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Attitudinal and behavioural influences on small firms' engagement with intellectual property protection

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Table of contents

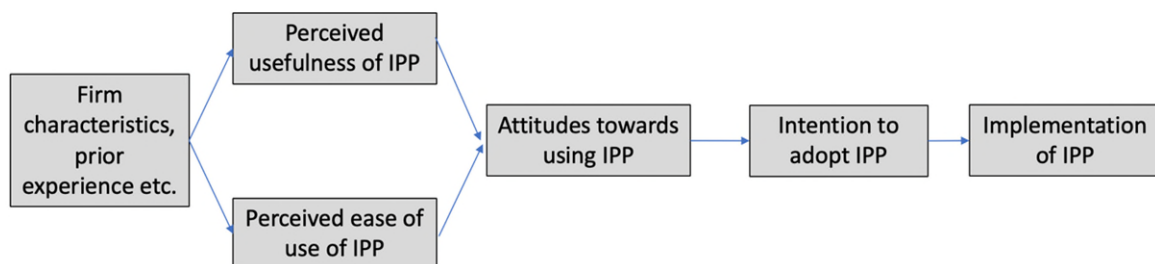
1. Introduction	7
2. Conceptual model	9
3. Policy context	11
4. Methodology and respondents	12
4.1 Methodology	12
4.2 Respondent profile	13
5. Interview analysis	16
5.1 Perceived usefulness and ease of use of IPP	16
5.2 Intention to use	24
5.3 Implementation of IPPs	25
5.4 Impacts of IPPs	28
6. IP Audit and Access	31
7. Summary of key findings	32
8. Providing additional support for small businesses	33
References	35

Executive Summary

This research is based on in-depth interviews with a group of 15 small firms which have had recent access to intellectual property (IP) related diagnostic and planning support (specifically the Intellectual Property Office’s (IPO) IP Audit and IP Access schemes), and a closely matched group of small firms which did not have access to such IP related support. We considered two key questions: Are IPO supported firms more aware of the applicability of IP instruments to their business or their potential value? And, are they more confident in implementing IP Protection (IPP) mechanisms? This research suggests the answer to both of these questions is ‘yes’, particularly regarding the confidence with which supported firms are pursuing their IPP strategies and particularly where respondents had less personal, previous experience with IPP.

While intellectual property (IP) regulation is ubiquitous, its relevance and use by smaller firms has often been questioned. In this report, we return to the question of why small firms often fail to engage with IP, both formal (or registered) and un-registered, focusing specifically on attitudinal and behavioural factors. We build our analysis around the IP Protection (IPP) Acceptance Model which relates the perceived attributes of IPP to attitudes towards IPP use and adoption (Figure 1).

Figure 1: IPP Acceptance Model



Overall, respondents who use IP described it as useful and important to their business. The challenge of understanding what can and cannot be protected, however, often presents difficulties, as does the complexity of IP and the difficulty of dealing with it, whilst also running a business. The cost of protecting IP was also mentioned in these discussions, not with regard to the cost of the process itself, but more usually the cost of legal support in obtaining and, potentially, defending IP, and the time taken internally to record and gather the information required.

A number of firms in the sample were able to articulate an IP strategy within the firm and demonstrate how IPP is embedded in the innovation process and in their costings. For Audit firms, their IP strategy had usually been informed by their IP Audit report.

All firms interviewed use, or intend to use, some form of IPP. Audit firms tend to adopt higher levels of IPP than Matched firms, with an average of 4.1 types of IPP recorded in use compared to 3.4 types in Matched firms. Audit firms are also more likely to use each type of IPP, with the exception of trade marks, which are in use equally across the Audit and Matched firms.

Most firms – both Audit and Matched – seek to protect their IP through the management of trade secrets (e.g., through employment contracts, quality control or file storage mechanisms) and the use of non-disclosure agreements (NDAs) with development partners and/or customers. The use of trade marks is less consistent, and no firms interviewed reported use of registered designs.

Over two thirds of firms interviewed report that having some form of IPP has a positive impact on the business, with Audit firms being more likely to report an impact than Matched firms. However, none of those sampled could quantify that impact or isolate IPP effects from other business factors. Additionally, none of the firms reported a positive impact of IPP on their propensity to innovate – the reported impacts are all associated with downstream commercialisation.

Patents, in particular, are reported as having direct and indirect impacts on a business. The direct impacts are protecting IP from competition, enabling licensing and providing a formal mechanism for managing know-how. The indirect impacts are signalling value and uniqueness to investors, customers and partners. The indirect impacts are most commonly cited. Additionally, trade marks provide firms with the confidence to promote their business, particularly reported by Audit firms.

The majority of Audit firms were very positive about the support they had received through the IP Audit and Access programmes. For some, it provided the foundational knowledge needed to protect their IP, for others, it enabled them to prioritise what they should do and when they should do it and spurred them into action.

Many firms suggest that the Intellectual Property Office (IPO) could do more to raise awareness of IP and of why IP is important. None of the Matched firms interviewed were aware

that IPO offers guidance and support to small firms (despite engagement in IP processes). One Matched firm noted that as they do have IPP, they must be known to IPO and questioned whether the details held could be used to promote IPO activity or inform and engage business in IP issues (e.g., through a newsletter or promotional material). One other firm suggested training courses on IP would be useful for start-up firms, and another suggested that 'idiot guides' on the different types of IPP would be useful. Other firms, facing complex international problems of the ownership of augmented data, did not know what IPO could do to support, but were keen to record the scale of the protection issues some small software firms are facing.



Attitudinal and behavioural influences on small firms' engagement with intellectual property protection

1. Introduction

While intellectual property (IP) regulation is ubiquitous, its relevance and use by smaller firms has often been questioned. In terms of patenting, the relevance to small firms has been questioned in terms of the up-front application and evidence costs, and the potential costs of defence. Even with other, perhaps more accessible IP instruments – e.g., trade marks, copyright – their relevance to smaller firms has often been questioned in terms of firms' awareness, their ability to estimate the value of IP protection (IPP), and implementation challenges. Previous studies have adopted econometric approaches to assessing the adoption of IPP, with factors such as finance and managerial capabilities being identified as key determinants of a firm's IPP strategy (Kitching and Blackburn 2003; Leiponen and Byma 2009; Hall et al. 2014). For smaller firms, prior evidence suggests that even in industries where IPP is an effective appropriation tool, small firms are least likely to engage in its use to help safeguard innovations (Kitching and Blackburn 2003). Resource and capability barriers exist in relation to IPP and small firms: owner-managers view IPP as a complex process (some are even unaware of its existence); owner-managers perceive the costs of IPP to be high; owner-managers perceive an ambiguous link between IPP and innovation; and, owner-managers feel unable to adequately administer and enforce IPP, especially when in conflict with larger firms (Blackburn 2003; EUPTO 2016). As a result, IPP ownership is considerably lower among small and medium-sized enterprises (SMEs) than among large firms. An EPO/EUIPO study of more than 127,000 firms from all 28 EU Member States (as of 1 January 2020) during the 2007-2019 period finds that less than 9 per cent of SMEs own at least one patent, trade mark or registered design, compared to more than 55 per cent of large firms (EPO/EUIPO, 2021).

Other evidence suggests, however, that where small firms do apply for patents, trade marks or registered designs, they are more likely to grow quickly and succeed than smaller firms that do not (WIPO 2021). IPP contributes both to small firms' propensity to innovate and to their ability to capture value from innovation (Turner and Roper, 2023). Accordingly, 'over and above the underlying product or service it protects, IP is a valuable asset in its own right. Indeed, it can become a company's most valuable asset' (WIPO 2021).

In this report, we return to the question of why small firms often fail to engage with IPP, both formal (or registered) and un-registered, focusing specifically on attitudinal and behavioural

factors. We base our analysis on a matched-firm methodology which allows us to control for firm characteristics (size, sector, age etc.) and more directly expose issues related to awareness of IPP, attitudes and decision processes. Specifically, we base our investigation on in-depth interviews with a group of 15 small firms which have had recent access to IP-related diagnostic and planning support (specifically the IP Audit and Access schemes), and a closely matched group of small firms which did not have access to such IP-related support. Previous studies have suggested that this type of in-depth, matched-firms approach retains the detailed insights of other interview-based approaches while controlling for firm-level and sectoral factors (Hitchens 1999; Hitchens et al. 1998; Hitchens, Birnie, et al. 1996; Hitchens et al. 1991; Hitchens, Wagner, et al. 1996). Sectoral matching may be important, for example, as appropriation regimes may play an important part in the decision-making process when a firm determines its IPP strategy. The tacit nature of knowledge in services, for example, means that applying IPP is not straightforward (Blind et al. 2003; Maskus 2008). In manufacturing, some technologies are also easier to protect than others. For example, in the chemicals and pharmaceuticals sectors, a specific compound (or a specific chemical formula) can be protected by a patent; it is clear what is protected and few disputes arise (Bessen and Meurer 2008). However, in other sectors (e.g., information technology), the applicability of patents is less clear. As a result, the probability of dispute is higher, and patent protection is less popular (Hall et al. 2014).

We make two main contributions. First, while econometric studies can identify those observable, firmographic influences (e.g., size, sector, firm age) associated with the adoption of IPP, the matched-firm approach used here allows us to examine the role of attitudinal factors, IP awareness, and perceived benefit-costs on firms' IP decisions. Second, the background of our matched firms, one in each match which has received IPP support and one which has not, allows us to consider the influence of such support on small firms' IPP decision process. Are supported firms more aware of the applicability of IPP instruments to their business or their potential value? And, are they more confident in implementing IPP mechanisms? Understanding these cognitive, decision-influencing factors is a critical element of designing effective support measures which can help to overcome barriers to IPP adoption in smaller firms.

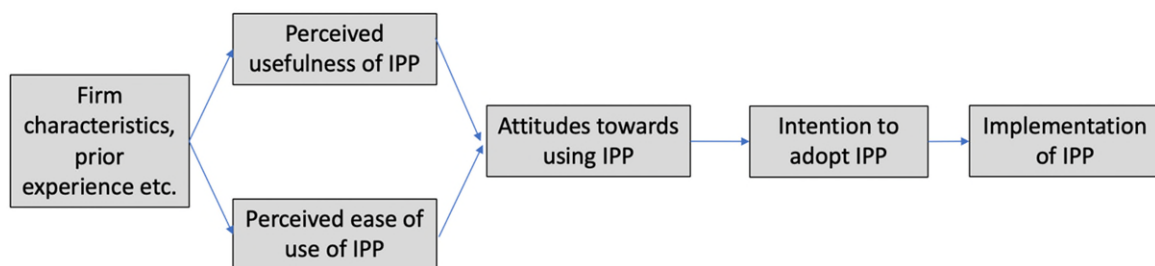
The argument proceeds as follows. Section 2 outlines the conceptual model we use to understand the attitudinal and behavioural influences in the use of IPP by small firms. In addition, we briefly summarise earlier literature on IPP use in smaller firms, with a focus on attitudinal or awareness issues. Section 3 provides an overview of the policy context and

Section 4 our empirical matched-firm approach. Section 5 and Section 6 summarise the key findings and Section 7 includes conclusions and Section 8 considers some implications.

2. Conceptual model

To understand the attitudinal and behavioural influences in the use of IPP by small firms, we adapt the conceptualisation of technology adoption in the Technology Acceptance Model (TAM) (Davis 1989; Davis et al. 1989) to develop the IPP Acceptance Model. Drawing on the Theory of Planned Behaviour (Ajzen 1991), this suggests that the behavioural intention to use IPP, which itself predicts actual implementation, will be dependent on a positive attitude towards IPP (see Figure 1).

Figure 1: IPP Acceptance Model



This positive attitude, in turn, is driven by two further psychological antecedents. First, perceived usefulness is an important precondition for the development of a positive attitude towards IPP use. Perceived usefulness is defined as the potential user's perception of IPP and its potential to contribute to business success. The more useful IPP appears to a business owner, the more positive the attitude, and the stronger the intention to use IPP in the business. Second, perceived ease of use of IPP instruments influences the attitude towards it. Perceived ease of use describes the perceived extent to which IPP can be adapted without having to invest significant effort (Davis et al. 1989). Perceived ease of use may also be related to individuals' judgment about their ability to implement IPP.

In regard to *perceived usefulness*, Kitching and Blackburn (2003) find that small business owners adopt IPP when they perceive the potential benefits of IPP to outweigh the potential costs. In their study of small firms across four sectors (computer software, design, electronics, mechanical engineering), Their face-to-face interviews reveal that perceived potential benefits are related to market size, i.e., the market needs to be large enough to protect. In a small,

niche market, firms have little incentive to invest resources into IPP while this is more likely if firms are operating in larger or perhaps international markets. In addition to this, some owner-managers were doubtful whether IPP could provide effective protection. Furthermore, some firms perceived that the use of IPP would lead to losses of specialist confidential knowledge. Most owner-managers also perceived the law as being largely irrelevant to their innovation. Users of IPP were only marginally less likely to believe that the legal framework had no effect on their product development. Indeed, factors other than the legal framework were perceived as having a greater influence on innovation (e.g., finance for investment or expansion). Some business owners interviewed said that they were unaware that they could protect their innovations, while some business owners that were aware said that they preferred to allocate resources towards the development of new products and processes.

Hall et al. (2003) carried out 23 interviews with UK SMEs in the chemicals, pharmaceuticals, machine and instrumentation sectors – including some firms with patenting experience and some without. Some businesses were unaware of the usefulness of patent information/literature. Moreover, some did not know where to locate such information. However, when firms did obtain patent information, their outlook changed, and they became avid users of patent literature. For the majority of firms interviewed, patenting was viewed as an ad hoc process, with no budgets set aside for the process. Firms were not clear about the benefits of patent use, making the costs associated with patenting an insurmountable barrier (resulting in ‘behavioural segmentation’, Hall et al. 2003; 158). Some SMEs had no expectation of gaining any real benefit from patents, with many technology-based firms in a state of relative ignorance as to the benefits of the patent literature.

In relation to *perceived ease of use*, Kitching and Blackburn (2003) find that the costs of obtaining, maintaining and enforcing registerable rights (money, time and effort) are often perceived as being high. However, their interviews suggest that the main two factors in a firm’s decision not to adopt IPP are the financial cost of enforcement and the risk of failed litigation. Combined, these factors persuaded many respondents to be wary of the supposed benefits of IPP. In another study, Matthews et al. (2003) suggest that SMEs find it difficult to use IPP due to cost constraints, a lack of in-house specialist personnel, and a lack of familiarity with IPP issues. Hall et al. (2003) highlight that some SMEs perceive the patenting process to be difficult. The use of patent agents is sometimes seen as a barrier, especially by those firms that do not understand how best to use their services and lack the capabilities to select an appropriate agent. SMEs who have had a negative experience with patent agents are apprehensive about re-engaging with the patent system and are left with psychological

barriers to overcome. Furthermore, interview responses suggest that SMEs typically operate close to the limits of profitability, and have little or no spare capacity in terms of time, resources or cash – with a lack of time being one of their greatest problems. This, combined with the observation that many SMEs do not know how to access the patents system, acts as a deterrent to patent use. When SMEs do understand the patent process, they are often deterred by the costs associated with IPP and the degree of expertise required to engage in the IPP process. In a 2011 review of IP and growth (Hargreaves 2011), SMEs were found to view the use of IPP as a complex process. Owner-managers of small firms were found to lack the knowledge and information required to pursue such protection. They were reluctant to adopt IPP because they perceived protection-related costs (both money and time) to be high (e.g., dealing with patent offices and patent lawyers and gaining the knowledge/skills needed to enforce protection). The overall administration and enforcement of IPP was found to be problematic for SMEs, especially when in dispute with larger firms.

Interventions which aim to stimulate IPP use – such as the IP Audit and Access programmes – may affect the perceived usefulness and ease of IPP adoption and thereby the attitude towards and intentions to use IPP. Following our theoretical reasoning, we might therefore expect IP Audit and Access to affect the perceived ease of use and the perceived usefulness of IPP. These changes in perception should lead to a more positive attitude towards business technology, which in turn should trigger the intention to use IPP and eventually lead to actual IPP implementation.

3. Policy context

The UK has a long established and well-developed IP regime supported by judicial processes which are effective by international standards. A well-established part of the Intellectual Property Office's (IPO) support for small firms is the IP Audit scheme (delivered in partnership with the UKRI Innovate UK Edge network in England, Welsh Government in Wales, Scottish Enterprise and Highlands and Islands Enterprise in Scotland, and Invest NI in Northern Ireland). The IP Audit scheme provides small firms with part-funding for an IP professional to carry out an assessment of the firm's existing IP assets, providing the firm with an IP Audit report with recommendations to assist them to formulate a strategy for IPP. An early evaluation of the IP Audit programme (2014) concluded that 'The value of the IP Audit to businesses is high. Before the IP Audit, few businesses were aware of the audit process (23%); post audit

awareness of intellectual property issues is much higher on their agenda'¹. The same evaluation suggested that around four-fifths of firms had acted, or were planning to act, on the recommendations outlined in their IP Audit report, around a fifth were seeking new IPP, and a third of firms had identified new business opportunities.

In 2021, the IPO launched the IP Access scheme in response to the government's ambition to "build back better" after the Covid-19 pandemic and as an IPO commitment with the BEIS UK Innovation Strategy. This scheme follows on from the IP Audit and provides financial support to enable businesses to implement some of the recommendations from their audit report, to help them manage and commercialise their IP. Companies are eligible for IP Access funding if they are SMEs and they completed the IP Audit after April 2020. Grant support is available to cover IP professional service costs related to: the management and commercialisation of IP; licensing and franchising agreements; IP insurance or valuation; tax relief advice; and, professional fees for IP services in the UK and abroad. Finance cannot be used to fund fees for filing trade mark, registered design or patent applications.

4. Methodology and respondents

4.1 Methodology

We follow a most-similar-case design as suggested by Przeworski and Teune (1970), Lijphart (1971) and George (1979) interviewing matched cases that are as similar as possible to help control for between-case differences. We first conducted 15 in-depth interviews with the leaders or owners of small businesses which had gone through the IP Audit and IP Access programmes. The sample was identified from 47 businesses which were initially invited to participate in the research by the Intellectual Property Office (IPO). Forty of these firms agreed and were then invited to interview by ERC resulting in the 15 interviews, which were conducted in September and October 2022. Following the practice in earlier matched firm studies, a sample of firms was then drawn from the Companies House database to match each of the 15 IP Audit and Access firms, based on the age, size, region and (4 digit) sector of the firm (Hitchens 1999; Hitchens et al. 1998; Hitchens, Birnie et al. 1996; Hitchens et al. 1991;

¹ See page 2 in https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/307450/ipresearch-ipaudit.pdf. Accessed 19/1/2023.

Hitchens, Wagner et al. 1996). The size of the sample available for matching varied for each of the 15 'Audit' firms from less than 10 to more than 100.

Over 150 potential matched firms were contacted to secure 15 'Match' interviews. Matched firms had not benefitted directly from either the IP Audit or Access schemes although we cannot rule out indirect benefits through demonstration type effects, for example, Contact emails invited firms to take part in the research, regardless of their level of use or knowledge of IP. Partway through interviewing, a £50 incentive was introduced to encourage the matched firms to take part – incentives were eventually paid to nine of the 15 matched respondents. Due to the difficulty in securing matched interviews, the regional matching criterion was also relaxed, to allow matching focused on age, size and sector. Interviews with the matched firms took place between October and December 2022.

The final interview sample therefore consisted of 15 'Audit' firms and 15 matched firms. In each firm, we aimed to talk to the individual within the senior management team with responsibility for IP. Interview questions were based around the IP Acceptance Model outlined earlier and focused on firms' awareness, attitudes, intentions and adoption of registered IPP (i.e., patents, trade marks and registered designs), unregistered rights (i.e., copyright, unregistered designs, NDAs), and more strategic IPPs (e.g., secrecy, time to market, complexity). Initial questions focused on the background of the firm and the prior experience of the lead individuals. A second set of questions then explored firms' awareness and attitudes to IPPs as well as their perceived ease of use. This was followed by questions relating to firms' intentions to adopt and their actual implementation of IPPs. A final set of questions related to the perceived barriers and enablers of IPP use and (where relevant) firms' perceptions of the IP Audit and IP Access programmes.

In reporting on the interviews, differences between the firms which received IP Audit and Access support and those which did not are reported. However, perhaps due to the reluctance of firms in the Matched sample to take part in the research, there are fewer differences than might have been anticipated. Where relevant, differences are also drawn out between those whose *main* activity is software or hardware.

4.2 Respondent profile

Table 1 provides an overview of the age, size, location and activity of the 15 IP Audit and Access sample (Audit) and the Matched firms (Match). Around two-thirds of the sample were less than five years old, and all were established in the last 10 years, with one exception which

was founded in 2001. In the Audit sample, eleven firms employ fewer than 10 people; the largest employs 30 people. In the Matched sample one firm had experienced recent growth and employed 70 at the time of interview. The Matched sample firms tended to be slightly larger in employment terms, though seven employed between one and nine employees. Matching the activities of the Audit group, nine of the pairs of firms (18 firms in total) were engaged in software development of some type. This impacts on what IP can be protected, though as we will report, firms took different approaches to this.

Table 1: Respondent characteristics by paired firms of Audit and Matched firms

Year established		Employment size		Region		Business activity commonality ²
Audit	Match	Audit	Match	Audit	Match	
2018	2017	1-9	1-9	Scot	W. Mids	Creative software
2015	2013	1-9	1-9	Scot	SE	Creative software
2018	2001	1-9	10-19	E. Mids	E. Mids	Software development
2017	2017	20-49	50-99	East	Ldn	Software development
2019	2021	20-49	1-9	Scot	E. Mids	Software development
2019	2014	1-9	20-49	W. Mids	Ldn	Software development
2016	2013	10-19	20-49	Scot	Ldn	Business support software
2019	2015	10-19	10-19	E. Mids	E. Mids	Business support software
2012	2019	1-9	1-9	E. Mids	East	Biodata
2018	2020	1-9	20-49	Wales	NE	Contract Research Organisations
2018	2019	1-9	20-49	E. Mids	E. Mids	Biotech
2018	2019	1-9	10-19	NE	NE	Life sciences support
2020	2018	1-9	1-9	NW	SE	Healthcare products
2015	2018	1-9	1-9	SW	SW	Environmental products
2019	2015	1-9	1-9	SW	E. Mids	Environmental products

Interview respondents were personally responsible for IP in their firm, usually in conjunction with lawyers and/or other experts. Some respondents had a background in IP (in larger companies and in one case, in a university) and many years of experience, a small number had a legal background. Generally, respondents had a good awareness and understanding of

² Whilst Standard Industrial Classification was used to identify the matched sample from the Companies House database, more precise matching was conducted by the ERC team to 'pair' the interviews. This allowed matching of firms which were developing software for the creative industries; software development or software support for managing business processes; the use of software for biological applications and more general software development.

IP, which probably influenced the decision of those in Matched firms to take part in the research. In just a couple of the Matched firms did the respondents have less detailed knowledge.

Most of the businesses interviewed, across both samples, had been established to undertake the work they were currently doing (whether this is in a new or older firm), but three of the Audit firms and one Matched firm had pivoted their business in response to a new business idea or opportunity. Innovation was described as being central to the business for all bar one of the 30 firms interviewed³. Just under a third of the 30 firms interviewed were rooted in research conducted in universities, and were either spin-outs or had otherwise been established on the basis of academic research. These were evenly split between the Audit and Matched samples. The ideas of a greater number of firms interviewed were generated in industry, with individuals bringing their expertise to start a new company – this applied to nine of the Audit firms and seven of the Matched firms. A smaller number, four of the firms, were developed by entrepreneurs capitalising on the ideas of other individuals who are varyingly involved in the business.

The extent to which the firms were founded on previous IP varied. Some of the university spin-outs were commercialising a university-filed patent. Other examples of innovation being founded on existing IP in the sample included:

- A firm which is developing a technology where the IP had expired;
- A firm which had purchased the IP from another firm and is developing enhancements in collaboration with the source firm;
- A firm which was developing a product for the UK market which is patented abroad and for which they were licensing the technology.

Just over half of the Audit sample are exporting their products or services. Of those which are not, some are not yet trading or trading fully, so there is potential for exporting when that happens. A similar proportion of the Matched sample are exporting, with similar reasons for not exporting.

³ The Matched firms were not necessarily expected to be involved in innovation or IPP, but it is possible that their innovation activities prompted them to take part in the research, in a way which firms less heavily involved in innovation might not be motivated to take part in the research for the IPO, despite the incentives offered.

5. Interview analysis

5.1 Perceived usefulness and ease of use of IPP

The perceived usefulness and perceived ease of use of IPPs are regarded as important pre-conditions for both firms' intention to implement IPPs and their adoption. The more useful/easy IPP appears to a business owner, the more positive the attitude, and the stronger the intention to use IPP in the business. Overall, respondents who use IP, described it as useful and important to their business, illustrated by this Audit interviewee:

To me, our technology, our ideas and our Intellectual Property are the absolute core of who we are.

Matched firm, hardware 32

The challenge of understanding what can and cannot be protected through different types of IPP, however, often presents difficulties, particularly in software as illustrated in this example:

The main issue is what we can register what we can't register. Making sure that we're always aware of that and so that we know how to strategise. We know what needs to be kept under wraps and what can be said... even when you're promoting a product, what can I say? What can I not say?

Audit firm, software 1

In terms of perceived ease of use, some firms pointed to the complexity of IP and the difficulty of getting to grips with it, whilst also running a business:

... it took me a long time to understand it in terms of specific Intellectual Property and patent protection related to our business. This is an area that is highly specialised that I think is very impenetrable for the average business owner.

Matched firm, software 25

It's a big beast and there's a lot of stuff around it ... there's culture change, there's process change, there's understanding what you can protect and what type of protection...the average executive would just feel potentially overwhelmed with the all the 10,000 things a day they have to do.

Audit firm, software 6

The cost of protecting IP was also mentioned in these discussions, not with regard to the cost of the process itself, but more usually the cost of legal support and the time taken internally to record and gather the information required:

... you can pay a firm to come and support you but they won't know your business as well as you do. It takes a lot of our time and resource to ... build that relationship with the firm so that they get to know you as a business. It's not something that you can do quickly and easily.

Audit firm, hardware 15

Four firms pointed to international complexities in protecting IP – with different regimes, conditions and costs in different parts of the world. One also referred to the additional difficulties in enforcing protection overseas:

... to enforce it means you need to be watching it and like we don't have the bandwidth to be scouring Asian websites, or even the ability to read them to see if we're being infringed on.

Matched firm, software 28

The perceived usefulness and ease of IPPs varied across different types of IPP. We therefore explore perceptions of usefulness and ease individually by IP practice.

Patents

For some of the small firms interviewed, especially those which are at the forefront of innovation in emerging markets across a range of areas of software applications, patenting is seen as useful in de-risking activity in a competitive market:

... making sure that you're protected, that bigger companies don't beat you to the punch and take your brilliant idea and commercialise it faster. That's a very important aspect.

Audit firm, software 1

Patents are seen as useful in demonstrating the uniqueness of a product, particularly to investors, with over a third of respondents with full or filed patents citing the need to attract investors as a reason for patenting. There is also a perceived value in having patents in application stage, and this quote represents the value of patents as a signal even at this stage:

... having a patent portfolio, even if it's just an application, is of significant help in communicating why you are special. Because if we've got as far as actually filing an application ... even if it's not been accepted but hasn't yet been rejected, it's hugely useful in communicating to people that this is a special business and we do have intellectual differentiators.

Audit firm, software 14

Patents perceived value in establishing the uniqueness of products is also seen as important in marketing to clients. However, investors are seen as more interested in patents and protection than customers, who are more concerned with the quality and price of a product e.g.:

... it's very important from their [the investors] point of view. The customers don't really care as long as it works.

Matched firm, software 31

Another respondent described patenting as a secondary consideration for customers:

... [patents are] behind your ability to deliver and the product working and things like that.

Audit firm, software 9

Patents were also seen as useful for a variety of other purposes. For example, a small number of firms had in mind the potential future sale of the business and the value which would be added to the company from having protected IP. Others want to license their products for others to use, for which patenting is vital. One firm wanted to protect against the technology being used '*for purposes that are the opposite of what we want to achieve, which is to increase privacy protection*'. The patent selected is intended to protect the integrity of their product. Another firm cited the value of patents prior to academic publication, with patenting a necessary pre-condition to protect intellectual capital before it is in the public domain.

Some firms did not see the value in patents specifically as their product cannot be patented (e.g., one Matched firm produced furniture, though this firm intended to develop their product and apply for patents on that development). For other small firms, patenting might still be possible, but the perceived value was reduced by concern that the publication required for patenting means you are '*handing everybody else your bright ideas*'. This issue was seen as particularly problematic for small firms – having the resource to protect their IP:

We have a granted patent on the original algorithm. What we've decided since then [in conjunction with our IP Patent attorney] that though we have developed these tools, they're all being treated as trade secrets.

Audit firm, software 5

... our ability to enforce patents is quite limited ..., especially for a small start-up company like ours, and especially for technology like algorithms, it can be very difficult to detect usage. Then even if we were capable of detecting usage to then somehow enforce that, especially if it was a larger company, it would be challenging for us to do so. So the superior defence in our eyes is for it to remain as a trade secret.

Matched firm, software 25

Other firms emphasised the difficulty of knowing what other patents have been registered, with one firm reporting they draw on the resources of the Patent Office to provide this assurance:

... one of the easiest ways of finding out what is out there is try and file your own, because the nice patent examiner sends you all the details of everybody else. It's actually cheaper than trying to do a global search sometimes.

Audit firm, software 14

Patents in software firms

Perceptions of the value and usefulness of patents in software firms reflected the difficulty of filing patents on software. Firms with live or likely patents had found other aspects of their product to patent, e.g., machine learning, aspects of the process, by-products of their primary research (such as biological products the software is testing). Another respondent in a software business, with previous experience of IP, found it created more difficulties than they wanted to pursue:

Even if I feel I'm bringing something to the table, the negotiation with the university IP team? Life is way too short. I just say 'you can have it.

Matched firm, software 29

And, in another Audit firm, the owner had to convince their developer employees that patenting was an appropriate route for IPP:

It [patenting] took longer than I wanted because developers are not very keen on patents - they like open-source code. So, I actually had to fight an internal battle to convince the people who built it that it was worth protecting.

Audit firm, software 6

However, this same firm also reported that software is difficult to protect:

There are risks of protecting a bit of software. And then people find slightly different way of achieving the same result that falls out of the scope of the patent. And also patenting means disclosing. So actually, you are giving people maybe 80% of a solution or 100% of solution.

It's difficult. It shouldn't be abused. It shouldn't be overused. It should be considered as part of a strategy. But you know, with software, I think it's more about trade secret than patents. I'd say it's about making sure that you and your employees are in line. You have a clear plan on how to communicate and you have a clear plan on how to protect things from accidental disclosures, rather than relying on a patent application, because it doesn't always protect.

Audit firm, software 6

So, for software firms, patenting is often seen as less useful. Rather, their approach is described as:

I have been more of a proponent of open-source software and share it out, because if you share something that you think is a secret, with somebody who can't do anything with it, you're not gonna ever lose it. They still have to come back to me and pay me to do something with it. And they would realise that it is good and complex. If they take it and steal it and do something, good luck to them.

Matched firm, software, 29

Other software firms also alluded to this preference for open-source software. One Audit firm reports:

Part of me is thinking like, oh, I would like to share everything we're doing and publish it. But on the other side, I feel fully understand, I think my attitude towards protecting our IP right now is really positive. I really want to do it just because we are small and we have to be realistic.

Audit firm, software 1

Trade marks

One Audit, software firm reported four types of value delivered by Trade marks:

- As a sign of quality to consumers;
- As a 'comfort blanket' in the unlikely event a bigger company tried to imitate them;
- For investors who like to see this within their strategy;
- To guard against 'trade mark trolls' who identify successful businesses and then register the trade mark in other countries where there is no protection as yet, in the hope to charge for release of the trade mark.

For one hardware business, trade marks were of paramount importance:

I can grow the business without patent, but I would be stuffed if someone came up our brand, I mean literally wiped out. So, for me, trade mark trumps all.

Audit firm, hardware 2

The value of trade marks was weighted by some firms against the complexity of their use. One software company – unable to patent their software, and an active trade mark user commented:

It's not as simple as just protecting a logo or a brand or script. They all need protection in each of their different forms. So, we have plain word text, we have stylised brand, we have different forms of logos, they each need to be protected in different trade classes. You know that often takes a lot of negotiation. You've got to get the

descriptions right. You've got to do it in each country. And you've then got to obviously keep repeating that and demonstrating usage'.

Matched firm, software 30

However, trade marks are more commonly seen as of secondary importance. For example, one Matched firm had considered trade marks, designs and copyright, but opted not to undertake any, focusing on patents and protecting know-how. The firm feels trade marks are:

... more of a vanity move as opposed to anything tangible in terms of value protection or creation.

Matched firm, software 25

In a further example, an Audit firm had trade marked their name and logo, but subsequently rebranded. They do not think they will trade mark again as they see more value in the '*domain and social handles*'.

Trade secrets and non-disclosure agreements (NDAs)

Trade secrets are generally seen as more useful than other types of protection. This may be because of the need to publish information when seeking patents:

*In my mind, what's the point in making something public and then trying to defend it?
Our method has been secrecy.*

Matched firm, software 33

Additionally, because of the cost of filing for other forms of protection, detecting usage and for defending it, especially for the small software firms:

... you could spend millions on it and get nowhere.

Matched firm, software 33

... the superior defence, in our eyes, is for it to remain as a trade secret

Matched firm, software 25

NDA's are seen as playing a similar role – a cheap and effective means of enabling collaborative relationships with potential developers or manufacturers, customers and investors. One Audit firm commented:

... for anyone that is a potential competitor, collaborator, advisor or ... prospective employee... the first step is an NDA in place.

Audit firm, software 10

Another respondent sees little value in NDA's, describing them as:

... a kind of choreography at the start of a relationship.

Audit firm, software 11

Other respondents were also sceptical about the use and enforceability of NDA's, given their position as a small firm, illustrating that having a legal document in place may not be sufficient depending on the power balance in a relationship, for example:

If [large pharmaceutical firm] decided to breach an NDA, to be honest with you, there's nothing we're gonna do about it.

Matched firm, software 25

Copyright

Copyright was seen as useful by software companies to protect coding, often in place of patents because of the difficulty in obtaining patents for coding:

... the technology is protected in the UK under copyright because it's software.

Audit firm, software 10

One software firm reports that copyrighted code, whilst important to the company, is of less value to investors because the copyrighting of software it is less 'tangible' than patented hardware.

5.2 Intention to use

A number of firms in the sample were able to articulate an IP strategy within the firm and demonstrate how IPP is embedded in the innovation process and in their costings⁴. For Audit firms, their IP strategy had usually been informed by their IP Audit report.

One Audit firm reported that the IP Audit report had enabled them to develop an IP strategy around 3 domains:

- Legal measures – what is needed in relation to patents, trade marks, performing searches etc.;
- Organisational measures – ensuring the management of know-how within the business;
- Technical measures – how to make it difficult for a third party to break what they've created and copy it. This is considered especially important working within the field of health, where there is an ethical imperative to explain how the IP works.

Another described their IP strategy and approach as:

Don't tell anyone. Keep it schtum. Keep your ideas to yourself. File it, and as soon as it's filed, tell everyone, because it might take four or five years to finally come through the other end. But when it does come through the other end, you can turn around and tell everyone in the market you filed it then and you promoted it.

Audit firm, software 13

Embedding IP in the innovation process usually involved validation of test results, a market valuation and a freedom to operate search, for example:

... understanding that that [product] has the ability to work, is successful, differentiates us in that market, and provides value in that market.

Audit firm, hardware 4

⁴ Due to a shortened interview time for Matched firms, this question was not asked of all Matched firms.

5.3 Implementation of IPPs

Firms were asked about the types of IPPs they used and this is summarised in Table 2. The Table shows which firms had patents agreed or filed; patents planned or likely in the future; which used copyright, trade marks, NDAs, and protected trade secrets.

All firms use, or intend to use, some form of IPP. Audit firms tend to adopt higher levels of IPP than Matched firms, as shown in Table 2, with an average of 4.1 types of recorded IPP in use compared to 3.4 in Matched firms. Audit firms are also more likely to use each type of IPP, with the exception of trade marks, which are in use equally across the Audit and Matched firms. Only two of the Audit firms do not have live or filed patents, nor were planning or hoping to file patents, whereas this is the situation for six of the Matched firms.

Most firms – both Audit and Matched – seek to protect their IP through management of trade secrets (for example, through employment contracts, quality control or file storage mechanisms) and use of NDAs with development partners and/or customers. The use of trade marks is less consistent and no firms interviewed reported use of registered designs⁵. Whatever their stage of development, firms tended to use *either* patents or copyright, e.g., a software firm might use copyright because they cannot patent their IP, however, this is not universal, and many software firms are able to file for patents for some part of their processes or products.

As is evident in Table 2, the use of trade secrets sits alongside other IP usage, as part of a wider strategy. In only one firm was trade secrets managed in isolation because they are still devising their IP approach. Firms identified a variety of approaches to managing trade secrets, including:

- Use of NDAs;
- Use of confidentiality clauses in employment contracts;
- Limiting employee involvement in certain engagement activities or external meetings;
- Ensuring employees understand the importance of keeping trade secrets, e.g., through training and communication;
- Maintaining IP files;

⁵ One firm had been recommended to use registered designs in their Audit report, but were deliberating how, when and whether to do this given the costs.

- Document control including use of SharePoint and Github;
- One firm had used a government grant to purchase computers for staff to clarify ownership of material produced on those computers.

NDA's are an essential component of managing trade secrets, as illustrated by this Matched firm, which protects collaborative development through:

... a tapestry of collaboration agreements and confidentiality agreements and material transfer agreements, so nothing, nothing at all, that we do goes outside of that umbrella of documents.

Matched firm, hardware 4

Copyright is, as Table 2 shows, less commonly used. Most Audit firms said they had been advised to use copyright, but not all were, or were to the extent they had been advised to do so in the Audit. For example:

Copyright? I'd love to, but frankly, that's extremely hard with what we do Audit firm, hardware 2

Table 2: Intellectual property protection (IPP) activity

Business activity	Patent live or filed		Patent possible		Copyright		Trade marks		Non-disclosure agreements		Trade Secret		Total	
	Audit	Match	Audit	Match	Audit	Match	Audit	Match	Audit	Match	Audit	Match	Audit	Match
Mainly software														
Creative software	n	n	y	n	n	y	y	y	y	y	y	y	4	4
Creative software	n	n	n	n	n	y	y	y	y	y	y	y	3	4
Software development	y	n	y	n	y	n	y	n	y	y	y	y	6	2
Software development	n	y	y	y	n	n	n	y	y	y	y	y	3	5
Software development	y	y	y	y	n	n	n	n	y	y	y	n	4	3
Software development	n	n	y	n	y	y	n	n	y	y	y	n	4	2
Business support software	n	n	n	n	y	n	y	y	y	n	y	y	4	2
Business support software	y	n	n	n	n	n	y	y	y	y	y	y	4	3
Biodata	y	y	y	y	y	n	n	n	y	y	y	y	5	4
Mainly hardware														
Contract Research Organisations	y	y	y	y	n	n	n	n	y	y	y	y	4	4
Biotech	y	n	y	y	n	n	n	y	y	y	y	y	4	4
Life sciences support	y	y	y	y	n	n	n	n	y	y	y	y	4	4
Healthcare products	n	n	y	y	n	n	y	y	y	y	y	y	4	4
Environmental products	n	n	y	y	n	n	y	n	y	n	y	n	4	1
Environmental products	y	y	y	y	n	n	y	y	y	y	y	y	5	5
Total	8	6	12	9	4	3	8	8	15	13	15	12	4.1	3.4
Average per firm														

5.4 Impacts of IPPs

Over two thirds of firms interviewed report that having some form of IPP (including both registered and unregistered IPPs) has a positive impact on the business, with Audit firms being more likely to report an impact than Matched firms. However, none of those sampled could quantify that impact or isolate IPP effects from other business factors. Additionally, none of the firms reported a positive impact of IPP on their propensity to invest in R&D and innovation – the reported impacts are all associated with downstream commercialisation. This section explores these perceptions of impact on two types of IPP where tangible impacts were reported: patents and trade marks.

Patents

Firms with full or filed patents, or those intending to file patents, tended to see this form of IPP as important to their business. Reported impacts include:

- Ability to license product, which would not be possible without publication;
- Working in collaboration with development partners;
- Working in collaboration in the health sector – with clinicians and accessing health data;
- Working in collaboration with manufacturers;
- Attracting Toll manufacturers;
- Attracting investment;
- Making the firm attractive for potential future sale;
- Protection against competition;
- Attracting customers;
- Training new staff.

In a couple of firms, which are developing new products in emerging markets, patents are essential for protecting IP against competitors and were linked to investor behaviour. Whereas for others, patents are:

a way to make the investor happy, not anything to do with defending the business.

Matched firm software 25

Attracting investment is a key reported impact of patents, for example:

It's very important from an investment point of view. It's important a) that it's registered and b) that it's usable and that it's within our gift and under our control.

Matched firm, software 31

However, among those reporting that patents help attract investment, they tended to be more guarded in reporting investment as an *impact* of patents than when considering *reasons* for filing patents. For example, one Audit firm reported that having patents help persuade investors, but the initial attraction was the technology and that it was the existence of an IP strategy which helped:

...having the IP and the IP strategy clearly mapped out has been something that has been of value and they [the investors] have seen and attached value to. I don't think it was the thing that attracted them. I think the technology was the thing that attracted them.

Audit firm, hardware 4

Another reported that although investors are attracted to patents initially, they are less important than sales:

[investors are] mostly interested in sales, but, when I talk to them about the big work that we're doing, I make sure I update them on the protection elements on that as well.

Audit firm, hardware 12

The impact of patents might be derived partly from the act of publishing, and alleviating the (internal and external) strain of protecting trade secrets, as illustrated by this firm:

If we're trying to keep it as a trade secret, we have to run everything through ourselves, whereas if we have a patent, it opens licensing opportunities and collaboration opportunities and then takes away any issues with teaching new staff to the techniques, nondisclosure, all that kind of thing. So, it simplifies all of that.

Audit firm, hardware 7

Some firms without patents report that their firms suffer for not having patents. One respondent said their business is currently 'hurting' because they do not have investment, and those he has spoken to about investment are always looking for protected IP.

On the other hand, a Matched software firm, without patents reported they were able to generate £1m of investment without patents, but they did have trade marks and copyright.

Trade marks

Around half of the firms interviewed have trade marks, and a few stated that having the trade mark gave them a confidence and reassurance in marketing and developing their product and has given them a clear business narrative. This was more likely to be reported among Audit firms:

It's a bit like having savings in the bank. There is a peace of mind for those of us in the business who are making decisions ... peace of mind that I don't have to worry about someone nicking my product names or nicking my brand name or any of that. I can go out there and shout loudly about my brand because they can't touch it.

Audit firm, hardware 2

registering the name has given us the confidence to actually build something around it and just basically go places and start talking about what we do. And that has translated well also with the new employees ... we needed to make sure that before we have people working with us, we had our story straight, our brand straight. So that whoever's working with us can go out and proudly say 'I work for this company and this is what we do'.

Audit firm, software 1

... we've got to make sure of words and logos on our trade marks and they certainly help us to market with confidence knowing that we're not gonna step on anyone's toes, shall we say so. So commercially, they're pretty important.

Audit firm, hardware 3

For a software business, which protects its trade mark internationally:

IP (trade mark) is both it's critical for defence of your business, but it's also critical to be able to grow your business and export.

Matched firm, software 30

But for others, trade marks were secondary to patents:

.... we'd see trade secrets and patents as important, and the other stuff is less so

Audit firm, hardware 7

6. IP Audit and Access

Although this research is not intended as an evaluation of the IP Audit and Access programmes, the research did cover respondent views on the programme and how it had informed their approach. It is notable that in the comparison of the Audit and Matched groups:

- Audit firms tend to adopt higher levels of IPP than Matched firms with an average of 4.1 types of IPP in use compared to 3.4 in Matched firms (Table 2);
- Audit firms are also more likely to use each type of IPP, with the exception of trade marks which are in use equally across the Audit and Matched firms;
- Audit firms being more likely to report that having some form of IPP has a positive impact on the business.

As in the earlier IP Audit evaluation, the majority of respondents were very positive about the support they had received through the IP Audit and Access programmes. For some, it provided the foundational knowledge needed to protect their IP, for others, it enabled them to prioritise what they should do and when they should do it, and it spurred them into action, e.g., 'a lever to move us from knowing what we should be doing to doing what we should be doing'. (*Audit firm, software, 14*)

The process of applying for support was also praised by one respondent who reported it was 'intelligible and brief' and they also appreciated the 'stepped' approach from Audit to Access support.

Whilst appreciative of the support, some identified how it could be expanded upon to help small firms take the next steps in protecting their IP, for example, with international protection:

I think the support receive is amazing, but now the next step (international protection) requires more funding.

Audit firm, software 10

One respondent expressed a concern that the IP Audit they received was a '*bit of a cut and paste job*', but it made them find out more for themselves and change the firms of advisors.

Another respondent noted that it had been hard to get information about the programme, they had been directed to it by their lawyer, but they had previously searched for IP support.

7. Summary of key findings

Most of the firms interviewed for the research made use of more than one of the IPP types explored, and many could describe a strategic approach to their use of IPP – in terms of use of multiple types of IPP, employed at particular times and circumstances, and in conjunction with innovation activity and their innovation strategy.

Trade secrets with NDAs are most commonly used, followed by patents, where possible, or copyright if not. There are mixed views about the value and importance of trade marks. For some, they are a vital component, for others, less important than social media handles.

The rationale for seeking patents is more commonly described as a signal to external parties – investors, customers, collaborators – of the uniqueness and value of the firm, rather than to explicitly protect the product. However, protection was seen as more vital for small firms in emerging markets, where there is an imperative to guard against imitation.

There were perhaps fewer differences between Audit and Matched firms than we might have anticipated in terms of the take up of IPP, although Audit firms have more IPP than Matched firms and were more likely to cite an IPP contribution to business performance. Overall, the research suggests a higher degree of confidence in their IP activities and approaches within Audit firms compared to *most* Matched firms, with that assurance coming from the Audit and knowing that all aspects of IP within the firm had been explored. While many respondents in Matched firms had similar confidence, borne from their own experience and/or use of IP lawyers, others are more questioning and uncertain of their IP approach.

Another difference is between software and hardware firms. Patents and IPP in general seem less problematic in hardware firms (where the product *can* be patented) because the criteria are clear. In software firms, there is greater difficulty in identifying what can be patented and in detecting usage. On-going technological developments also raise new and different IPP challenges.

Most software firms patent some part of their process or foundational algorithms and used other means – copyright or trade secrets – to protect the rest of their IP.

Patents are reported as having direct and indirect impacts on a business. The direct impacts of protecting IP from competition, enabling licensing and providing a formal mechanism for managing know-how. The indirect impacts of signalling value and uniqueness to investors, customers and partners is significant and most commonly cited.

The process of obtaining IPP itself is not reported as a barrier to the use of IPP. The greatest challenge reported is of knowledge of what to protect and through which mechanisms. The cost of legal advice to develop that understanding is cited as a barrier, but one which firms accept and weave into their budgeting, where IP forms an integral part of their innovation strategy.

However, these small firms routinely report that managing and enforcing their IPP would prove problematic as they lack resources to detect usage and prosecute – especially if the infringement was conducted by a large firm.

8. Providing additional support for small businesses

As part of the interviews, firms were asked what additional support they would like in protecting IP. A variety of suggestions were made some of which reflected a lack of awareness of existing IPO support measures. For example, many firms suggest that the IPO could do more to raise awareness of IP and of why IPP is important. None of the Matched firms interviewed were aware that IPO offers guidance and support to small firms (despite engagement in IP processes), this suggests IPO support does not have a high profile among small firms.

One Matched firm noted that as they do have IPP, they must be known to IPO and whether the details held could be used to promote IPO activity or inform and engage business in IP issues (e.g., through a newsletter or promotional material). One other firm suggested training courses on IP would be useful for start-up firms and another that ‘idiot guides’ on

the different types of IPP would be useful. Advising on IPP within partnership arrangements was also mentioned in the research. Collaborative projects require ‘good governance’ to protect the IP of all parties, and this can be complex where there are multiple funding streams. It may be that some guidance and training, particularly related to public funding of innovation, might be helpful for firms with less background in IP.

Another respondent suggested that IPO could offer a service similar to that in the City and Town Planning system, whereby there is an initial stage of the process which allows for a plain English outline of the application which would provide an assessment of likelihood to proceed. This would lower the barrier to IPP, as even if this was a charged-for service, it would be cheaper than the process involving lawyers.

As well as IP routes to protection itself, one respondent thought there was more the IPO could do to help businesses understand what the risks are:

... it's not just about what a trade mark is and what IP is, ... but what are the threats?

Matched firm, hardware 32

Some threats (and opportunities) are known to firms. A couple of software firms commented on the larger issue of the ownership of database rights, whereby client data is enhanced by the technology of a third party – who owns augmented data? This was identified as a significant international issue and one which had no clear answers as yet but is vital in sustaining revenue streams. The firms could not identify what IPO could do but noted it as a significant issue for their business.

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