SMU SINGAPORE MANAGEMENT UNIVERSITY | Centre for AI and Data Governance

Conversations at the Intellectual Property and Artificial Intelligence Interface

Understanding the Needs of Singapore's Innovation Community

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This report sets out the findings and conclusions from the research conducted by the authors to gather views from the Singapore innovation community on the intersection of AI, IP and data laws, and is not a policy reform paper or study by IMDA or IPOS. All views, opinions, conclusions and recommendations expressed in this material are solely those of the authors.

Content page

Foreword (by IPOS and IMDA)

Artificial Intelligence (AI) is one of the fastest growing and popular data-driven technologies being used around the world. No longer confined to just the high tech and telecommunications industries, it has become embedded throughout various industries and is now part of day-to-day lives, enabling powerful search engines, or personalised product recommendations for online shopping.

As recognised in Singapore's National AI Strategy (NAIS), a top-class intellectual property (IP) regime is an important enabler to support the development and commercialisation of new AI technologies. However, traditional applications of the IP regime towards the protection of AI innovations (both assisted and purportedly autonomous) have led to challenges, among which are difficult questions on inventorship and authorship of such innovation outputs, and the appropriate balance to be struck between data accessibility for AI model development and data rights protection to preserve incentives for data collection, including collection of good quality data. These issues have been generating much debate and discussion globally across jurisdictions and at international fora such as the World Intellectual Property Organization (WIPO).

The Intellectual Property Office of Singapore (IPOS) and the Info-communications and Media Development Authority of Singapore (IMDA) recognise the importance of understanding the local AI innovation landscape in relation to the interface between IP, data and AI, the dynamics among the stakeholders in this space, and consequently, the role that regulators may play to support AI innovation.

As a first step, the Centre for AI and Data Governance (CAIDG) at Singapore Management University was jointly tasked by IPOS and IMDA to elicit the perceptions and beliefs of key stakeholder groups in the AI innovation space on the relationship between AI, IP and data. This was conducted by CAIDG through its conversational focus group methodology on important questions of the role of IP and data in incentivising AI research and investment – What are the AI assets that are important to be protected, balanced against the access to open-source knowledge? How could the IP system better protect AI applications and output or are there aspects that actually hinder AI innovation? Are current laws and rules sufficient to protect data or do such rights affect the free flow of data needed for the improvement of science, technology and business? What are the key legal, business, or societal issues (e.g., gaps, problems, risks etc) that can arise from the IP/AI interface, and/or the intersection of IP and data protection frameworks?

As explained in this report, the findings derived by CAIDG from the focus groups should be understood as opinions that are suggestive in nature and specific to each participant's personal experiences, rather than conclusive of how IP contributes towards AI innovation. It is the first step in the conversation amongst policymakers, AI practitioners, and other key stakeholders on

the balance between protecting innovation outcomes and facilitating open access, so as to support and enable AI innovation.

Executive Summary (by CAIDG)[1]

On the central research question of whether the current IP regime stimulates AI innovation in Singapore, the focus group participants generally did not see a simple causal connection. The authors' assumption about the existence of some central confusions between key stakeholders in the AI/IP ecosystem regarding what should facilitate innovation was confirmed in this study.

The policymakers tend to work from more traditional notions of IP, seeing IP rights as "rewards" for the innovators' efforts. In contrast, the AI practitioners are less convinced that patents are helpful, preferring open access to knowledge ahead of knowledge protection. However, the policymakers also noted that they are unsure about the degree of protection they should endorse for AI-related patents to be profitable and enable innovation, signalling that there may be some extent of shared uncertainty between policymakers and the AI practitioners regarding patenting AI.

Another tension existing at the AI/IP interface is an atmosphere of misunderstandings between AI practitioners and lawyers involved with offering IP services. IP lawyers seem to perceive that AI practitioners are withholding information regarding their technology and lack patience in articulating their inventions. On the other hand, AI practitioners felt that lawyers, lacking the technical foundations, may have problems understanding their technology which makes the whole process of filing IP cumbersome. The lawyers and the AI practitioners, did however, agree that bigger companies have more understanding and are better positioned than start-ups to utilise patents, so the issue of IP adoption may be relative to organisational capacity and market positioning.

Generally, while AI practitioners considered access to open source AI models and data sets, talent acquisition and providing transparency to AI regulators as their main challenges, lawyers tended to be more concerned with the difficulties of protecting datasets and AI-related innovations, as they understand facilitating protection to be their main role in the IP regime. For instance, while AI practitioners prioritised the availability of open-source AI models and data sets, a legal practitioner argued the importance of having *sui generis* protection for datasets to support innovative efforts.

It was acknowledged by the lawyers and policymakers that classifying AI-related inventions under the traditional IP regime is challenging. As a result, policymakers said they want to adapt current laws to better protect AI. However, it has also been noted by AI practitioners and lawyers that the AI's black box provides a layer of protection to the invention as it is difficult to reverse-engineer.

[1] This research is supported by the National Research Foundation, Singapore under its Emerging Areas Research Projects (EARP) Funding Initiative. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not reflect the views of National Research Foundation, Singapore.

Apart from IP protections, there was also a strong consensus across the focus groups that continued access to data is important for AI development, as AI practitioners emphasised the need for clear and consolidated guidance on data availability, access restrictions, confidentiality etc. for different industries and applications.

Other factors cited by AI practitioners that drive or impede innovation in AI include human talent and Singapore's limited market size, though there is consensus that as an innovation hub, Singapore has a good ecosystem in place with well-measured policies and attractive incentives/grants.

Where do we go from here with the IP/AI interface?

It was evident from the discussions that in order to motivate AI practitioners to file for patents, they must trust that IP attorneys have the know-how to help them, which suggests a need for IP lawyers to communicate better and build rapport with their clients.

Some AI practitioners also reported a lack of knowledge and clarity around the IP application process and its latest developments, which was consistent with a policymaker's calls for minimising grey areas in the IP regime since they could derail any initial motivation to file for patents, especially as local innovators are more cautious in the face of uncertainty.

Finally, as AI practitioners may not see the correlation between patents to that of revenue clearly, a marketplace to readily license and sell IP could enable them to appreciate the commercial value of patents and therefore incentivise the filing of IP.

1. Background

1.1 Problem Statement

Global interest in regulating artificial intelligence (AI) is gaining momentum, and some of the risks of deploying AI and using big data are more apparent. At the same time, questions are being asked concerning whether and how legal regulatory regimes are stimulating or retarding AI innovation.

Increasingly, use cases wherein AI-related innovation and associated theoretical developments are challenging the traditional paradigms of the existing intellectual property (IP) regimes require evaluating how IP can better support and stimulate AI innovation and the appropriateness or limits of these IP regimes in this regard.

This Research Project conducted by the Centre for AI and Data Governance (CAIDG) based at Singapore Management University (SMU) and associated review will guide the Intellectual Property Office of Singapore (IPOS) and Singapore's Infocomm Media Development Authority (IMDA) in understanding the regulatory needs of the Singapore innovation community concerning IP protections and processes for making commercialisation and integrity of AI-related innovations more sustainable while balancing the needs of the public and innovators via a healthy, open and competitive market for ideas. The tension between protecting rights and interests and benefiting from open access is a challenge to be resolved by regulators and innovators on a common innovation mission.

Traditionally IP law is designed to stimulate innovation and endorse creativity. An exclusive agency over innovation elements may, however, be viewed either as a fillip or an impediment to AI development across the ecosystem. This Research Project will interrogate these alternative understandings so that policy will favour innovation through appropriate IP engagement.

1.2 Objectives

The objective of the Research Project is to understand the perceptions of key stakeholders concerning regulatory stimulation at the IP/AI interface. With this knowledge, policymakers will be better able to harmonise positive regulatory potentials, those of IP in particular, with the scientific, commercial and social demands on the AI ecosystem consistent with the Singapore National AI Strategy for:

(a) Generating economic gains and improving social good;

(b) Creating a progressive and trusted regulatory environment; and

(c) Ensuring Singapore's attractiveness as a global IP hub through developing a modern and sustainable IP regime that supports AI-related innovation (including the research and development of AI systems, as well as the innovative use of AI systems in generating IP).

1.3 Research Question

Based on the problem statement and the research project objectives, the following research question (RQ) has been devised:

RQ: Does IP promote AI innovation?

This overarching RQ will be supplemented by guiding questions for the research participants to understand issues about IP and factors contributing towards AI innovation.

1.4 Project Aims

- Identify the gaps in communications between IP practitioners and AI experts;
- Discuss the way these disconnects in understanding impact upon AI innovation; and
- Understanding the regulatory needs of the innovation community concerning IP protections and processes through making the commercialisation and integrity of AI-related innovations more sustainable while balancing the needs of the public and innovators via a healthy, open and competitive market for ideas.
- Explore ways in which, once misunderstandings and differing expectations are addressed, AI innovation can be stimulated with the assistance of IP developments and policy adaptations
- Look at ways where this conversation about AI innovation in Singapore and beyond can be maintained and reflected through sustainable development policy

2. Methodology

This research will deploy the focus group discussion (FGD) methodology. FGD is a technique where the research team assembles a group of individuals to discuss a particular issue, to draw understandings from the complex personal experiences, beliefs, perceptions, and attitudes of the participants through a moderated interaction.

In each FGD, a conversational method was adopted, stimulated by a series of broad questions that initiated discussions among the various stakeholders regarding aspects of understanding or navigating the IP-AI interface. Rather than formal Q&A exchanges, this methodology promotes a natural and free-flowing dialogue between participants. Resulting from such conversations, the findings should be understood as opinions that are suggestive in nature and specific to each participant's personal experiences, rather than extrapolated to infer conclusions about how IP and other factors contribute towards AI innovation. This method is often preferred when the research seeks experiential opinions rather than definitive conclusions. In the present instance, this method was selected to reveal how different stakeholders felt about legal protections when considering innovative data use.

Specifically, for this research, four groups of people who will be representative of the AI ecosystem were recruited to participate in four FGDs. The four groups of individuals participating in the four FGDs were as follows:

(a) FGD1: AI practitioners – professionals who develop, deploy, research, or provide AI consultancy; They comprise a mix of AI practitioners from start-ups, SMEs, larger tech companies and research institutes, with some having experience in more than one type of organisation, or even holding concurrent positions (e.g. in a large tech company as well as in a start-up);

(b) FGD2: In-house counsel – lawyers who are employees of companies that are utilising AI;

(c) FGD3: Legal practitioners – lawyers from law firms that are dealing with intellectual property (IP) and AI technologies; and

(d) FGD4: Policymakers – public servants from ministries and statutory boards involved in regulations or enforcement.

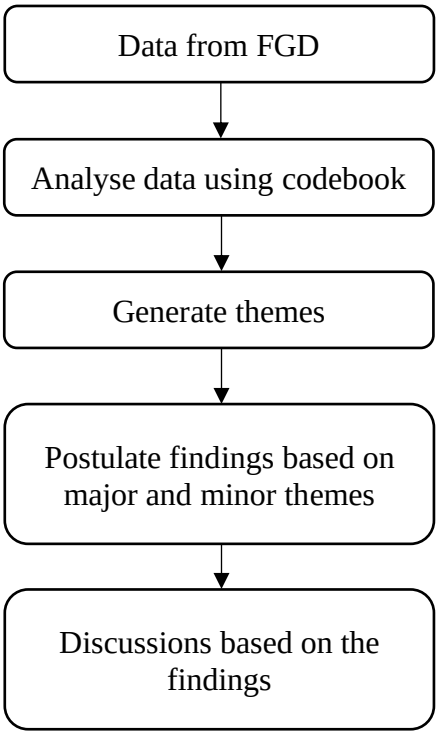
Informed consent was obtained from all participants before the conduct of any of the FGDs. Participants were instructed regarding the significance of the research and, at the same time, were reminded that their participation was voluntary. The participants were told that all information disclosed in this study would be kept strictly confidential and anonymous as required by the research ethics Institutional Review Board(IRB)'s approval conditions.

Participants in this study were recruited based on convenience sampling via participants' previous involvement with CAIDG, SMU, IPOS, IMDA or the researchers' network. Ethical clearance was obtained from SMU's IRB with the approval number: IRB-21-033-A035(221). The sample was randomized insofar as the network contacts were then subject to filtering on the basis of age gender and professional experience.

Based on the recruitment drive, a total of 27 participants were assembled (FGD1 – 6 participants, FGD2 – 9 participants, FGD3 – 7 participants and FGD4 – 5 participants). The four FGDs were conducted between April 2021 to May 2021. The sample sizes were consistent with studies that deployed FGD as a research method, as the rule-of-thumb is that each group will have 6-8 participants. The participants recruited came from diverse backgrounds and had different experiences, which contributed to a robust discussion between all participants. As with most qualitative research methods, the data cannot be said to be representative of the ecosystem, and therefore the findings in this report are indicative rather than prescriptive.

Figure 1 depicts the process flow on how the data from the four focus group discussions (FGDs) were analysed to generate the findings based on major and minor themes using a codebook. The findings were further specified based on the guiding questions (See **Annex A**), which were formulated to answer the overarching research question (RQ) previously noted. Further discussion will be made concerning the RQ as this report develops. The process is consistent for all four FGDs.

Figure 1: Process flow of raw data to the development of themes



3. Analysis

3.1 Content Analysis

The transcribed FGDs from the four groups were analysed using content–analysis, a technique used to identify key themes in the qualitative data. In content analysis, there are two main approaches. The "manifest analysis" approach tries to understand the written content, whereas the "latent analysis" approach expounds on the hidden meaning. Both approaches were incorporated for this research.

Guiding questions were used as units of analysis for coding can be found in **Annex A**. In addition, the four transcripts from the FGDs were iteratively read line-by-line to tease out appropriate themes, relationships and subheadings based on a codebook, as seen in Table 3-1.

Table 3.1. Codebook for content analysis

No.	Source	Probe	Response	Meaning Unit	Subheadings	Relationship	Themes	Remarks
1.	E.g. FGD1	M: [Probe from Moderator]	P: [Participant's response]	[Coder rephrases participant's response into simple terms]	E.g. Large companies are motivated Start-ups may be less motivated	E.g. Motivation to file for patents could be based on the size of the organisation.	E.g. Motivation	E.g. IP rights consist of more than patents (copyright, trade secrets).

The content analysis generated three-level themes. The 1st level is granular themes, with the 3rd level themes being most broad-based. The 3rd level themes will be used to cluster the findings from the data and provide the base structure for the discussions and recommendations of the report.

3.2. Definitions of Themes

There were 16 3rd level (or broad-based) themes generated from the data. The definitions of each theme adopted by the research team are set out below.

3.2.1 Access

The ability of the AI practitioner to get hold of data, training sets, models, codes etc. required for AI development.

3.2.2 Awareness

(a) The understanding of the technical workings of the AI such as its codes, data, training sets etc. or the benefits/challenges in applying AI (*AI awareness*);
(b) The anticipation of potential commercial benefits from filing or protecting IP or otherwise not disclosing technical know-how (*IP awareness*).

3.2.3 Challenge

Multi-faceted difficulties in terms of

(a) AI development;
(b) AI deployment;
(c) data access;
(d) AI patentability;
(e) enforcement; and
(f) commercialisation.

This could also take into account labour-related challenges, e.g. 'Experts' (in 3.2.7 below).

3.2.4 Commercialisation

Commercialisation here refers to the exploitation of IP in the marketplace, for example, selling and licensing IPs. This typically involves monetary remuneration for companies or organisations.

3.2.5 Competition

The competition theme broadly covers two aspects:

(a) Among organisations (start-ups, SMEs, MNCs) in multiple industries vying for the market with regards to the application of AI; and
(b) Among governments endeavouring to promote their IP regimes.

3.2.6 Components

This refers to components comprising AI technology, such as:

(a) Codes
(b) Training data sets
(c) Data set
(d) Algorithms

3.2.7 Experts

This refers to:

(a) Practitioners who develop, deploy and implement AI; and
(b) IP lawyers (whether practising in-house or in law firms) who are experts in AI-related IP laws

3.2.8 Future of AI

This refers to the anticipated development of AI technology, as well as impact of AI on individuals or companies in multiple industries in the near or medium-term future.

3.2.9 Industry Impact

This refers to the impact on companies due to:

(a) Implementation of AI;
(b) IP regimes.

3.2.10 Innovation

This refers to innovation in two areas:
a. AI-related applications to solve real-world problems;
b. the environment or ecosystem that facilitates innovation.

3.2.11 IP Regime

The set of IP laws, regulations and policies a jurisdiction that deals with IP filing and/or protection, patentability requirements, enforcement and the like.

3.2.12 Liability

The responsibility owed under law by an entity (whether individual or other legal entity such as corporations) for the development, deployment and implementation of AI.

3.2.13 Motivation

"Motivation" here refers to the incentive to adopt a particular strategy. In the context of the focus group discussion (FGD), it relates to instances such as the motivation to file for patents or any other IP-related strategies.

3.2.14 Ownership

The legal entitlement over artefacts such as AI application or its components such as the codes, the data sets, or the training data sets.

3.2.15 Patentability

The requirements set out under a jurisdiction’s IP laws that determine whether a technology can qualify for patent protection.

3.2.16 Trust

Trust between and among the different groups of people across the AI ecosystem, with a focus on the trust between AI practitioners and start-ups and lawyers practising IP law, and IP policymakers.

4. Discussion

Table 4-1 below gives an overview of the themes covered in the Discussion section. In the Analysis (Section 4) section, 16 themes were deemed significant. On further analysis, 11 themes were chosen from the original 16 themes. Two of those themes, Access and Ownership, were merged given that the discussion about these two themes was often intertwined.

There were several reasons as to why some of the themes were merged or removed. Data from the focus groups could initially appear to warrant a theme, but on further analysis of the narrative, there appears to be a lack of data to support the theme.

Themes were merged when we find that the data from two or more themes are intrinsically linked (as in ***Access*** and ***Ownership***) or the data from one theme could be used to further support a major theme (i.e. ***Patentability*** being merged into ***Challenge*** and ***IP regime***). Further, certain themes may not be as relevant to the project's research questions (i.e. ***Liability***), and were therefore excluded from the main report.

Table 4.1 – Themes covered for discussion

		FGD 1 (AI Practitioners)	**FGD 2** (In-house counsel)	**FGD 3** (External counsel)	**FGD 4** (Policymakers)
1	Motivation				
2	Innovation				
3	Challenge				
4	Awareness				
5	Access & Ownership				
6	Commercialization				
7	IP Regime			Patentability	
8	Industry Impact				
9	Trust				
10	Competition				

	Major theme
	Minor theme
	None

4.1 Motivation

There was a consensus across all the groups that the motivation to file for patents is generally low due to the operational and conceptual realities, such as the cost of patents, the difficulty of enforcement, the industry's fast pace etc. (elaborated further below), which can cause patenting to not be considered worthwhile. Regardless, they could also acknowledge several positive motivations, mostly empirical reasons, that may offset these reasons and encourage the filing for IP, such as grant requirements, to attract investors or to preserve their market power.

The AI practitioners and lawyers both agreed that grants are highly valued in the competitive tech industry, and that grant requirements, which may include patents, could be a positive motivation to file for IP. An AI practitioner revealed that start-ups are told that generating IP rights increases their chances of receiving government grants, even if they do not believe these patents would be worth something beyond that[2] . Highlighting his/her experience working in a tech firm, an in-house counsel similarly emphasised that they "have to do so much for those grants", where they try to keep innovation in-house by employing their own developers.

As attractive as grants are investors' confidence. Recounting his/her exchanges with start-ups, a legal practitioner argued that smaller companies will only file for patents with the financial aid and assurance from their investors, signalling the importance of impressing investors.

While patents can be helpful in enabling companies to seem like a "true tech company" and attract investors, an in-house counsel highlighted that they have to also examine their other assets, such as their trade secrets and copyright protections, to ensure they have an holistic asset portfolio to present to investors:

> *"It's not just "we have a patent, give us money""*

This corresponded with an AI practitioner's view that while they may file one or two patents to attract investors, he/she does not believe this to be a key driver to filing for patents as they can get away with not filing by saying they want to keep their invention as a trade secret.

In relation to the perceived value of patents, an AI practitioner argued that a patent's value depended not on the market, but on the investor's confidence in their invention's potential. Further highlighting the significance of investors' influence on companies' decisions to file for patents, another AI practitioner observed how the value U.S. investors peg to patents translates downstream to start-ups who then become motivated to adopt an IP strategy from an early stage, and how this correlation may not necessarily stand in other countries where investors may value patents less. As such, beyond implementing policies that may promote innovation, consideration should be given to market realities, such as how local investors valuate start-ups, that could influence decisions to adopt an IP strategy.

[2] While IP rights consist of more than patents, such as copyright and trade secrets, these two terms ('IP rights' and 'Patents') were used interchangeably by the participant.

Building upon previous observations that highlighted companies' reliance on investors' endorsement, another AI practitioner proposed incorporating a quantitative score for investors and venture capitalists to compute the valuation of start-ups based on their patents with greater ease, which he/she suggested could be key to motivating companies to file for patents.

The motivation to preserve market power was an interesting factor raised by a legal practitioner, who argued that larger companies seek to prevent competitors from entering the market or copying their invention through applying for patents as quickly as they can, which corresponded with an AI practitioner's observation that companies, more broadly, may want to file for IP to adopt an offensive IP strategy of dissuading competitors from entering their turf. However, the legal practitioner also importantly highlighted that this goes against the ethics and ideals of IP law, which is meant to encourage competition and innovation, rather than enable larger companies to preserve their monopolies. Hence, policymakers need to recognise how the current IP regime could instead be detrimental to a competitive innovation space (by advantaging big players over smaller players).

Without discounting the positive motivations to file for patents, all the groups could acknowledge the operational and conceptual realities, several listed below, that may cause the whole process of filing of IP to be considered cumbersome.

Cost:

The cost of drafting, filing and enforcing patents was acknowledged by the different groups to discourage the application for patents, especially among smaller companies and start-ups that may prefer to spend their limited funds on other areas. In contrast to start-ups, a legal practitioner highlighted that larger, more established companies with more abundant financial resources are more likely to have a clear IP strategy in place, which resonated with an AI practitioner's observation that larger organisations are usually better able to direct their resources towards patentable inventions with a potentially high commercial value. The AI practitioner contrasted his/her previous stint at a larger organisation, which placed substantial emphasis on commercialisation and considered licensing out IP to MNCs and SMEs as their primary source of revenue, against his/her experiences at start-ups, which were less keen on patenting their inventions.

Regardless, due to the costs, time and effort required, even large companies with abundant resources may not be particularly incentivised to file for patents, but the groups found this reluctance to file to be more pronounced among start-ups.

Patent disclosure requirements:

The lawyers highlighted that clients who work on AI-related innovations usually find their technical know-how to be the most valuable, and not to be disclosed in a patent, which then discourages filing. An in-house counsel lamented that many AI practitioners have an unfounded fear that all the details of their technical invention, including datasets, would be published in the public record if they disclosed too much in the patenting process with their lawyer, which then causes them to withhold information from lawyers. He/she finds their wariness to be unfortunate as lawyers require more information and transparency from the developers to help them determine how much should be disclosed in the public record – *See* ***Trust*** *below*.

Interestingly, the AI practitioners' reluctance towards patent disclosure does not contradict with the lawyers' views. A legal practitioner admitted to sometimes advising his/her clients *not* to file for patents, and to leave their invention as it is, as long as it cannot be reverse-engineered. This preference to keep the invention under wraps was similarly shared by an in-house counsel:

> "If I want to know what another company is doing, I can look at public [patent] records – and sometimes I think there's too much disclosed. I analyse [from how they file] whether they're going into this country or not, and this information becomes market intelligence.
>
> As a company, we think, "do we want that kind of exposure?""

Difficulty of enforcing patents:

Agreeing with the AI practitioners' views that enforcing patents is expensive, the legal practitioners and in-house counsels found that the difficulties they face in enforcing IP rights could discourage patenting among clients. This was especially the case in the South-East Asian context, in which an in-house counsel found enforcement to be particularly problematic. Relatedly, a legal practitioner revealed that he/she expects pushback regarding proof of ownership when sending out cease-and-desist letters to competitors, as it is often difficult to meet all the requirements of proving ownership to the alleged party.

Industry's fast pace:

Understanding their clients' perspectives, the lawyers admitted that the tech industry's fast pace and fierce competition may cause the effort and resources put into patenting to not be considered worthwhile. They found that patents could quickly be rendered useless when innovation is incremental and the current tech becomes obsolete fast. An in-house counsel also revealed a shift in his/her company's strategy for in-house inventions, from patents in the past to trade secrets protection currently, as they find the latter to be more appropriate for achieving their commercial goals of scaling fast and capturing market share in the rapidly-evolving tech industry.

A potential disconnect on the perceptions of IP law could be observed between the policymakers and the AI practitioners. The former tend to work from more traditional notions of IP, generally seeing IP rights as 'rewards' for the innovators' efforts. While the AI practitioners (from different backgrounds) did acknowledge benefits of IP protection (i.e. for commercialisation, as an offensive or defensive tool), due to the perceived costs of patents (as elaborated above: expenses, patent disclosure requirements etc.) and experiencing, first-hand, challenges in enforcing their IP rights, there is a preference among the latter for *specific* types of IP protection, like trade secrets, rather than seeing IP rights in general as 'rewards'. The policymakers' acknowledgment that the black box provides protection for AI-related innovations is consistent with the AI practitioners' views, but runs contrary to the assumption that patents would be the preferred mode of protection.

Despite this, an AI practitioner argued that companies, especially start-ups, *should* be taught how to use IP rights as a defensive, offensive or valuation tool. Revealing that his/her start-up had to figure out how to navigate the IP space by themselves, he/she emphasised that there are various benefits to knowing how to capitalise on IP rights, valuable knowledge that is unfortunately not readily-available to start-ups. As there is some enthusiasm among start-ups to learn more about IP protection and its value, more educational attention and resources could be directed to this area.

Where do we go from here with the IP/AI interface?:

Lastly, the AI practitioners also mentioned practical considerations that may motivate them to try filing for patents.

A few AI practitioners pointed out the importance of trusting that IP attorneys have the know-how to help them. Suggesting a lack of effort from the lawyers' part to build rapport, an AI practitioner mentioned that he/she has not seen any lawyers attend the regular meet-ups they organise for stakeholders in the AI field, adding that they would appreciate more opportunities to interact with lawyers on AI-related patents. This leads to the belief that the knowledge lawyers have is outdated, and that they would have a lot of catching up to do for their legal advice to align with the fast-evolving AI field.

Another AI practitioner mentioned that they would be more confident to file for patents if they knew a lawyer well-versed in their specific area of interest who would understand exactly what they want, as opposed to a general lawyer. He/she suggested that it is best for AI practitioners to engage a lawyer through recommendations from other innovators in their sector.

Another concern shared among AI practitioners was the lack of clarity around the IP application process and its latest developments, with an overwhelming majority of them reporting to be unfamiliar with the fast-track patent application program. Simplifying the IP filing process and having a clear path to enforcing their patent rights against infringements could encourage companies who do not know how to navigate the IP space to try filing for IP.

This was consistent with the observations from a policymaker that grey areas in the IP regime could lead to confusion and derail any initial motivation among AI practitioners to apply for patents. The policymaker emphasised that it is the IP regime's role to elucidate policies around protecting AI-related inventions, competition laws and data use rights, especially since innovators in Singapore are much more cautious than their overseas counterparts in the face of uncertainty.

Finally, an AI practitioner highlighted that start-ups do not see the correlation between filing a patent to that of revenue clearly:

> "For start-ups, for the first three years, survival is very important. [I] foresee that in a start-up, everyone is really chasing their revenue so they don't have time to think about IP."

He/she believed that if there was a marketplace to readily licence and sell IP, innovators could learn to appreciate the commercial value of patents and would be more incentivised to file for IP. However, the AI practitioners could not reach a consensus on this suggestion; Another AI practitioner argued that he/she would not want to visit the 'IP marketplace' as he/she prefers to feign ignorance on prior art rather than knowingly infringe on a patent.

A few AI practitioners also found the Singapore market to be too small for patents to be profitable, and argued that the IP regime would only be attractive if patents filed in Singapore could expedite patent application in the US, presumably a more attractive market.

Regardless, it remains uncertain if these conditions are enough to overcome the other dissuading factors elaborated earlier, such as the cost of patents, the difficulty of enforcement and the tech industry's fast pace etc., that discourage the filing for patents.

4.2 Innovation

Interestingly, there was a strong consensus across all the groups that IP does *not* stimulate innovation, as the participants did not detect an obvious correlation between protecting AI-related inventions and innovation in AI and AI-related fields.

The AI practitioners could agree that IP and innovation are independent of each other, with one AI practitioner highlighting that IP remains more of an afterthought when innovators conclude their innovation process. Similarly, a few in-house counsels argued that registered IP (patents) may not be a reliable indicator for measuring innovation in the industry, as inventions are usually kept under wraps via copyright, trade secrets or confidential information, which are non-registrable. One of them suggested that innovation may be best discerned through improved user experience with the product.

A policymaker expressed doubts if protecting AI-related inventions via the traditional IP route was better than the alternative of keeping things open (calling for more open-source innovation tools) to promote innovation in the field, while a legal practitioner went further to argue that too strong a protection regime could actually *hinder* innovation, due to the fear of getting sued for infringements. To meet the needs of Singapore's innovation community, policymakers should consider a balance between enabling more open access to innovation tools, whilst crediting innovators' inventive efforts within the IP regime.

With IP protection being ruled out as a major impetus for innovation, the participants from the different focus groups also discussed other factors that may drive innovation in AI and AI-related fields.

Human expertise:

The human expertise behind the AI invention was valued as an important driving force for innovation by all the groups. An AI practitioner argued that ironically, "the human brain is the most important part of AI", while another commented that building an AI model is more of an artistic endeavour rather than a systemic one, where developers cannot easily predict the outcome of their innovative efforts. As such, he/she argued that Singaporeans, who he/she believes are more skilled in academics/practical assessments and managerial duties, may not be comfortable with the unpredictability and the creativity required for AI development, highlighting the value of human talent in their industry.

Similarly, both an in-house counsel and a policymaker deemed the human expertise required to write new algorithmic codes and assemble quality data to train algorithms to be of most value to a company, especially in the tech industry where there is a high turnover rate and employees may join competitors. They both also suggested looking beyond IP protections to promote AI innovation, including valuing the human expertise.

Access to data: open source vs sui generis protection:

While there was a consensus among the different groups that access to data is crucial for promoting innovation in the AI field, there was disagreement on how this should be facilitated. Being in support of open-source innovation, an AI practitioner argued that the availability of open-source AI training models and data sets has enabled the proliferation of AI-related innovation. Relatedly, a legal practitioner raised that the AI development sphere is competitive enough, in which many open-source tools are available for developers to benefit from without infringing on copyright or taking advantage of someone else's work. However, the enthusiasm around open-source data was called into question by another AI practitioner who argued that the quality of free/open-source data may not be good enough to train AI models, generate satisfactory outputs and promote innovation.

Conversely, a legal practitioner postulated the introduction of *sui generis* data protection laws (that have been passed in the European Union) to support innovative efforts in Singapore. He/she brought in the example of facial recognition in airport customs being trained on the data of Caucasian people not functioning well in the Asian context to highlight the importance of pushing more companies to invest into data collection to produce well-representative datasets, which will be protected by law, to result in good algorithmic outputs. Another legal practitioner disagreed with his/her suggestion, citing that he/she has never had a client request for the protection of data generated by his company, and insinuating that innovation and data protection may be unrelated.

Clarity on laws and regulations:

Apart from access to data, the AI practitioners and policymakers could agree that greater clarity on laws regarding data use could support innovation. An AI practitioner emphasised the need for focused government leadership and formalised, easily-accessible policies on data access and use restrictions if Singapore wants to be a regional leader in AI innovation, which corresponded with a policymaker's views on the need to provide AI stakeholders with clarity over competition principles and data use policies, so that large companies would be less likely to lock up their data for long periods of time, and more likely to share data access to smaller companies, thereby supporting innovation.

Trust and communication:

Acknowledging the negative impacts that the lack of trust and communication between stakeholders may have on innovation, a policymaker highlighted the importance of communicating directly with AI practitioners to have a clearer idea of which policies work or do not work for them, and to adapt their policies accordingly. He/she highlighted that while policymakers want to play a supportive role in encouraging innovative efforts, this push may not always come from the top-down policy angle and may instead flourish ground-up from the positive innovative energies within start-up and R&D circles.

How does Singapore fare as an innovation hub?:

Lastly, when asked how Singapore fared as an innovation hub, there was a general consensus that there is a good ecosystem in place with well-measured policies and attractive incentives or grants that facilitate the setting up of businesses, but that the country's small market size limits growth. An in-house counsel argued that Singapore should instead focus on functioning as a hub, or a "launchpad", for local innovators to enter regional markets, leveraging on its policy expertise to lobby for stronger IP laws and improved enforcement in the larger South-East Asian market.

A potential misunderstanding between AI practitioners and legal practitioners could be observed when a legal practitioner blamed the lack of entrepreneurial culture, or how Singaporeans are more geared towards the status quo rather than taking risks, for hindering innovation, while the AI practitioner lamented that the space for entrepreneurism was crowded out by top-down government initiatives, such as AI Singapore, which deprived them of AI-related consulting opportunities. The observed disconnect again highlights the value of communication between stakeholders to understand the needs of the innovation community for a healthy, open and competitive market for ideas.

4.3 Challenge

The AI practitioners and lawyers (in-house counsels, legal practitioners) cited different concerns as their main challenges, which indicates their distinct priorities. The AI practitioners considered *data access*, especially as anxieties regarding data protection and privacy have increased among the public and regulators in recent years, *talent acquisition* in their competitive industry, and *providing transparency to regulators* when incorporating AI solutions, to be their top concerns. An AI practitioner shared how regulators that scrutinise AI solutions adopted in the financial sector would prohibit the use of the tech until clients can provide them with greater transparency on it. On the other hand, lawyers tended to be more concerned with the difficulties of protecting AI-related innovations and having to rely on a "piecemeal" approach, as they understand facilitating protection to be their main role in the IP regime – See ***IP regime*** below.

This is not to say that their priorities are in conflict. AI practitioners find it challenging for them and their clients to provide transparency to regulators as they have to disclose the inner workings of their algorithm, which could threaten their IP rights. In such situations, an AI practitioner revealed that they rely on their in-house counsels to guide the technical team communicating with regulators, adding that it would be ideal for developers to also be protected by legal frameworks for information shared with regulators to remain confidential.

Another point of commonality was the shared concerns around data access. A few policymakers recognised that access to data sets is a major concern that is often brought up by AI practitioners, as compared to other issues like IP rights, which are rarely raised, highlighting an effort on part of the policymakers to understand the concerns AI practitioners face.

A few AI practitioners recounted their difficult experiences obtaining data in Singapore, contrasting it to previous smoother experiences in other countries like New Zealand and South Korea. An AI practitioner criticised the rising over-sensitivity around data privacy for limiting their data access, attributing it to low public awareness on how AI works:

> "People are worried about privacy violations [but] people are overly-sensitive to this. For e.g. a model using human facial images for training data, because as mentioned, after you train the model it becomes a bunch of data, you cannot use the model to recover the data (faces)."

He/she argued that organisations should be able to utilise the data as long as they have a clear, specific purpose, and the government is able to regulate against other unlawful uses. This corresponded with an in-house counsel's views that existing data protection legislation impedes access to data, which AI developers are reliant on. Bringing in the aspect of unfair competition, a legal practitioner also argued that existing data protection policies further marginalise smaller companies, as they enable larger companies to preserve their monopolies in the data market.

An AI practitioner argued that the government should present industry-specific guidelines over data use and restrictions in a clear, consolidated manner so that developers can easily access the information and be able to use the data in an ethical manner. This aligned with the policymakers' goals of providing greater clarity over policies, especially those regarding data access, to AI practitioners, although one policymaker pointed out that the data requester should articulate the purpose of access clearly to the government entity in question, rather than expect access to be granted – See ***Access & Ownership*** below.

Potential tensions and the lack of trust in the working relationships with patent attorneys were revealed to be significant challenges that AI practitioners face, which was similarly acknowledged by the in-house counsels. Responding to the AI practitioners' criticism of lawyers' patent-filing instructions being confusing or unhelpful as patent attorneys usually push for the patent's coverage to be as broad as possible, the in-house counsels admitted that communicating legal advice to AI practitioners is indeed challenging. One of them further revealed that there is currently a movement to translate the legal language in their practice into an enterprise one, such as presenting legal risk in numbers, for AI practitioners to better understand the IP filing process. Building on these efforts, policymakers could further help to facilitate such ground-up initiatives to improve understanding about the IP regime between stakeholders.

While the different groups may perceive challenges differently, the discussions reveal some consensus and consideration on part of the lawyers and policymakers to understand the challenges AI practitioners face, and to make efforts to mitigate these issues.

4.4 Awareness

While the AI practitioners argued that their awareness of IP and patentability requirements varied depending on each of their past or current experiences with IP filing, there was a stronger judgement from the lawyers and the policymakers that AI practitioners, in general, are unaware about IP.

Recounting their experiences, an AI practitioner shared that he/she learnt more about IP and technical disclosure at his/her current workplace, as his/her Principal Investigator is interested in commercialising patents for their inventions. Another AI practitioner similarly revealed that his/her previous organisation placed much more emphasis on filing for and licensing their IP, as compared to when he/she worked at start-ups, demonstrating how AI practitioners may be more or less aware of IP depending on their backgrounds. Two AI practitioners, who seemed to have more knowledge on IP, also shared that awareness on how to use IP as a defensive, offensive or valuation tool (– see ***Motivation*** above), to their advantage by cleverly disclosing just the bells and whistles (rather than any major components) of the invention in the patent disclosure process would benefit start-ups, but many are unfortunately not taught how to do so.

The AI practitioners also displayed varying levels of awareness on patentability requirements; One practitioner seemed to be the most unaware as he/she asked the group if algorithms were patentable, while another practitioner shared that the algorithm by itself may not be patentable, but a novel idea or invention emerging from the algorithm may be.

From the lawyers' perspectives, however, their clients are generally unaware about IP. A legal practitioner revealed that clients often expect advice on how to protect their invention from competitors by just providing lawyers the background details of their invention. An in-house counsel similarly shared that clients require advice from them to understand the benefits and complexities of IP. While a policymaker ascribed the low filing of IP for AI-related inventions to the lack of awareness AI practitioners have on IP, an in-house counsel disagreed by highlighting that developers are only responsible for making the tech disclosure to the in-house legal team, and it is the IHCs that decide whether to file for patents or to rely on other protection methods like trade secrets.

Interestingly, the policymakers noted that they are unsure about the degree of protection they should endorse for AI-related patents to be profitable and also enable innovation, and whether advocating for more open-source innovation tools would be more beneficial for innovation, signalling that there may be some extent of shared uncertainty between policymakers and the AI practitioners regarding patenting AI.

A starker disconnect was revealed in the scepticism and mismatch of expectations between IP attorneys and their clients. An in-house counsel pointed out that most clients seem to be unaware about the inner workings of their AI invention. A few AI practitioners, on the other hand, criticised lawyers for their outdated knowledge on AI and confusing patent filing instructions – See ***Challenge*** above. Another IHC revealed that developers, who believe

lawyers do not understand their tech, do not then have the time and patience to sit through the patent application process with lawyers, especially when they are working across so many different projects in their fast-paced industry. Regardless, a few IHCs, who saw their role as legal counsel to act as 'bridges' helping AI practitioners pass the milestone of filing patents, highlighted the need to familiarise themselves with AI in order to offer better advice on IP protection and the potential risks.

Other expectations of awareness:

With more tasks being delegated to AI, an in-house counsel revealed that he/she expects AI practitioners to be more aware of the ethical implications, such as the fairness and transparency, of their tech deployment. A policymaker importantly pointed out that ethics are dependent on the cultural norms of where a company is operating from. European countries, for instance, gravitate more towards rights-based issues than Asian countries, which AI practitioners operating there must take note of.

The responsibility of AI practitioners was explored not only in terms of ethical AI deployment, but also in relation to ensuring they are not engaging in anti-competitive behaviour, but there was acknowledgement from the policymakers that they had to provide AI practitioners greater clarity on existing competition laws and data use regulations so that they can be more careful not to engage in such unfair practices.

4.5 Access & Ownership

Access issues:

There was a strong consensus across the focus groups that data and continued access to data are important for AI development. AI practitioners highlight that open-source datasets can be flawed, and that poor quality of data can affect AI implementation, although data access issues seem minimal when data is provided by clients (FGD 1). However, datasets may be subject to protection, such as trade secrets, which could in theory hinder access.

Outside of client-vendor relationships, competition in the private sector renders it unlikely that such datasets will be shared (FGD 1, 2). While purchase or licensing agreements are possibilities, an in-house lawyer remarked that parties in the private sector were still inexperienced in this area. Consequently, this might inadvertently place big tech companies at an advantage viz-a-viz start-up companies as smaller companies may not be able to develop their technologies without access to big companies' data pools (FGD 3) – see also ***Challenge*** above.

A potential misunderstanding was detected between AI practitioners and policymakers in relation to access to public sector data. Anecdotes were shared by AI practitioners describing their frustration in obtaining such data (with one having had to build the data instead), comparing their difficulty in Singapore to much smoother processes in other jurisdictions like New Zealand and South Korea. Policymakers however suggested that it was a question of naming a legitimate purpose for data access, namely if the research benefits the public (FGD 4). A disconnect in expectations may therefore be inferred regarding whose role it is to ensure access: AI practitioners describe it as a whole-of-government coordination problem while policymakers describe it as the requestor having to articulate clearly the purpose of access.

What is clear is that AI practitioners want clear and consolidated industry-specific guidance on data availability and access restrictions. Other suggestions proffered by AI practitioners include:

- Establishing a 'Chief Data Office' in the public sector to handle data access issues; and
- Implementing fees to access governmental datasets (however it has been acknowledged that this might raise ethical concerns, such as motivating the government to monetise the data they collect).

Regarding the latter suggestion, policymakers pointed out that in the e-commerce context, it may be unfair to make merchants pay for data generated from their own activity. It was raised whether merchants on e-commerce platforms should have the right to the data they generate. Interestingly, a policymaker suggested that data accessibility does not fall under the purview of the IP regime, which suggests a narrow view of IP as IP ultimately aims to encourage innovation and data accessibility is at the heart of AI innovation. The policymakers however agree that they might have an obligation to prevent unfair competition due to differential data access prejudicing small players in the market.

Ownership issues:

It was consistent among the focus groups that there is a lack of clarity on the ownership of AI models where more than one party is involved. In practice, it is difficult to segregate data belonging to different parties. A legal practitioner mentioned that AI developers classify which data belongs to them and which is the training data from clients, but it is difficult to clearly segregate between the two in the output data and determine ownership of the product in practice (FGD 3). Typically, lawyers would negotiate ownership beforehand, but for un-negotiated situations IP law does not provide any guidance and in practice parties prefer to settle disputes over ownership between themselves rather than go to Court (FGD 3). Separately, AI practitioners asked whether the practice of owning AI models which were produced for the client using client's datasets would be allowed under Singapore's Model AI Governance Framework. It was observed that there are less disputes over ownership of data, however there are often contentions over the ownership of the AI product (FGD 3).

AI development throws up new complexities over the concept of data ownership and ownership in general. It is not straightforward because there are three components – algorithm, data and then the trained model (FGD 1). A policymaker also remarked that open-source data and software challenges the role of IP protecting ownership of AI and its components (FGD 4). From an enforcement angle, it is difficult to prove ownership of datasets as data is non-registrable IP, and therefore it is difficult to determine what is proprietary IP to clients who want to claim ownership of the whole AI (FGD 3).

Data access or ownership?:

It was suggested that data ownership debates should be framed around data access, control and portability, however ownership could be considered to protect databases for machine learning (FGD 4). However, access to data might be a bigger priority than ownership, at least from the clients' perspective (FGD 3), which is also generally aligned with the view of policymakers (FGD 4).

4.6 Commercialisation

Where companies choose to file patents (keeping in mind the general low motivation for this – see ***Motivation*** above), such a decision is driven by product commercialisation and/or patent licensing rather than innovation, according to both lawyers and AI practitioners. It might be that innovation is neither hindered nor driven by IP commercialisation (FGD 1). Further, it has been commented that technology might be commercially viable without IP (FGD 2, 3).

While a lawyer in FGD 2 had used the fast-track patent scheme once before, there s/he did not indicate that this aided commercialisation. However, legal practitioners were not against all types of IP protection, as they believed registering one's trademark and branding to be more important for commercialisation than filing for patents (FGD 3).

It was shared by lawyers that the valuation of AI-related tech (in the context of selling or licensing the technology) was challenging, resembling guesswork. An AI practitioner added that the innovation to commercialisation process resembled a funnel, whereby only a few tech ideas would produce commercial value. Valuation might be tricky considering further that algorithms might be worthless without data, and that performance of algorithms might vary with the dataset (FGD 2). Hence it was shared by an in-house counsel that the practice was to license or assign on an 'as-is' basis.

Separately, an AI practitioner felt that IP marketplaces (where IPs are commercialised) might instead lead to an increase in enforcement action as such marketplaces would give no room for the infringer to claim ignorance.

There seems to be a consensus among focus groups that in any case, start-ups may not be very aware of how to commercialise their IP, and that it is the big players that are better placed to do this. In part, this may be because the financial burden of enforcing protection and dealing with infringements could weigh heavy on start-ups (FGD 1). Nevertheless, all in all the different focus groups (FGD 2,3,4) seemed to agree that IP is a beneficial asset (albeit to different degrees) but they acknowledge the challenges in commercialising IP.

The tension of AI not fitting into traditional concepts of IP would also have implications on commercialisation. For instance, as AI machine learning gets more sophisticated ownership issues would arise as the link to the human input becomes completely detached (FGD3 and 4).

4.7 IP Regime

The lawyers stressed that classifying AI-related inventions under the traditional IP regime was challenging. This was acknowledged by policymakers who said that they want to adapt current laws to better protect AI, subject to constraints arising from international legal obligations. However, it has also been noted by AI practitioners and lawyers that the black box provides a layer of protection and that it is difficult to reverse-engineer. While algorithms are generally not patentable, in any case, this is the valuable part of the invention that lawyers advise their clients not to disclose (FGD 3). Generally, there is a consensus between lawyers and AI practitioners that algorithms are hard to patent. Furthermore, classifying AI-related inventions under the traditional IP regime is difficult (FGD 2, 3, 4). This importantly demonstrates that the low filing of IP may not be due to a lack of familiarity with IP protection, but instead arise from an *informed decision* not to file, due to the reasons discussed above, such as AI's black box offering the invention protection and the requirement of disclosure for patents.

Lawyers criticised the current approach to protection as "piecemeal" or "patchwork" (FGD 2, 3) and said that new forms of protection are required. Lawyers were particularly concerned with data theft, employees' disclosure of IP or trade secrets to competitors (FGD 2, 3). However, policymakers were also concerned with over-protection. One policymaker said that the different aspects of the AI model should be protected with a combination of the different types of IP law, including patents, copyright and trade secrets, due to the complex development pipeline or process consisting of data collection, pre-processing, training the model etc., but he/she also felt strongly that there should not be a broad AI legislation. For instance, software copyright protection might not be beneficial since the long protection period can hinder AI innovation. Further, [more] patenting might lead to high enforcement costs.

Lawyers were also very concerned with protecting datasets (FGD 2, 3), with one lawyer stating that the lack of sui generis protection (which would not require authorship) for databases could be "a big stumbling block" to innovation in Singapore. Regarding data protection itself, AI practitioners felt that this could be too much as access to data was a concern, particularly since free data might be flawed.

An AI practitioner observed that existing AI-related patents do not disclose how an AI model is trained and that in practice, only "bells and whistles" are patented – this is consistent with FGD2, which have said that a lot of innovation takes place behind closed doors. This suggests a practice of general insufficiency of disclosure in AI patents, and that even if disclosure if a necessary requirement for getting a patent, AI practitioners are able to skirt full disclosure. An AI practitioner further suggested that the nature of AI-related innovations might only be incremental; a lawyer seemed to agree with this by saying that "we are struggling to get [AI] out of the box and find ways to innovate that piece of it" (FGD 3). There needs to be further examination into whether amendments to the IP regime around disclosure requirements for AI and AI-related inventions should be pursued by policymakers. If IP policymakers believe that

disclosure requirements are misunderstood by the potential patent application then such confusion needs addressing.

Therefore, the central question might be what the IP regime seeks to protect in AI innovations. A policymaker remarked that the regime should protect the person who invested in the process. On this front, there seems to be a further disconnect as to whether AI needs protection by the IP regime: an AI practitioner said that there is the least need for IP protection in the field of AI but lawyers however seemed very concerned with protection and enforcement issues, and try to convince their clients of the benefits of patent protection (FGD 3).

There seems to be a consensus between the AI practitioners and the lawyers that trade secrets are preferable devices for protection over patents, for reasons such as cost-effectiveness. As patents may not reflect the innovative landscape, consideration should be given to what underlies this preference particularly concerning exposure of knowledge in the patent process. Alternative protection strategies include data security, employment contracts and splitting datasets into different repositories (FGD 2, 3).

Suggestions raised to better the IP regime:

Separately, an AI practitioner suggested that the IP regime could help companies' audit/AI explainability obligations by enabling them to clarify how the models work, while offering legal protection from opening up the AI black box beyond the platform's guardrails.

There seemed to be a consensus among AI practitioners and lawyers that the fast-track scheme has limited utility (only one lawyer has made a fast-track application), but that it could help appeal to investors and attract PCT patents to Singapore (FGD 2). However, such appeal would depend on the intended market (FGD 3). The critical question seemed to be whether the scheme would assist in obtaining more attractive overseas patents, since the scheme would not circumvent nor speed up the search and examination process in overseas jurisdictions, except if there was an explicit agreement between the IP offices of both jurisdictions. Notably, lawyers raised concerns that the local search and examination process might not be thorough in the fast-track scheme (FGD 3), which might pose enforcement issues. A lawyer opined that the scheme would only be attractive to companies already planning to file, rather than independently motivate them to do so. Meanwhile, AI practitioners who were not as enthusiastic about the fast-track scheme felt that the longer patents were pending the better as the invention was protected during the period.

Quite plausibly, lawyers are over-concerned with IP protection and enforcement than what is needed for the industry when compared to the views of AI practitioners and policymakers. Contrary to what their company's patent team thinks, the significance of patents was unclear to AI practitioners, as chances of patent infringement were not considered to be high (FGD 1). Generally, patents are being filed for defensive rather than offensive purposes (FGD 1, 2), and

it has also been pointed out by lawyers that the enforcement landscape in Southeast Asia is problematic (FGD 2).

Finally, the discussions across groups continuously points to how AI practitioners value access to data over protection of their datasets, hence the IP regime needs to be mindful of this preference if it is to continue to argue commercial relevance.

4.8 Industry Impact

The patent regime seems to have limited impact on the AI industry, particularly start-ups as they may be more concerned with survival and revenue in their starting years (FGD 1), although it has also been said that having some patents would increase the reputational value of start-ups, companies and universities (FGD 1). It was speculated that start-ups might be disadvantaged in protecting their AI assets as they do not have the same resources as bigger companies – if so, the impact is two-fold: affecting start-ups' AI implementation as well as protection.

It was viewed that patents may not be in step with the industry (FGD 1). A common industry practice, such as in Google, was to patent first before publishing (in journals). Thereafter, patent owners might encourage everyone to use the product / the product becomes a 'freemium' (FGD 1).

A lack of access to data, particularly public data, is likely to have an impact on the industry, since an AI practitioner had said that they had to build data from scratch (see Challenges above). Within the private sector there might be a reluctance to share data with each other (see ***Competition*** above); this is consistent with in-house counsel's observation that source code licensing is a rare practice (FGD 2).

Regulatory initiatives too might have an impact on the AI industry, however a policymaker suggested that there is a lack of will within the tech industry to apply AI governance frameworks to their projects. There might be a difference in expectations between AI practitioners and policymakers of the role and responsibilities of AI practitioners on this front. While AI practitioners are aware of explainable AI requirements (FGD 1), a policymaker suggested that AI deployers (or the end-users) have the responsibility to evaluate how the AI was developed and to ensure that the outcomes achieved are consistent with the values of their organization. It was also viewed that AI deployers have the responsibility to be aware of the outcomes generated by the AI and ensure that they are not engaging in anti-competitive behaviour (FGD 4).

Regarding the impact of AI innovation on the legal industry, there is a consensus among lawyers that smart contracts are not yet suitable (and do not seem) to be used at scale, although many vendors are offering solutions. AI-tech however has been adopted to aid in the enforcement of IP (copyright and trademark infringements). There are also AI solutions for the drafting of patents, such as to help the user visualize the claims better, however a lack of motivation has been observed within the legal industry to adopt AI technologies, as compared to other industries like finance (FGD 3). It was predicted nonetheless that workplace automation would affect the legal industry and that the role of lawyers would evolve such that lawyers would be expected to read code and understand datasets (FGD 2, 3). As such, the legal industry would need to rethink its training for young lawyers as legal tech would be able to perform the tasks of junior lawyers (FGD 3). However, it was also felt that AI tech would free

up lawyers' capacity to focus on other aspects of their work that require emotional intelligence or problem-solving skills (FGD 2, 3).

It was predicted that AI-tools would be used to assist dispute resolution such as in the division of matrimonial assets or injuries (FGD 3). However, an in-house counsel warned that in the future AI deployment could become "too natural" which could decrease users' awareness of the workings of AI (FGD 2). Lawyers have also highlighted the need to get AI governance right from the start, before the proliferation of AI solutions, including implementing an appeal system against flawed AI-assisted decisions.

4.9 Trust

Several issues of trust emerged between AI practitioners (FGD1) and IP lawyers (FGD2). IP lawyers seem to perceive that AI practitioners are withholding information regarding their technology and lack patience in articulating their inventions. On the other hand, AI practitioners felt that lawyers have problems understanding their technology, which makes the whole process of filing of IP cumbersome.

Perhaps from the AI practitioners' perspective, it is not fair that they are being charged legal fees while the lawyers take some time to understand the various innovations. There is also a perception that lawyers are often guilty of overcharging. However, lawyers (FGD2) argued that AI practitioners need to improve their communication skills to articulate their inventions. Generally, AI practitioners trust for lawyers is based on recommendations (FGD1). Perhaps AI practitioners' lack of trust in how IP could benefit them affects the companies' relationships with IP lawyers, resulting in the absence of motivation to articulate the innovation. Beyond current efforts to increase public education on IP laws, policymakers should also help bridge the apparent gaps between AI practitioners and IP lawyers so that AI developers can better appreciate the potential benefits of relevant IP protections.

At the same time, there is also a lack of trust in clients towards AI practitioners (FGD1). Clients are usually keen to know how their source and trained data are used. Some participants suggested increasing trust between AI practitioners and clients by obtaining consent from customers regarding the use of their data and co-developing a playbook to clarify data sharing arrangements and who benefits from data insights.

Competition between companies has also resulted in a decrease in trust between companies. Such phenomena would seriously challenge potential collaboration within and between industries, which could impact innovation. Another fear companies have is when employees leave a company to join another competitor, possibly sharing their knowhow or divulging secrets from their previous company (FGD 2). Such trust issues could affect how companies structure their employment contracts which could be onerous for AI talents.

AI practitioners from FGD1 felt that regulators are over-sensitive about data protection, possibly in response to concerns from the general public regarding privacy violations, and put in inconvenient policies which inhibit innovation. They believe that companies and research institutions should be able to use the data as long as the government is able to set controls on the use of the data. Policymakers, however, thought that it is worrisome that the industry is not committed to applying proper AI governance frameworks to their projects (FGD4). However, policymakers still harbour the hope that the AI practitioners would trust them and are committed to promoting the industry through proper legislation.

The in-house counsels in FGD2 put forward that some of the trust issues were raised because of warranties or lack of it from companies that are providing the AI solutions. These solutions' commercialisation contracts are generally based on 'as-is' basis which protect the companies

from liabilities and may have an impact on the users' ability to fully trust such solutions/products.

4.10 Competition

There has been substantial discussion on competition and how data access influences it. Policymakers (FGD4) claimed that the regulations they have put up promote innovation and encourage market development. However, through their companies, the AI practitioners have been responsible for anti-competitive behaviours (FGD4).

There is a consensus among the AI practitioners (FGD 1) and legal practitioners (FGD3) that most regulations are favourable to the big tech companies. One AI practitioner shared his/her experience on the threat his/her company received from a big-tech company. Another AI practitioner from FGD1 expressed concerns that patent infringements could sometimes occur unknowingly, and how the financial repercussions from this could be damaging to them.

There was a consensus from in-house lawyers (FGD2) that startups are disadvantaged when dealing with competition as protection of AI assets require resources. Legal practitioners (FGD 3) also opined that data protection laws unfairly protect big tech companies over smaller ones, since they decrease access to data pools in larger companies that start-ups may not have. The policymakers further added that big corporations will still be able to monetise the data they curate despite legal interventions to level the playing field, since they have more sophisticated lobbying methods.

Discussion on competition also touched on e-commerce merchants versus platform owners. E-commerce platforms have a greater advantage over individual merchants because they have access to insights generated from information from all their merchants, which can be unfair especially if the platform sells the same products to their merchants. Intervention through data portability policies should allow merchants to access their data and measure their growth (FGD4). Policies to promote a greater playing field should not be limited to e-commerce platforms but any platforms that companies are using (FGD4). The policymakers suggested implementing a clearer data portability framework that allows platform owners and users to have equal access to port data generated by their own activities.

Large companies tend to engage in anti-competitive practices by consistently applying for patents and monopolizing related IP in a particular space (FGD3). This would create a barrier for small-tech companies and startups, and they would have to tread carefully in their respective spaces to avoid infringements.

There is a disconnect in how the in-house counsels (FGD2) and policymakers (FGD4) see IP laws. The policymakers stated that data are part of AI innovation and indicated that IP laws had been set up to help startups protect their innovation from competition by safeguarding their data. However, while agreeing that IP laws do help startups deal with competition, in-house counsels did not mention data. They also noted that the use of IP depends on the type of startup. For example, if the startup focuses on products rather than research, they should prioritise first-mover advantage rather than filing for IP.

Competition in various industries has encouraged the adoption of AI (FGD3). Innovation begets innovation - the innovation made by the software development community has reduced the barriers to enhancing AI innovation further (FGD3). However, the adoption of AI varies from one industry to another. The legal community, for one, has been slow in adopting AI as opposed to verticals such as health and finance. To prepare for the future, law schools have to expose legal students to various technologies that will eventually prepare them to understand technologies even at a high level.

One of the ways that companies gather intelligence on their competitors, such as which jurisdictions they may be filing patents in, is by ploughing through public patent records (FGD2). Such risks could demotivate companies from filing for IPs as it may give their competitors an upper hand. On the same premise, companies are reluctant to collaborate for fear of turning collaborators into competitors.

Singapore's aim to be competitive as an AI innovation hub globally will be challenging. There is a dearth of talent, with many companies competing for these AI talents. This is the sentiment shared by both AI practitioners (FGD1) and legal practitioners (FGD3). The trend is further exacerbated by the high turnover among AI practitioners who move from one company to another, potentially divulging critical information.

A disconnect appears from policymakers as they opined that Singapore is well-placed in talent (FGD4). This belief is based on the high number of companies that want to set up their businesses in Singapore. However, apart from the lack of talent, Singaporean's lack of entrepreneurial spirit could hurt Singapore's ambitions to be a global AI innovation hub.

Singapore seems to have the upper hand regionally regarding competition between IP regimes. Sanctioning grants and introducing fast-track schemes for patent applications are some of the many initiatives by Singapore and its IP regime to compete with other IP regimes (FGD1 and FGD2). However, the small market size limits competition, which can be circumvented by being part of an ASEAN bloc and tapping into a larger market (FGD 3).

Any attempts to shape itself as a global player should involve having a consolidated and focused leadership on data usage with clear guidelines. Apart from data, better communication is required from IP offices to convince companies of the benefits of filing. This will increase the number of IPs filed which will contribute in making the Singapore IP regime more competitive.

Annex A – FGD Questionnaires

Focus Group Discussions (FGD) Questionnaires

A.1 Main Research Question

Does intellectual property (IP) promote AI innovation?

A.2 Guiding Questions

1. Introductions
   a. What is your job title, and can you share what a normal workday looks like for you?
   a. Which sector are you from, briefly describe your work (1-2 mins)
   b. What are your general impressions of the relationship between AI and IP?

2. What are your experiences with AI in your line of work?
   a. What is your understanding of AI?
   b. Please share your understanding of the implications of AI innovations on IP.
   c. Can you please share with us any policy change that you are aware of due to AI[3]?

3. What are your experiences with IP law/regulation in your line of work?
   a. (Practical/Theoretical) Have you had any challenges with regards to them?
   b. Are there any components in AI that needs protection that is not being looked into yet?
   c. Are any areas that need improvement? Where do you think would need greater attention?
   d. (Is the current IP regime suitable for innovation?)

4. For those who have worked with AI practitioners, walk through the process with us[4].
   a. What concerns do they usually raise (e.g. knowing what needs to be protected, costs, etc.)
   b. What kinds of innovation require protection?

5. Previously IPOS created a special application process, the AI^2 Initiative (now known as the new SG IP fast Track) for AI-related inventions. Have any of you made any applications to IPOS for your inventions via this, and if so, could you share your experience?

6. How do you understand where data/data sets sit in the pipeline of AI innovation?
   a. What specific challenges do you face with regards to the data/data sets your AI practitioners work with?
   b. Do you think data/data sets are sufficiently protected?
   c. Are they overprotected?

7. Onto the topic AI of innovation, how do you think Singapore fares as an innovation hub?
   a. Do you feel that Singapore is a conducive environment to facilitate innovation? If so, please provide examples.
   b. What blockages do you think stand in the way of innovation? (i.e. Data issues, hardware accessibility)

[3] This question was included in FGD4 for the policy makers
[4] This question was not included in FGD1 where the participants were AI practitioners

c. Which part of the innovation process is most important to you? Do you feel sufficiently supported in Singapore's environment?

8. In the future, what do you expect AI to be like/ How do you foresee AI developing?