role of IP search in grant timelines, commercial use, and protection, emphasizing challenges in terminology and databases. Legally, IP search challenges impact accuracy, validity, and infringement risks, necessitating engagement with legal professionals and advanced tools for compliance and precision. Private companies perceive IP search challenges as pivotal for operations, requiring advanced technologies and engagement with IP experts. IP service providers face challenges in data complexity, terminology, and cross-jurisdictional differences, investing in research and advanced tools for accurate search services. Government offices see IP search challenges as vital for promoting innovation, focusing on patent quality and supporting domestic industries. Educators encounter challenges impacting information access, emphasizing collaboration and specialized tools for teaching enhancement. Respondents in the pilot study highlight challenges in readability, articulation, and translation during IP search examination. Process standardization issues and participants' knowledge levels in legal and technical aspects are crucial considerations. Limitations in existing tools and significant efforts throughout the IP life cycle are also emphasized. Findings suggest a need for improvements in language, standardization, legal knowledge, software functionality, and educational approaches to comprehensively address IP search challenges.

Keywords: Pilot Study, Intellectual Property, Patent Examination, Artificial Intelligence

1 INTRODUCTION

The purpose of the pilot study titled "Exploring the challenges faced by 'Examination' phase of Intellectual Property (IP) life cycle – A Pilot Study" is to establish an initial understanding of the challenges faced during the process of conducting intellectual property search. The study aims to identify and categorize these challenges as a foundation for further research and the development of strategies and tools to enhance the efficiency and effectiveness of intellectual property search activities. By exploring the challenges faced

by professionals involved in intellectual property search (across domains), the pilot study seeks to contribute to the improvement of an overall management of intellectual property, innovation, and decision-making.

2.1. Background and Rationale:

Intellectual property (IP) is crucial for fostering innovation, protecting inventions, and driving economic growth. However, effectively managing IP assets requires a comprehensive understanding of patents, trademarks, copyrights, and related rights. IP search plays a vital role in this process, helping professionals identify prior art, assess novelty, and determine patentability or infringement potential.

However, IP searches can be complex and challenging. Existing databases may have limitations in coverage, accessibility, and search functionalities. The vast volume of IP information and rapidly evolving technology further complicates finding accurate results. Suboptimal search outcomes can have significant implications for IP decision-making.

To address these challenges, it's important to understand them comprehensively. This pilot study aims to identify and categorize the challenges faced by professionals in IP search. Insights gained will inform further research and the development of innovative solutions, contributing to improved IP management, innovation, and informed decision-making.

2.2. Pilot Study Objectives:

a) To identify the challenges involved in the Examination phase of IP life cycle.
b) To gain insights into the specific aspects of intellectual property search that pose challenges, such as complex search queries, limitations of existing search databases, interpretation of search results, and time-consuming search processes.
c) To explore the potential impact of these challenges on decision-making in intellectual property-related activities.
d) To establish a foundation for further research and the development of strategies and tools to enhance the efficiency and effectiveness of intellectual property search.

By carefully crafting the questions, the pilot study aims to provide a comprehensive understanding of the challenges faced in intellectual property search, leading to the development of potential solutions that improve the overall effectiveness and efficiency of the search process.

2 METHODOLOGY

The overall research is planned to be conducted following 2-pronged phases -

3.1. Qualitative studies for data collection through interviews & surveys, correlation

a) The qualitative phase of the study will involve unstructured in-depth interviews followed by focus group discussions conducted with participants across various strata.
b) Quota based and purposive sampling methods shall be deployed. A structured research instrument shall be used for the descriptive (quantitative) phase of the study.
c) Qualitative research allows for an in-depth understanding of participants' experiences and perspectives, which is essential for capturing the nuanced nature of the challenges.

3.2.Developmental research by proposing a model for adoption

a) The model conceptualizing portion of the study shall involve assessment of technology led capabilities, alternatives, and applicability.

The scope of the pilot study under consideration is restricted to 1st phase of qualitative studies for data collection through surveys and correlation. A purposive sampling technique is used to select participants with expertise and exposure in intellectual property search. Participants included innovators, government officials, patent lawyers, intellectual property service, and professionals working in IP-related roles. Initial sample size will be 2 individuals from each category of roles and further be determined based on data saturation, where new information and insights cease to emerge. Participants who do not have direct involvement in intellectual property search activities or lack the required expertise may be excluded from the study.

The selection of participants is be based on careful consideration of their qualifications and experiences related to intellectual property search. The aim is to ensure that the sample includes individuals with diverse backgrounds and varying levels of experience to capture a wide range of perspectives on the challenges faced in the field.

The pilot study has a limited sample size, which may affect the generalizability of the findings. The focus on qualitative data may limit the ability to quantify the prevalence of specific challenges. The study's scope is exploratory and may not encompass all possible challenges faced in intellectual property search.

The set of questions deliberated and identified for administering the interviews and data collections are –

1) What are the **main challenges encountered** during the process of intellectual property search?
2) How do you perceive the **complexity of search queries and their impact** on search outcomes?
3) What **limitations and shortcomings** exist in the currently available intellectual property search databases?
4) What are the **key difficulties** associated with the interpretation and analysis of search results?
5) How do the challenges in intellectual property search **impact decision-making** in intellectual property-related activities?
6) What **potential strategies and tools** can be developed to address the identified challenges and enhance the efficiency of intellectual property search?
7) What are the potential stages where **next generation technologies such as AI can be useful** in accelerating the patent search process?

3 PILOT STUDY PROCEDURE

The objective of conducting pilot study with a methodical and systematic procedure is to gain valuable insights into the challenges faced during the examination phase of the IP life cycle and lay the groundwork for a comprehensive and impactful larger-scale study.

4.1.Pilot Study life-cycle

Following is the life-cycle involved in the pilot study with a commentary on activities conducted in the context of the subject under pilot study.

Table 1: Pilot Study Procedure

Sr.	Phase	Activity Details	Pilot Study considerations
1	***Pilot Study Planning***	Identification of phases & sub-activities in each phase	2-pronged approach (qualitative & developmental studies)

		Stakeholder identification and inclusion criteria definition Development of questionnaire Plotting timeline view over the plan Necessary approval from institution Setting-up a periodic review mechanism	Cross-section of stakeholder participation across entities Experience and expertise of identified stakeholders Fair distribution of gender Timeline consideration considering broader research
2	***Participant Recruitment***	Identification and recruitment of participants meeting the inclusion criteria Use purposive sampling techniques to ensure participants possess the required expertise and experience Invitations to potential participants, explaining the purpose and nature of the study seeking their voluntary participation Informed consent sought prior to collection of data Methods and procedures for securing confidentiality and data privacy is retained	Participants identified from – Innovators community, IP CoEs/functions within Corporates, IP service providers, Government officials involved in IP related activities, individuals from education sectors (teachers or managers of training institutes) Exploit available sources such as social media, industry acquaintances and community for identification of stakeholders
3	***Data Collection***	Semi-structured interviews with the participants to explore the challenges Interview sessions at mutually convenient schedules and locations, ensuring a comfortable and private environment for participants Present any potential risks or benefits associated with participating in the study Administered surveys designed for the purpose	Help stakeholders to explain the context of the questionnaire with real-time examples Extract relevant outcomes based on the discussion in consultation and deliberations with stakeholder
4	***Data Analysis***	Safeguard the confidentiality and anonymity of participants' data throughout the study Unique identifiers to participants to maintain anonymity during data analysis and reporting Store and secure the collected data in accordance with applicable data protection regulations	Initials are chosen for identifying stake holders Validations with stakeholder for analysis and assessment as needed

		Transcribe the interview details and organize the qualitative data Thematic analysis to identify codes, themes, and patterns in the qualitative data Analyze the quantitative data using descriptive statistics to summarize the survey responses	
5	***Reporting and Dissemination***	Comprehensive report detailing the pilot study's procedures, findings, and limitations Dissemination the findings through academic conferences, research publications, or other appropriate channels to contribute to the existing knowledge in the field	Pattern and trend identification based on the responses to the interviews

4.2.Pilot Study Timeline

The pilot study lasted over 16 weeks of duration with following general outline of the timeline, including the data collection and analysis periods. The timeline considered various factors such as the number of participants, availability of resources, and the complexity of the data analysis.

It was important to allocate sufficient time for each stage of the study to ensure rigorous data collection, analysis, and reporting. Flexibility was also maintained in the timeline to accommodate any unforeseen challenges or delays that may arise during the research process.

#	Phase	Activity	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16
1	Project Initiation and Planning	Define the research objectives, research questions, and study design																
		Obtain ethical approval: 2-4 week																
2	Participant Recruitment and Informed Consent	Identify potential participants																
		Approach and contact potential participants																
		Obtain informed consent																
3	Data Collection	Conduct semi-structured interviews																
		Administer surveys																
4	Data Management	Transcribe interviews																
		Organize and store the qualitative and quantitative data																
5	Data Analysis	Qualitative data analysis																
		Quantitative data analysis																
6	Reporting & Dissemination	Summarize findings																
		Prepare a comprehensive report																
		Disseminate findings through conferences or publications																

Figure 1: Pilot Study Timelines

4.3.Provision for modifications and refinement

During the pilot study, modifications to the research protocol was necessary to improve the study's efficiency, address unforeseen challenges, or enhance the quality of the data. The modifications made during the pilot study could include:

Table 2: Pilot Study Modifications

Sr.	Category	Refinement Reason	Experience
1	***Refinement of Research Questions***	Based on initial data collection and analysis, the research questions may be refined or expanded to ensure a more comprehensive exploration of the challenges faced in intellectual property search.	A set of questions dropped during the life-cycle Relating to rejections of the IP candidate Stakeholder control over the process
2	***Adjustments in Sampling Strategy***	If certain segments of the target population are underrepresented or if new insights emerge, the sampling strategy may be adjusted to include a broader range of participants or specific subgroups to ensure a diverse and representative sample	Set of stakeholders around IP service providers dropped due to overlap of their contribution to the overall process.
3	***Adaptation of Data Collection Methods***	During the pilot study, it may become apparent that additional data collection methods are needed to gain a deeper understanding of the challenges faced in intellectual property search	Follow-up questions were deliberated with stakeholders from semi-government group
4	***Revision of Timeline and Resource Allocation***	Unforeseen circumstances or logistical challenges may require adjustments to the timeline and resource allocation to ensure the smooth progression of the study. Flexibility in managing these modifications is crucial to maintain the integrity of the research.	Non-availability of stakeholders during the festive season, delayed the process collecting data by 2 weeks

4 RESULTS

5.1.Pilot study Participants

Table 3: Pilot Study Participants

#	Role	Name of Participant	Role	ender	Exp	Location
1	Innovators	MM	Solution Architect, Development Mgr.	emale	~20	Pune, India
2	Innovators	RJ	Solution Architect, Head of CoE	Iale	~25	Chennai, India

3	Legal Professional	BD	Advocate	Iale	~20	Pune, India
4	Legal Professional	PG	Advocate	emale	~15	Pune, India
5	Private Sector	SJ	Head of IP CoE	Iale	~20	Mumbai, India
6	Private Sector	AM	Lead of IP CoE	emale	~15	Bangalore, India
7	IP Service Provider	RK	CEO, IP Start-up	Iale	~25	Bangalore, India
8	IP Service Provider	NA	IP Services expert	emale	~20	Pune, India
9	Govt. Office	NJ	Research Analyst	emale	~15	Delhi, India
10	Govt. Office	AS	Leadership Role	Iale	~30	Pune, India
11	Education	AP	Assistant. Professor	emale	~20	Pune, India
12	Education	BB	Head of Dept.	Iale	~25	Pune, India

5.2.Participant Statistics –

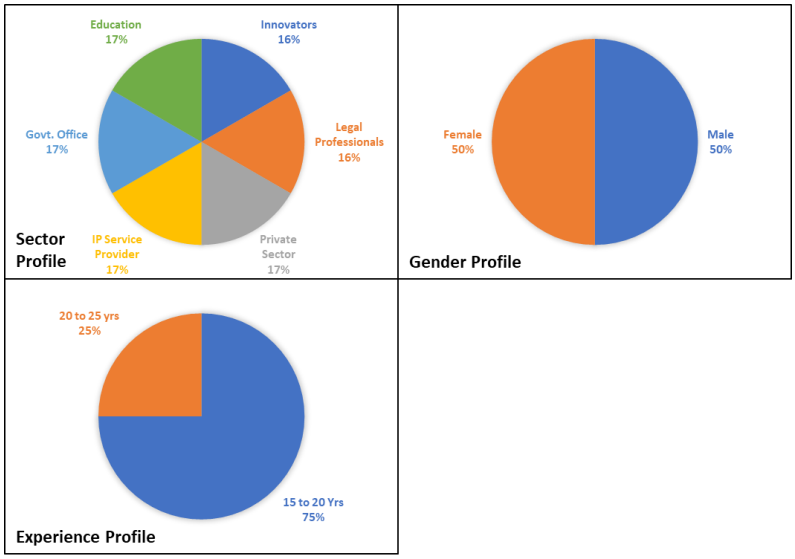

Figure 2: Pilot Study Respondent Statistics

5.3. Innovator's Response summary

Following is the summary of responses received from the innovators –

Table 4: Innovator's Response Summary

#	Question	Response Summary
1	What are the main challenges encountered during the process of intellectual property search?	↗ Identifying the appropriate filter criteria to assess prior-art search ↗ Compromised ability to understand existing innovation due to complex articulation

		↗ Ability to relate legal language with innovation description
2	How do you perceive the complexity of search queries and their impact on search outcomes?	↗ Interpretation of standards limits ability to effectively search ↗ Dependency on SMEs users of search database ↗ Understanding of context of the innovation under assessment
3	What limitations and shortcomings exist in the currently available intellectual property search databases?	↗ Navigation is not user friendly ↗ Lack of standardization outcomes ↗ Variability in results due to inconsistent databases
4	What are the key difficulties associated with the interpretation and analysis of search results?	↗ Complex articulation ↗ Selection of the right domain ↗ Assessor's ability to understand the context
5	How do the challenges in intellectual property search impact decision-making in intellectual property-related activities?	↗ Identifying existing innovation ↗ Assessing legal risks associated ↗ Assessing monetization of opportunities
6	What potential strategies and tools can be developed to address the identified challenges and enhance the efficiency of intellectual property search?	↗ Conversion of functional documentation into technical language, diagrammatic representation ↗ Creating guided process for documentation, understanding of innovation by Assessor, ↗ Making the process cost effective by helping in reduce intermediary dependency
7	What are the potential stages where next generation technologies such as AI can be useful in accelerating the patent search process?	↗ Simplifying prior art search ↗ Auto-interpretation - English writing ↗ Drafting documentations

For innovators, prior art search is of a significant importance as it has direct implications on grant timelines, commercial use and protection. Following is the summary of innovator's feedback on the questionnaire on intellectual property search related challenges -

1. **Identifying Existing IP**: Conducting a comprehensive IP search helps innovators identify existing, relevant, and most appropriate innovation with legal protection. IP search challenges, such as complex terminology and inconsistent databases, makes it difficult for innovators to analyse and study existing innovations from prior art universe. Innovators believe that overcoming these challenges is crucial for ensuring that they are aware of existing IP and can avoid legal challenges in future.
2. **Assessing Novelty and Patentability**: Innovators rely on IP search to assess the novelty and patentability of their inventions. Failure to identify prior art or relevant patents during the search process can lead to wasted resources and potential legal disputes. Addressing search challenges enables innovators

to conduct a thorough analysis of existing IP, evaluate the patentability of their innovations, and make informed decisions about pursuing patent protection.

3. **Supporting R&D and Innovation Strategy**: IP search is instrumental in shaping an innovator's research and development (R&D) efforts and innovation strategy. It helps identify gaps in the existing IP landscape, uncover emerging technologies, and inspire new ideas. Overcoming search challenges allows innovators to explore untapped opportunities, align their R&D efforts with market needs, and make strategic decisions about product development and commercialization.

4. **Avoiding Infringement and Legal Risks**: IP search helps innovators identify potential infringement risks and design around existing IP rights. Failure to identify relevant patents or trademarks during the search process can lead to unintentional infringement and costly legal disputes. Overcoming search challenges ensures that innovators can navigate the IP landscape effectively, minimize infringement risks, and protect their innovations.

5. **Enabling Collaboration and Licensing Opportunities**: IP search assists innovators in identifying potential collaboration partners and licensing opportunities. It helps them discover complementary technologies, assess the licensing landscape, and explore avenues for technology transfer. Addressing search challenges facilitates effective networking and collaboration, opening doors to partnerships that can accelerate innovation and commercialization efforts.

6. **Strategic Market Entry and Competitive Intelligence**: IP search provides valuable insights into competitors' IP portfolios and market trends. It helps innovators understand their competitive landscape, identify white spaces for innovation, and make informed decisions about market entry. Overcoming search challenges allows innovators to gather competitive intelligence, assess market opportunities, and position their innovations effectively.

Innovators rely on comprehensive and accurate IP search to inform their decision-making, protect their intellectual property, and navigate the complex landscape of existing IP rights. Overcoming search challenges is crucial for supporting their innovation process, minimizing legal risks, and maximizing the value of their intellectual property assets.

5.4. Legal Professional's Response summary

Following is the summary of responses received from the legal professionals –

Table 5: Legal Professional's Response Summary

#	Question	Response Summary
1	What are the main challenges encountered during the process of intellectual property search?	↗ Limited understanding of technology and associated terminology ↗ Compromised ability to understand existing innovation due to complex articulation ↗ Ability to relate technical language with innovation description
2	How do you perceive the complexity of search queries and their impact on search outcomes?	↗ Understanding of context of the innovation under assessment ↗ Ability to build effective search queries considering facts, history, issues associated with the innovation under consideration

		↗ Documentation review is a laborious task, limits time window for refinement of queries
3	What limitations and shortcomings exist in the currently available intellectual property search databases?	↗ Quality and sufficiency of databases as they may not include all innovations ↗ Coverage of different legal framework and jurisdiction ↗ Non-user-friendly interfaces
4	What are the key difficulties associated with the interpretation and analysis of search results?	↗ Complex articulation limiting the ability to understand content considering context ↗ Additional steps for credibility and authenticity assessment ↗ Understanding of legal frameworks across jurisdictions
5	How do the challenges in intellectual property search impact decision-making in intellectual property-related activities?	↗ Identifying patentability and freedom to operate in a particular market ↗ Assessing risks associated with legal implications ↗ Assessing monetization of opportunities
6	What potential strategies and tools can be developed to address the identified challenges and enhance the efficiency of intellectual property search?	↗ Improved coverage across regions and IP offices ↗ Use of advance technology leveraged search ↗ Linguistic translation and standardization
7	What are the potential stages where next generation technologies such as AI can be useful in accelerating the patent search process?	↗ Accurate prior art search ↗ Classification and distribution ↗ Usage and legal activity monitoring and search

From a legal perspective, intellectual property (IP) search challenges can impact the accuracy and effectiveness of the search process, potentially leading to legal implications. Here are some legal considerations regarding IP search challenges:

1. **Validity and Enforceability**: The accuracy and comprehensiveness of IP search results are crucial for assessing the validity and enforceability of IP rights. Failure to identify relevant prior art during the search process can weaken the validity of a granted patent or trademark. Inadequate search efforts may also result in overlooking existing IP rights that could potentially infringe upon new inventions or trademarks.
2. **Infringement Risk**: Conducting a thorough IP search helps identify existing IP rights and potential infringement risks. If an inventor or business fails to identify existing patents, trademarks, or copyrights that are similar or identical to their own invention or mark, they may unintentionally infringe upon someone else's IP rights. This can lead to legal disputes and potential liability for infringement.
3. **Clearance and Freedom to Operate**: IP search challenges can hinder an individual or company's ability to determine freedom to operate in a particular market. An inadequate or incomplete search may

result in the failure to identify existing patents or trademarks that could restrict or block the use, production, or sale of a product or service. This can expose businesses to the risk of infringement claims and associated legal consequences.

4. **Licensing and Due Diligence**: Thorough IP search is essential during licensing negotiations or due diligence processes. Inaccurate or incomplete search results can impact licensing agreements, valuation assessments, and investment decisions. Failing to identify existing IP rights or uncovering hidden prior art may lead to potential licensing disputes or undervaluation of IP assets.

5. **International Considerations**: IP search challenges are often magnified when dealing with international IP rights. Searching for prior art and assessing the uniqueness of an invention or the availability of a trademark across multiple jurisdictions can be complex. Language barriers, differences in legal systems, and variations in patent or trademark databases pose additional challenges for conducting comprehensive international IP searches.

To address these legal considerations, it is crucial to engage legal professionals, such as patent attorneys, trademark attorneys, or IP specialists, who possess the necessary expertise and experience in conducting thorough IP searches. They can navigate the legal intricacies, understand the implications of search challenges, and provide guidance to ensure compliance with IP laws and regulations. Collaboration between legal experts and technologically advanced search tools can enhance the effectiveness and accuracy of IP searches while minimizing legal risks.

5.5. IP CoE (Private Sector) Professional's Response

Following is the summary of responses received from the IP CoE (Private Sector) Professional

Table 6: IP CoE Professional's Response Summary

#	Question	Response Summary
1	What are the main challenges encountered during the process of intellectual property search?	↗ Time constraints & deadlines ↗ Quality & Reliability of results ↗ Cost effectiveness
2	How do you perceive the complexity of search queries and their impact on search outcomes?	↗ Coordination efforts in query iterations and refinement ↗ Language barriers across regions of operations ↗ Complexity in technology related articulation
3	What limitations and shortcomings exist in the currently available intellectual property search databases?	↗ Real time updates posing risks on competitiveness ↗ Lack of coverage comprehensiveness (insights from public domain) ↗ Terminology standardization
4	What are the key difficulties associated with the interpretation and analysis of search results?	↗ Coordination, communication, and governance challenges ↗ Technology complexity and domain expertise ↗ Ambiguity and subjectivity

5	How do the challenges in intellectual property search impact decision-making in intellectual property-related activities?	↗ Supporting innovation strategy ↗ Optimizing R&D investments ↗ Mitigating legal risks
6	What potential strategies and tools can be developed to address the identified challenges and enhance the efficiency of intellectual property search?	↗ Platform based collaboration ↗ Continuous training and promoting the innovation culture ↗ Enabling pre-built data for innovators
7	What are the potential stages where next generation technologies such as AI can be useful in accelerating the patent search process?	↗ Data mining and analysis ↗ Search optimization ↗ Automated documentation

From a private company's perspective, IP search challenges can have various implications for their business operations, product development, and intellectual property strategy. Here's how private companies may perceive IP search challenges:

1. **Freedom to Operate**: Private companies conduct IP searches to assess the freedom to operate in a particular market. IP search challenges, such as complex patent language and multiple jurisdictions, can make it difficult to identify existing patents and trademarks that may restrict their operations. Overcoming these challenges enables companies to navigate the IP landscape, avoid infringement risks, and make informed decisions about introducing new products or services.
2. **Innovation and R&D Strategy**: IP search plays a crucial role in shaping a company's innovation and research and development (R&D) strategy. It helps companies identify existing patents and technologies, assess the competitive landscape, and uncover white spaces for innovation. Addressing search challenges enables companies to gain insights, focus their R&D efforts effectively, and develop innovative products or technologies that differentiate them in the market.
3. **Intellectual Property Protection**: IP search is essential for companies to protect their intellectual property. It helps identify prior art, assess the novelty of inventions, and determine patentability. IP search challenges, such as hidden prior art or inconsistent terminology, can impact the strength and enforceability of a company's IP rights. Overcoming these challenges ensures that companies can adequately protect their innovations, obtain valuable patents, and safeguard their competitive advantage.
4. **Licensing and Technology Partnerships**: IP search assists companies in identifying potential licensing opportunities and technology partnerships. It helps them discover complementary technologies, assess licensing landscapes, and negotiate favorable agreements. Search challenges, such as fragmented patent databases or language barriers, can hinder the identification of suitable licensing partners. Overcoming these challenges enables companies to leverage their IP assets effectively, generate additional revenue streams, and forge strategic collaborations.
5. **Market and Competitive Intelligence**: IP search provides valuable insights into competitors' IP portfolios, market trends, and emerging technologies. It helps companies understand the competitive landscape, identify potential threats, and make informed decisions about product positioning and market entry. Addressing search challenges allows companies to gather competitive intelligence, monitor industry developments, and stay ahead of the competition.
6. **Mergers and Acquisitions**: IP search plays a critical role in due diligence processes during mergers and acquisitions. It helps identify IP risks, assess the strength of IP assets, and evaluate potential

synergies. Overcoming search challenges ensures that companies can conduct thorough IP due diligence, make informed investment decisions, and mitigate the risk of acquiring IP assets with potential conflicts or weaknesses.

For private companies, addressing IP search challenges is essential for informed decision-making, mitigating legal risks, protecting intellectual property, and staying competitive in the market. Leveraging advanced search technologies, engaging IP experts, and utilizing comprehensive databases can help private companies overcome these challenges and maximize the value of their intellectual property assets.

5.6. IP Service Provider

Following is the summary of responses received from the IP service Provider Professional

Table 7: IP Service Provider's Response Summary

#	Question	Response Summary
1	What are the main challenges encountered during the process of intellectual property search?	↗ Understanding of the terminology and complexity of articulation ↗ Variations across databases ↗ Volume and coordination across entities
2	How do you perceive the complexity of search queries and their impact on search outcomes?	↗ Clarity assessment of an innovation ↗ Impact assessment of both technology and legal framework ↗ Lengthy review process of clarifications
3	What limitations and shortcomings exist in the currently available intellectual property search databases?	↗ Lack of access to variety of databases ↗ Lack of standardization posing difficulty in analysis ↗ Language dependencies
4	What are the key difficulties associated with the interpretation and analysis of search results?	↗ Segregating irrelevant information (false negatives) ↗ Narrowing down of perspectives due to complex articulations ↗ Over load of data
5	How do the challenges in intellectual property search impact decision-making in intellectual property-related activities?	↗ Risk assessment of legal implications ↗ Assessment of competitiveness ↗ Process delays and dependencies
6	What potential strategies and tools can be developed to address the identified challenges and enhance the efficiency of intellectual property search?	↗ Enhancement to data standardization, integration, and harmonization ↗ Improving precision of search outcome through various methodologies ↗ Continuous learning and enablement
7	What are the potential stages where next generation technologies such as AI can be useful in accelerating the patent search process?	↗ Preparatory phase (prior to search) ↗ Document process and visualization ↗ Coordination and communication across entities

From the perspective of IP service providers, who offer specialized services related to intellectual property, there are several challenges they face in the intellectual property search process. Here are some key challenges:

1. **Complex and Vast Data**: The sheer volume of patent and trademark data available makes it challenging to efficiently search and analyze relevant information. IP service providers need to navigate through extensive databases, multiple jurisdictions, and various languages, which can be time-consuming and resource-intensive.
2. **Inconsistent Terminology**: Inconsistent terminology used in patent and trademark documents presents a significant challenge. Different inventors and applicants may use different words or phrases to describe similar technologies or inventions. This inconsistency can lead to difficulties in conducting comprehensive searches and may result in relevant prior art being missed.
3. **Hidden or Unavailable Information**: Certain relevant information, such as unpublished patent applications or non-public trademarks, may not be readily accessible through public databases. IP service providers need to explore alternative sources, such as industry-specific databases, non-patent literature, or specialized search tools, to uncover this hidden information.
4. **Rapidly Evolving Technologies**: Keeping up with the latest developments in technology and industry sectors is crucial for conducting effective IP searches. However, emerging technologies and rapidly evolving industries pose challenges, as the relevant prior art may not yet be well-documented or easily searchable. IP service providers need to employ specialized strategies and expertise to overcome this challenge.
5. **Cross-Jurisdictional Differences**: Intellectual property laws and practices vary across jurisdictions, which can complicate the search process. IP service providers must have a deep understanding of the different legal frameworks and databases of various countries to conduct accurate and comprehensive searches. Harmonizing search techniques and accessing reliable global patent databases can help address this challenge.
6. **Quality and Accuracy of Search Results**: Ensuring the quality and accuracy of search results is essential for IP service providers. The risk of missing relevant prior art or providing incomplete search reports can have significant consequences for their clients. Striving for high-quality search results requires continuous training, expertise in search techniques, and access to reliable and up-to-date databases.
7. **Technological Tools and Expertise**: IP service providers need to invest in advanced technological tools and expertise to effectively address search challenges. This includes adopting artificial intelligence, machine learning, and natural language processing technologies to enhance search capabilities, automate certain aspects of the search process, and improve the accuracy and efficiency of the search results.

To tackle these challenges, IP service providers continuously invest in research and development, collaborate with technology providers, and employ skilled professionals who possess expertise in intellectual property law, search methodologies, and database navigation. They also engage in ongoing professional development and stay abreast of emerging trends and technologies in the field. By doing so, IP service providers strive to offer comprehensive and accurate search services to their clients, assisting them in making informed decisions regarding intellectual property protection, licensing, and enforcement.

5.7. Govt. Office

Following is the summary of responses received from the Government officials

Table 8: Government Official's Response Summary

#	Question	Response Summary
1	What are the main challenges encountered during the process of intellectual property search?	↗ Limited resources ↗ Challenges due to political issues on international and cross border interactions ↗ Collaboration challenges with corporates and industry bodies
2	How do you perceive the complexity of search queries and their impact on search outcomes?	↗ Understanding of the technical language ↗ Understanding of the domain under consideration ↗ Priority conflicts due to government policies
3	What limitations and shortcomings exist in the currently available intellectual property search databases?	↗ Fragmented structure of databases ↗ Confidence over documentation and accuracy of information ↗ Lack of standardization
4	What are the key difficulties associated with the interpretation and analysis of search results?	↗ Lack of technical expertise and domain understanding ↗ Ability to determine context and relevance ↗ Continuously evolving nature of legal framework
5	How do the challenges in intellectual property search impact decision-making in intellectual property-related activities?	↗ Delay in decision making ↗ Uncertainty in assessment outcome ↗ Risk to legal compliance
6	What potential strategies and tools can be developed to address the identified challenges and enhance the efficiency of intellectual property search?	↗ Investments in next generation tools to improve search efficiency ↗ Cross-border collaboration for harmonization ↗ Invest on tracing post grant activities
7	What are the potential stages where next generation technologies such as AI can be useful in accelerating the patent search process?	↗ Classification and trend analysis ↗ Standardization and accuracy ↗ Monitoring and Review

From a government office's perspective, such as a national patent or trademark office, IP search challenges are viewed in the context of promoting innovation, protecting intellectual property rights, and supporting economic growth. Here's how government offices may perceive IP search challenges:

1. **Enhancing Patent Quality**: Government offices are committed to granting high-quality patents that meet the criteria of novelty, inventiveness, and industrial applicability. IP search challenges, such as complex patent language and inconsistent terminology, can impact the quality of patent examinations.

Government offices strive to address these challenges to ensure that granted patents are valid, enforceable, and contribute to technological advancements.

2. **Facilitating Timely Examination**: Timely examination is essential for providing legal certainty and fostering innovation. IP search challenges, including the vast amount of data and hidden information, can prolong examination timelines. Government offices work towards improving search tools, databases, and examiner training to enable efficient and accurate searches within reasonable timeframes.
3. **Supporting Domestic Industries**: Government offices recognize the importance of promoting domestic industries and supporting their intellectual property needs. Effective IP search plays a crucial role in helping domestic inventors and businesses navigate existing IP rights, avoid infringement, and identify opportunities for innovation. Addressing search challenges enables government offices to provide better support to domestic industries and foster their growth.
4. **Encouraging Foreign Investments and Collaboration**: Governments often aim to attract foreign investments and encourage international collaborations. A robust IP search system is crucial in providing clear information on existing IP rights, ensuring transparency, and facilitating foreign investors' confidence in the local IP landscape. Overcoming search challenges helps create a favorable environment for foreign investments and collaboration in research and development.
5. **Promoting Technology Transfer and Licensing**: Government offices recognize the importance of technology transfer and licensing in driving innovation and economic growth. Thorough IP search helps identify available technologies, patent licensing opportunities, and potential partners for technology transfer. Addressing search challenges enhances the accessibility and usability of patent information, facilitating technology commercialization and licensing activities.
6. **International Harmonization and Cooperation**: Governments engage in international harmonization efforts to align their IP systems with international standards and facilitate cross-border IP protection. Harmonization aims to reduce search challenges associated with multiple jurisdictions, language barriers, and differences in legal systems. Government offices actively participate in international cooperation initiatives to improve search capabilities and promote global IP collaboration.

Government offices typically allocate resources to address IP search challenges by investing in technology infrastructure, training examiners, and improving access to comprehensive databases. They collaborate with stakeholders, including industry associations, inventors, and international organizations, to gather insights and enhance search processes. By addressing IP search challenges, government offices strive to create a supportive environment for innovation, protect intellectual property rights, and stimulate economic development.

5.8. Education

Following is the summary of responses received from the professional from education sector

Table 9: Education Industry Representative's Response Summary

#	Question	Response Summary
1	What are the main challenges encountered during the process of intellectual property search?	↗ Ability to access quality resources available over multiple platforms ↗ Limitation posed by awareness of technology development

		↗ Limited experience and skills for carrying out research
2	How do you perceive the complexity of search queries and their impact on search outcomes?	↗ Limited understanding of terminology ↗ Ability to creatively build search queries considering the variations in the database interfaces ↗ Experience and skills for carrying out research
3	What limitations and shortcomings exist in the currently available intellectual property search databases?	↗ Lack of understanding contextual information ↗ Limited time availability to master the process ↗ Barriers of multiple languages
4	What are the key difficulties associated with the interpretation and analysis of search results?	↗ Limitations in analyzing complex legal language ↗ Lack of experience in drawing decisive insights ↗ Lack of legal background impacts quality of assessment
5	How do the challenges in intellectual property search impact decision-making in intellectual property-related activities?	↗ Lack of financial support in strengthening the process ↗ Considerations to analyst and market data ↗ Risk of legal challenges
6	What potential strategies and tools can be developed to address the identified challenges and enhance the efficiency of intellectual property search?	↗ Standardization and templatization of terminology ↗ Training and education support ↗ Forums for interfacing with industry professionals
7	What are the potential stages where next generation technologies such as AI can be useful in accelerating the patent search process?	↗ Hands on experience and preparing for specialization ↗ Decisioning on IP filing for the innovation ↗ Data collection and processing

From an educator's perspective, there are several challenges in IP search that can impact the sector. Some of these challenges include:

1. **Access to comprehensive and up-to-date information:** Finding accurate and comprehensive information on intellectual property rights can be challenging. The vast amount of data, including patents, trademarks, copyrights, and trade secrets, makes it difficult to navigate and stay updated with the latest developments.
2. **Complex and ever-changing legal frameworks:** Intellectual property laws vary across countries and are subject to frequent changes and updates. Educators need to stay abreast of these legal frameworks

to provide accurate information to students. However, keeping track of the evolving laws and regulations can be time-consuming and challenging.

3. **Language and technical jargon:** Intellectual property documents often contain complex legal and technical terminology. Understanding and interpreting these documents require a deep understanding of the subject matter. Language barriers can also pose challenges when conducting IP searches across different jurisdictions.

4. **Limited access to specialized databases:** Access to comprehensive databases that contain patent information, trademark registrations, and copyright records can be costly or limited. Educators may face challenges in accessing these databases, particularly if they are affiliated with institutions or organizations with limited resources.

5. **Data quality and reliability:** Ensuring the accuracy and reliability of the data retrieved during IP searches can be a challenge. Errors in data processing, incomplete records, and outdated information can lead to unreliable search results. Educators must critically evaluate the quality of the data they use in their teaching materials.

6. **Teaching practical application:** Translating the theoretical aspects of intellectual property into practical applications can be challenging for educators. IP search involves understanding the intricacies of patentability assessment, infringement analysis, and licensing considerations. Educators need to bridge the gap between theory and practice to effectively teach students about IP search and its real-world applications.

To overcome these challenges, educators can benefit from collaborating with IP professionals, utilizing specialized IP search tools and resources, and staying updated with developments in intellectual property law. Additionally, promoting interdisciplinary approaches that integrate legal, technical, and business perspectives can enhance the teaching and understanding of IP search in the education sector.

5.9. Result Analysis

Following table depicts the response analysis depicting score across various categories –

Categories	Sub Categories	Innovators	Legal Profession	IP CoEs	IP Service Provid	Government Representati	Education Sector	Total
People	Knowledge - Legal	1	4		1	2	4	12
	Knowledge - IP Process	1		1	3	1	1	7
	Knowledge - Domain Knowledge	2	1	3		1	1	8
	Knowledge - Tehnology/ Software		1	1		1	1	4
	Efforts			4	3	1	1	9
Process	Language - Readability, Articulation, Translation	3	4	2	2		2	13
	Complexity - Query Building, Domain Definition, Tech adoption	2	2	1	3		1	9
	Inter-dependency (Political, technical, procedural, collaboration)	1			1	5		7
	Standardization - Process, Templates, Inputs, Outcome, Inconsistency	4		2	2	2	2	12
	Monetization	1	1					2
	Documentation	1	1			1	1	4
	Refinement		2					2
Tools	Improving Existing Software - Navigation, User friendliness	2	2	1	2	1	1	9
Funding	Sufficiency of Fundings			2		2	1	5
Strategy	Competitiveness, technology strategy, trend assessment, Research			1	1	1	2	5
		18	**18**	**18**	**18**	**18**	**18**	

Figure 3: Pilot Study Response Analysis

Top 5 weighted responses by the respondent are –

1. Language - Readability, Articulation, Translation (Process Category)

The respondents in the pilot study highlighted challenges related to readability, articulation, and translation during the intellectual property (IP) search examination process. They expressed concerns about the clarity and comprehensibility of documents, particularly legal and technical texts, which can impede the search and analysis process. Difficulties in articulating search queries effectively and accurately translating information from different languages, diagrams were also identified as significant obstacles. These challenges can hinder the efficiency and accuracy of the IP search examination phase, emphasizing the need for improved readability, clear articulation, and effective translation methods to enhance the overall search process. Addressing these issues could contribute to better understanding and interpretation of IP-related information, enabling more efficient decision-making and knowledge extraction from search results.

Deep dive - The need for improvement in IP search related language is driven by the challenges researchers face in comprehending complex patent documents. Readability enhancements are crucial to facilitate the understanding of legal and technical jargon, enabling users to extract valuable information efficiently. Improved articulation capabilities would aid in summarizing intricate concepts, saving time and facilitating faster evaluation of patent relevance. Translation advancements are necessary to bridge the language barrier, ensuring researchers can access a broader pool of global intellectual property resources accurately. Language comprehension improvements would enhance search algorithms' accuracy, enabling precise results by disambiguating terms and understanding context. Overall, these enhancements would create a more intuitive and user-friendly experience, empowering researchers to navigate the intellectual property landscape effectively.

Literature study indicates that issues involved in patent search (when traditional prior art search techniques are employed) usually are around resulting in a large number of false positives and false negatives.

- Data processing errors,
- Errors due to language pitfalls,
- Errors due to faulty syntax,
- Classification error

2. Standardization (Process Category)

During the pilot study, respondents expressed concerns about the lack of process standardization in the IP search examination phase. They identified challenges related to templates, input/output formats, and data harmonization. Respondents noted the absence of uniformity in templates used for documenting search results and analysis, leading to inconsistencies and difficulties in comparing and evaluating findings. The lack of standardized data harmonization practices also posed challenges in integrating and analyzing innovations from multiple sources. Respondents emphasized the importance of clear guidelines, standardized templates, and consistent input/output formats to streamline the IP search examination process. They suggested that standardized processes and formats would enhance efficiency, accuracy, and interoperability, facilitating better collaboration and knowledge sharing among stakeholders involved in IP search activities. Addressing these challenges would contribute to improved decision-making, resource optimization, and overall effectiveness in the examination phase of IP search.

Deep dive - The need for standardization in IP search is essential to address the challenges posed by the diverse and fragmented landscape of intellectual property. A standardized framework would promote

consistency in search methodologies, classification systems, and data formats across different patent databases and jurisdictions. This would enable researchers to conduct comprehensive searches, compare results accurately, and make informed decisions. Standardization would also facilitate interoperability among different IP search platforms, allowing seamless data exchange and collaboration. Moreover, it would enhance the efficiency of patent examination processes by providing uniform criteria for assessing patentability. Overall, standardization in IP search would promote transparency, reliability, and accessibility, fostering innovation and benefiting stakeholders in the intellectual property ecosystem.

3. Legal Knowledge (People Category)

According to respondents, the knowledge levels of participants in the intellectual property (IP) search process, including their understanding of legal, technical, and domain-specific aspects, greatly impact the overall effectiveness and efficiency. They suggested that developing user-friendly processes, documenting knowledge, and simplifying formats and templates would contribute to improving the search process. However, the topic of knowledge in the IP search process is considered broad and contextual, encompassing policies, domains, and legal frameworks. As a result, it is recommended that an independent research initiative be conducted specifically focusing on the knowledge aspect, as it falls outside the scope of the current research.

4. Software Enhancement – existing databases (Tools Category)

Certain respondents raised concerns about the limitations of existing tools and software in intellectual property (IP) search, including fragmented formats, querying processes, query results (formats and contents), and user-friendliness of screens with navigation complexities. They expressed the belief that improving the functionality and capabilities of software databases would greatly alleviate the challenges encountered in the IP search process. While these responses shed light on the need for enhancements in existing tools, it is important to note that they have limited relevance to the specific research topic at hand. Addressing these software-related limitations would require an independent initiative focused on software development and improvement, separate from the scope of the current research.

5. Efforts (People Category)

Some respondents emphasized the significant efforts required throughout the intellectual property (IP) life cycle. In particular, IP Centers of Excellence (CoEs) and IP service providers experienced the impact of the process due to their interactions with diverse innovator communities and IP offices. However, it is important to note that these responses have limited relevance to the specific research topic being considered, which focuses on exploring the challenges faced during the examination phase of the IP life cycle. Therefore, while the efforts required by IP CoEs and service providers are acknowledged, they are not directly aligned with the focus of the study.

5 CONCLUSION

The pilot study on exploring the challenges faced during the "Examination" phase of the Intellectual Property (IP) life cycle has provided valuable insights into the difficulties encountered in IP searches. Through qualitative methods such as interviews and focus group discussions, the study identified challenges including limited search databases, complex queries, and time-consuming processes. The

findings contribute to enhancing the efficiency and effectiveness of IP search activities, aiming to improve IP management, innovation, and decision-making.

Participants selected through purposive sampling include innovators, government officials, patent attorneys, intellectual property researchers, and professionals in IP-related roles. The initial sample size will consist of 2-3 individuals from each category, with further determination based on data saturation. Inclusion criteria involve participants with professional experience in IP searches, working in IP roles, and possessing a comprehensive understanding of IP laws. Exclusion criteria involve individuals who do not meet the inclusion criteria or lack direct involvement and expertise in IP searches. Participant selection aims to ensure diversity and varied perspectives on the challenges in IP search

In the pilot study, the top five weighted responses from the respondents highlighted challenges in various categories. These included

1. **Language** - Challenges related to language, such as readability, articulation, and translation, which can hinder the IP search examination process.
2. **Standardization** - Process standardization was also identified as a concern, particularly in terms of templates, input/output formats, and data harmonization. Respondents emphasized the need for standardized processes and formats to improve efficiency and collaboration.
3. **Legal Knowledge** - The knowledge levels of participants, specifically in legal and domain-specific areas, were considered significant for the effectiveness of the IP search process. Respondents suggested user-friendly processes and documentation to enhance knowledge.
4. **Software Enhancements** - Some respondents expressed concerns about limitations in existing software databases and the need for software enhancements to address fragmented formats and user-friendliness.
5. **Efforts** - Finally, respondents acknowledged the considerable efforts required in the IP life cycle, but noted that this aspect was not directly aligned with the research topic focused on the examination phase challenges.

The pilot study has laid the groundwork for further research and the development of strategies and tools to address these challenges. It has also highlighted the potential role of AI in optimizing the patent search process.

While the study had limitations such as a small sample size and an exploratory nature, the systematic approach and rigorous data collection and analysis ensure the reliability and validity of the findings. Overall, this pilot study has paved the way for a larger-scale study, where the insights gained can be further investigated and applied to enhance the management and utilization of intellectual property.

6 WAY FORWARD

In order to proceed with the qualitative pilot study aimed at narrowing down the challenges faced by stakeholders in the Intellectual Property Search phase, it is crucial to follow a systematic approach. After collecting data through surveys and interviews, a thorough analysis will be conducted further to identification of initial analysis for common patterns and themes. Subsequently, practical strategies and recommendations will be developed to address these challenges.

Moving forward, the focus will shift towards conducting developmental research to pilot and evaluate the effectiveness of these strategies in a controlled environment. The goal is to propose an adoption model that conceptualizes the study findings. This phase of the research will involve assessing technology-led capabilities, exploring alternatives, and determining their applicability.

To facilitate the developmental research, a second pilot study will be carried out specifically to identify a suitable AI model and examine its efficacy in optimizing the search phase of intellectual property. This additional study will provide valuable insights into the potential of AI technology in improving the efficiency and effectiveness of intellectual property search processes.

7 BIBLIOGRAPHY

Table 10: Bibliography

Terminology	Definition
Intellectual property	Creations of the mind, such as inventions; literary and artistic works; designs; and symbols, names and images used in commerce
Data saturation	The point at which new information and insights cease to emerge from the collected data, indicating that the sample size is sufficient to address the research objectives.
Prior-art search	One of the initial steps before filing a patent. It involves searching for all existing prior arts that are nearest to the given technological innovation within the same domain.
Patent Monetization	Patent monetization is the process of generating revenue by selling or licensing patents to others.
Novelty/ Patentability	Search process used to determine if an invention is new and unique