Imagination

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Tom Tugendhat MP
Chair, Foreign Affairs Committee
Committee Office
House of Commons
London SW1A 0AA

27 April 2020

Dear Mr Tugendhat,

Ahead of our scheduled appearance before your committee on 5 May, I wanted to reply in further detail to the list of questions you set out in your letter of 7 April to my predecessor Dr Ron Black, and those in your letter to me of 8 April. As I am now interim CEO of Imagination Technologies in addition to my responsibilities with Canyon Bridge, I am well placed to respond to all such questions.

As you will be aware, following our recent meeting with the Secretary of State, we are also in continuing discussions with the Department for Digital, Culture, Media and Sport on several of these matters. We hope to be able to make further announcements on our plans for Imagination before the committee hearing.

Our answers to your questions are set out below. We are willing to provide any further detail you may need, whether before the hearing or during it.

Yours sincerely,

Ray

Ray Bingham
CEO, Imagination Technologies

Question	Answer
What assurances or undertakings were given by Canyon Bridge Capital Partners and by China Reform Holdings Corporation about the future ownership and control of the company in 2017?	China Reform was not in a position to provide any such assurances, as it has no control over the company. This remains the case. Formal assurances were however given by Canyon Bridge, the acquirer and 100% shareholder, in the Scheme Document relating to the acquisition. These included: ▪ Maintaining Imagination's current UK headquarters ▪ No change to Imagination's principal locations ▪ Safeguarded employment conditions or rights ▪ Continued investment in Imagination's R&D capabilities in the UK All of these commitments have been honoured.
What is the purpose of the appointment of the new directors of the company?	The purpose of such appointments for any board is to enhance its financial and technical expertise and improve scrutiny of executive decision-making. Imagination has yet to return to profitability and one of the key areas for growth is the Chinese market, where national expertise is critical. As you know, we have now withdrawn proposals to appoint new directors from China Reform. However, this does not mean the needs outlined above no longer exist. Therefore, we will be considering other board appointments, including reviewing whether some independent directors may be helpful to the overall operations of the Imagination board. Any new appointments will be notified to key stakeholders including the UK government.
What makes you confident that these new directors will 'act fairly as between members of the company' and other responsibilities in accordance [with] their duties under Section 172 of the Companies Act 2006?	The directors of Imagination understand and respect their duties under section 172 of the Companies Act 2006 to act in the way they consider, in good faith, would be most likely to promote the success of the company for the benefit of its sole shareholder. The directors understand that, in discharging this duty, they must have regard to the factors mentioned in section 172, including the likely consequences of any decision in the long term, the interests

	of employees and the need to foster the company's business relationships with suppliers, customers and others. The company has honoured the commitments made at the time of the 2017 acquisition.
What steps has the company taken to ensure that jobs and intellectual property remain in the UK? *What assurances can you provide in relation to the retention of jobs and intellectual property in the UK?*	We continue to employ a majority of our workforce in the UK, and both the absolute number and the proportion of UK employees have remained very stable since 2017. As of today, 581 of our 914 global employees are UK-based. More recently, we have dramatically reduced our staff turnover rate, from more than 20% to under 10% - lower than the industry average. We have re-stated our assurances that our HQ will remain in the UK and that a majority of our workforce will continue to be employed in the UK. Transfer of IP is unnecessary for a global technology company. It is prohibitively expensive and it has never been considered by the Board. The quality of our IP is not a function of incorporation or domicile. It derives from the intelligence, experience and talent of our workforce. Our assets are ultimately our people, and this is one of the main reasons we're committed to our UK workforce and our multi-year strategy. Finally, we would note that our business model is based upon the licensing of our IP by our customers, and the royalties that this generates. Decisions - and ultimately the control - over licensing of technology and IP rights are taken in the UK by the senior management of the business.
Are you aware of any plans to relocate parts of the business overseas, or for intellectual property assets to be relocated?	There is a long-term discussion about how our investor, Canyon Bridge, might exit the company – a universal question for private equity funders from any country. As part of this, the prospect of listing the company on an international public exchange has been raised, which has prompted the question of an appropriate listing venue. With respect to a potential IPO, we intend to take into account various listing venues, with valuation, timing and long term fit as key considerations. These include the LSE, NASDAQ, the NYSE, and the

	STAR. It is normal for any board and the directors in the proper exercise of their duties to discuss various options as part of this discussion, and part of this is examining the requirements around any listing, which vary from place to place. Imagination is committed to remaining headquartered in the UK, and senior management will continue to set the strategic direction from the UK. There are many prominent British companies, who are very committed to the UK, who have an international domicile, Dyson being a good example. We are a long way from deciding these issues and we are very committed to the UK and other current locations of our facilities on an ongoing basis.
Do you have any reason to believe any such assets could be considered a threat to the United Kingdom?	No. Imagination is a consumer-product technology business. Its technology is used extensively in everyday applications used by millions of ordinary people across the world. Imagination is an IP licensing business and supplies technology that is incorporated by third party clients in their products such as mobile phones and tablets, Augmented Reality and Virtual Reality systems, car infotainment systems, consumer electronics including TVs digital radio and home entertainment systems. Imagination also supports the UK's vital knowledge economy through its Universities programme, which gives universities in the UK and globally access to Imagination's expertise as part of their education programmes. Imagination does not supply its products directly to the UK or any other governments, nor is its technology developed for use other than in consumer-facing end products. In particular, Imagination does not supply technology that is used in data networks or other telecommunications infrastructure, such as 5G networks.
What steps have you taken to alert the government to the proposed changes in control? What response have you had?	As mentioned above, the proposed changes to the board of Imagination were intended to enhance its financial and technical expertise and improve scrutiny of decision-making. At the Secretary of State's request, we cancelled the

	planned board meeting where the new appointments would have been made. As you will be aware, we are in an ongoing dialogue with the Secretary of State for Digital, Culture, Media and Sport, as well as other officials in his department and at the UK's National Cyber Security Centre (NSCS).
What advice have you sought and received about the government's powers to intervene in this case?	We have received legal and political advice on the scope and powers contained in relevant legislation, especially the Enterprise Act 2002 and subsequent amendments. We are committed to conducting our business in compliance with all laws and regulations and the boards of Imagination and Canyon Bridge seek appropriate advice where needed in order to do so. But, beyond that, we also hope to be good citizens in the places we do business. Therefore, whether or not the government has formal powers of intervention, we look forward to maintaining constructive dialogue both with ministers and with parliamentarians, including your committee.
What offers, inducements or arrangements have been made in respect of the future engagement of the existing and recently departed executives at Imagination Technologies?	None of Imagination's current or former employees are under any financial or legal pressure to restrict what they say at the hearing.

Briefing Paper: Imagination Technologies

Woz Ahmed, Chief Strategy Officer & Chief of Staff, Imagination Technologies
27th April 2020

Introduction

Imagination is a UK headquartered business engaged in the development and licensing of blocks of "Intellectual Property" (IP) that help accelerate our customers' semiconductor chip design efforts. Customers come to license from Imagination as they (a) may not have the requisite domain expertise to design the kind of blocks that Imagination provides, (b) do not have the time or funds to design such a block even if they do possess the expertise, or feel that their time and funds are better spent on their proprietary differentiating features rather than common building blocks shared with other businesses, and (c) may feel they are developing a block that may infringe the fundamental patents of domain expert companies (like Imagination). In the classic "make or buy" decision, our customers consider time to market alongside development and business risk. Today, the company has a global workforce of over 900 employees, with approximately two-thirds in the UK.

Imagination's History

Imagination was founded in 1985, originally as VideoLogic, by Tony Maclaren. The company was originally focused on the development of plug-in cards for PCs and Apple Macintosh computers for video capture, conferencing, training, etc. The company was listed on the Main Market of the LSE in 1995 (LSE: IMG).

Dr Sir Mohammad Hossein Yassaie joined VideoLogic in 1992 as Technical Director. He steered the company towards its entry into 3D graphics, unsuccessfully targeting PC graphics, but later pivoting to mobile graphics. Yassaie ascended to the CEO position in 1998. The company was renamed Imagination Technologies in 1999. Yassaie evolved Imagination's business model to pure-play IP development and licensing.

He was replaced as CEO by Andrew Heath in 2016, who in turn was replaced by Dr Liyou Leo Li in 2018 following the November 2017 private equity buyout of Imagination and its de-listing from the LSE. Dr Li was in turn replaced by Dr Ronald Douglas Black in 2019, who left in 2020. Chairman Ray Bingham currently serves as Interim CEO.

Chip Talk

In the early days of the semiconductor, or "chip" industry, chip companies were "highly integrated", undertaking nearly all parts of the design and manufacture of chips. But as the amount of features that could be integrated into a chip doubled every two years, complexity and costs increased – it was impossible for a chip company to be expert in every aspect of design and manufacture, and this led to a "disaggregation" of the industry, as companies emerged that specialised in specific parts of the industry value chain. Fabless chip companies designed and sold chips but outsourced the manufacturing to third party fabs (foundries). Companies like Arm, Ceva, Imagination and Rambus emerged as specialists in particular design elements, licensing their wares as blocks or cores of "intellectual property" to chip companies. A few chip companies, like Intel, retained the traditional vertical model of design and manufacture – but even these companies began to license technologies from 3rd party specialists.

This disaggregation enabled various countries to enter the semiconductor market. Aside from Europe, Japan and the USA, the Taiwanese entered the industry, in the form of fabless companies (MediaTek, Realtek), foundries (TSMC, UMC, Vanguard), as did the South Koreans (Mtekvision, Telechips, Hyundai,

SK Hynix and Samsung) and later the Chinese (Unisoc, Actions, Rockchip, SMIC and Grace Semiconductor). Countries far and wide, including Brazil, India, Malaysia, Russia, Singapore and Vietnam, are involved in some aspect of the semiconductor industry – design, fabrication, test and packaging, etc.

A simplified model of the electronic systems value system is shown in figure 1.

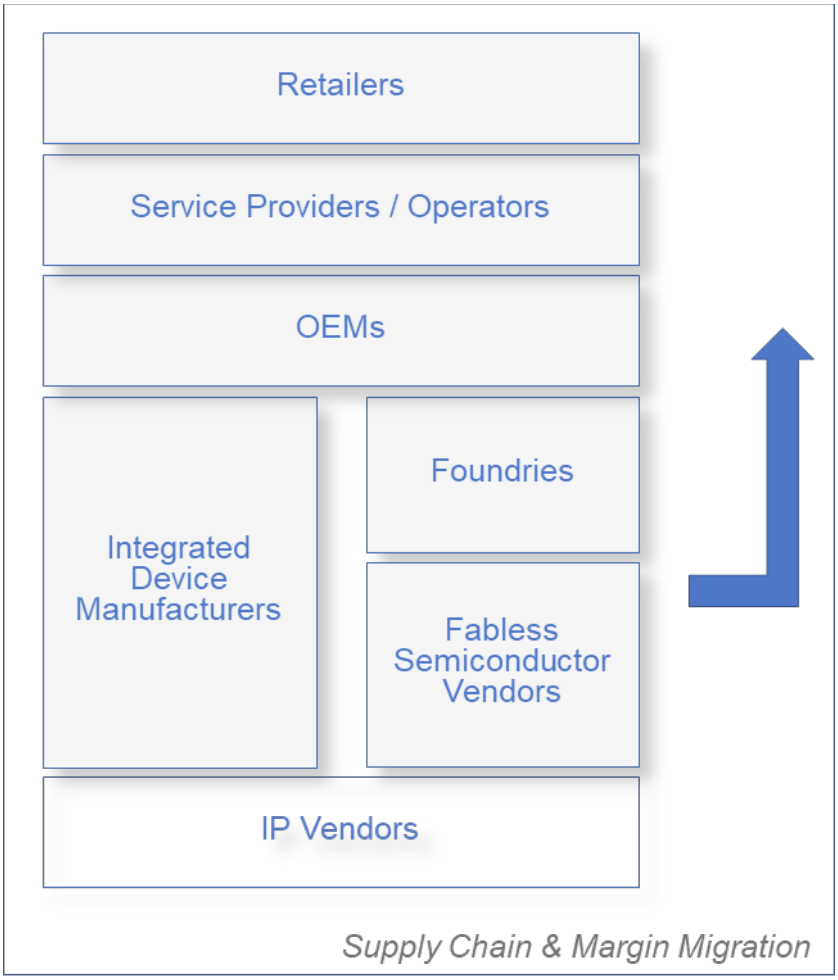

Figure 1: Electronic Systems Value System (simplified)

With reference to figure 1, the IP is typically licensed to chipmakers – both those with their own manufacturing plants (fabs), so called "Integrated Device Manufacturers", and those that outsource their chips designs to 3rd party manufacturing plants (foundries), so called "fabless" chip companies. These companies will integrate the IP with other 3rd party IP and their own design elements to develop a chip. After manufacture, they will sell the chip to an original equipment manufacturer (OEM), who could be making anything from smartphones to cars.

An IP vendor may also license its IP to OEMs who develop their own chips. Examples of such companies are Apple, Huawei, Samsung and Tesla.

Business model

Imagination's business model is the technology licensing of pre-designed and pre-verified blocks of hardware IP together with software "drivers" that licensees integrate within their overall chip designs, in return for an upfront license fee and per-unit royalties when the chip enters mass production, typically a percentage of chip Average Selling Price (ASP). This model is distinct from patent licensing,

which may also be augmented with consulting services to support the customer's design of their own implementation. Imagination's business model is not that of a "patent troll", i.e. a non-practising entity that does not use the patented invention, but instead uses the legal system to generate profits. Licenses may be limited to specific use-cases, e.g. a customer may have the license to use the IP in handheld products but not desktop ones.

The IP sales cycle is long, taking anywhere from six to 18 months (or more) from start to contract closure. This cycle time includes due diligence, encompassing customer requirements, technical Q&A and evaluation of the IP, followed by sometimes extensive commercial negotiations and legal review. The cycle time can vary based on the customer's risk appetite, strength of need, availability of budgeted funds, experience of licensing 3rd party IP in general and experience in dealing with Imagination specifically. Even if a customer proceeds to licensing IP, it is not a given that the IP will be used in a royalty-bearing chip – for instance, customer plans can change, the customer's design team may be unable to complete the chip design (inexperience or complexity), or the customer is unhappy with some aspect of Imagination's proposition, whether the IP block or the support surrounding it.

On receiving the IP, the customer must integrate the IP into their chip design, test it, and ramp-up production, often with extensive support from Imagination along the way depending on the experience of the customer's design team in integrating 3rd party IP, the complexity of the chip, and their desire to optimise various parameters, *e.g.* power, performance and silicon area (silicon area in this case directly driving cost) – abbreviated as PPA. Few chip designs are *"right"* the first time and typically take several *"spins"* through the fab to be finalised.

Being an *"ingredient"* (IP) of an *"ingredient"* (chip) means a long time to market/money - on average, IP vendors typically plan three years to get from initial discussion to the start of royalty payments, though as noted, much depends on both customer and end market profile. As can be deduced from this model, licensing activity today is one leading indicator of future royalties.

An existing end market with a compressed product lifecycle (*e.g.* consumer electronics, mobile phones, where new products are launched annually) will see faster cycle times than a new/emerging market or those with complex qualifications (*e.g.* industrial and automotive).

In the case of automotive, a new car model takes approximately five years to get from design brief to production start (some newer car makers try to be faster). From freeze of the specifications to launch is about three years within that timescale. Car makers are trying to reduce this, but cars require lots of testing (winter tests, emissions tests, crash safety tests, etc). Silicon chip selection is done as part of car spec freeze, so usually no later than three years before car launch. This means the chips need to be ready approximately three years before car launch (so that they can be evaluated), so if you allow some time to specify and design the chip, this means that chip development needs to be started four or more years before car launch. The upshot is that when licensing IP for an automotive chip development, there is an increased time lag between license revenue and first royalties, compared with faster moving markets such as consumer electronics. This market also requires very long support commitments; Imagination has been supporting some automotive products for over 10 years.

Less experienced semiconductor firms exhibit a longer sales cycle and often require more extensive support, from both the UK and locally. The longer sales cycle is a revenue risk (opportunity cost), and for this reason IP companies including Imagination place a lot of emphasis on winning repeat business with existing customers.

Like software development, IP development has a high ratio of fixed to variable costs, which are sunk and recovered later - or where product development is unsuccessful, seldom recovered at all. Imagination is required to invest one to three years ahead of the product being available for licensing, depending on whether it is developing the next roadmap iteration for an existing product line (incremental innovation), or developing a new/emerging product line (radical, disruptive innovation). As a business heavily reliant on human capital, Imagination's costs are predominantly talented people, 3rd party design tools, IT infrastructure, training, office rent and travel costs to customers and partners. Imagination's business model does not require it to own any plant or factories.

In the IP business model, scaling revenues requires (a) winning more customers per product offering, (b) hiring and deploying more engineers to design more product offerings, and (c) competitive pricing structures. In this business model, all upfront license fees and a portion of per-unit royalties are required to recover the upfront R&D cost; thereafter, royalties are profit.

The IP model in effect means that the IP vendor and its licensee share in the risk and reward – the IP vendor only makes money if the chip containing the IP ships in very high volume. This "royalty bias" in the IP business model means that IP vendors are focused on high-volume consumer markets. Low volume markets – military, aerospace, defence, etc – are anathema to an IP vendor.

Imagination's IP

Imagination develops IP in the area of Graphic Processor Units (GPUs). GPUs were originally targeted at 3D graphics, but their ability to perform complex arithmetic quickly, makes them suitable, as one of multiple components, for accelerating AI/ML and big data algorithms. Imagination holds some of the key patents in GPU, alongside Arm (UK) and US firms AMD, Intel, Nvidia and Qualcomm. In its key market areas of smartphone and automotive (for car navigation, entertainment, dashboard, and driver assistance), Imagination faces considerable competitive constraints and is *not* the leading GPU IP vendor.

Imagination also develops Neural Network Accelerator (NNA) IP. These blocks are smaller than GPUs and are intended to accelerate popular neural network models (details of such neural networks are widely published in the engineering and scientific press). By virtue of so much published research into neural networks, many companies have developed their own NNAs, reducing the market size for Imagination, and consequently lowering the market price of such IP.

It also develops and licenses technology which provides the ability to receive digital TV and digital radio broadcasts (essential for flat-panel TVs, set-top boxes and DAB digital radios) and can also support short-range wireless connectivity standards such as Wi-Fi and Bluetooth.

Essential to the development of IP of this kind – whoever the developer – is the involvement of standards bodies. Programming standards for GPUs are in the main defined by industry body Khronos. Standards for Wi-Fi are defined by the IEEE standards body; Bluetooth is defined by the Bluetooth Special Interest Group. Standards for TV and radio are defined by broadcasting industry bodies, such as the European Broadcasting Union for Europe, ARIB in Japan and the Grand Alliance in the USA.

IP vendors in each product category compete on the key metrics of power, performance and silicon area (silicon area directly driving cost). Additional considerations may include the size of a 3rd party ecosystem that provides software (if the IP is highly programmable). In terms of key IP competition, leading competitors include Ceva (Israel/US), which provides an alternative to our connectivity technology, and Arm (UK), which provides an alternative to Imagination GPUs. Arm is significantly larger than Imagination, and Ceva's connectivity IP business is larger than Imagination's.

Assets, resources & capabilities

Imagination's Critical Success Factors (CSFs) revolve around *difficulty* (of problem being solved), *relevance* (its importance or meaningfulness to the customer), *competitiveness* (of solution), *scarcity* (of alternative solutions), *quality* (of product and service experience), *customer loyalty* (importance of the technology to the customer's activities, including scale of any benefits for a customer arising from increasing user numbers) and *monetisation* (Imagination can get paid, preferably as a recurring revenue stream).

Innovating against these CSFs requires diversity of thought and therefore diversity in gender, nationality, ethnicity, etc. Imagination employs a very diverse R&D team, and the clash, the contest between different engineering viewpoints, has led to engineering excellence. IP development requires not just a good engineering education (and the UK does not produce enough STEM graduates) but relies on tacit skills and know-how. This is not easily transferred between people.

Imagination develops its IP in the UK, Poland, Romania, Sweden, India, Taiwan, and Australia, as outlined in table 1. The UK is Imagination's largest R&D centre and is where all the advanced R&D is performed. The other R&D locations either develop complements (software development kits in Poland; RF transceivers in Sweden and Taiwan), some standards-based algorithms (India) or lower-end derivative products (Australia). The IP resides in Imagination's wholly owned UK data centre. Some of this IP will also reside on "mirrors" to enable the local offices to perform R&D and to support customers.

Site	R&D Headcount	Development
Australia (Sydney)	35	Low-end GPU hardware and CSIM
India (Bangalore)	4	Wi-Fi algorithm and system design
India (Hyderabad)	54	Wi-Fi algorithm and system design; EPP development
India (Pune)	57	GPU compiler & driver; verification; NNA tools
Poland (Wroclaw)	31	GPU & NNA software and tool development
Romania (Timisoara)	18	AI software
Sweden (Stockholm)	17	RF transceiver for Wi-Fi and Bluetooth
Taiwan (Taipei/Hsinchu)	6	RF transceiver for Wi-Fi and Bluetooth
Bristol (UK)	51	GPU development & verification; Wi-Fi & Bluetooth software
Kings Langley (UK HQ)	349	High-performance GPU & NNA hardware and software development; long-term research; ray tracing; firmware for Wi-Fi & Bluetooth

Table 1: Imagination R&D Activities, by Location

It has sales, marketing and customer support offices in the key deep tech clusters of China, Japan, South Korea and Taiwan, with Europe and the USA supported from the UK.

Business Performance

Imagination's revenue history for the last decade is outlined below in table 2, with the revenues of UK based IP vendor - and primary competitor - Arm given as a comparator:

Year	Imagination Revenue (GBP, Millions)	Arm Revenue (GBP, Millions)
2010	£81M	£ 406M
2011	£98M	£492M
2012	£128M	£577M
2013	£152M	£715M
2014	£171M	£795M
2015	£177M	£968M
2016	£120M (continuing biz only)	£1266M
2017	£145M	£1391M
2017	£71M (8 months, due to reporting change)	
2018	£86M	£1395M
2019	£68M (unaudited)	Not yet released

Table 2: Imagination Revenue History, 2010-2019

A review of the revenue history must keep in mind the record of acquisitions and divestments during the same time frame, outlined in table 3:

Entity	Acquired	Divested/Sold/Shutdown
Ensigma	2000	N/A
Cross Products	2001	2017 (as part of MIPS)
Pure Digital	Organic	2016 (to Aventure AT)
Hellosoft	2010	2016 (to Meeami Technologies)
Caustic	2010	Shutdown 2017
Nethra	2012	Shutdown 2017
MIPS	2012	2017 (to Tallwood Venture Capital, US)
Posedge	2013	N/A
Kisel	2014	N/A
IMGworks	Organic	2017 (to Sondrel)

Table 3: Acquisitions & Divestments

The years of "peak revenue" of 2013-2015 were driven, in part, by the existence of the Pure Digital consumer OEM division and MIPS, as well as a strong relationship with Apple.

Imagination's share price history is given below in figure 2:

Figure 2: Imagination Technologies, Share Price History

The first share price spike coincided with the dot com bubble of late 1999 - early 2000. The next peak coincided with market enthusiasm over Imagination's relationship with Apple and investor outlook regarding Imagination's prospects. A failure to realise those prospects led to Yassaie stepping down in February 2016 and then a programme of cost-cutting and divestment commencing under the subsequent CEO Heath. During Heath's tenure, the relationship with Apple suffered. Heath then led a sale process which resulted in US VC firm Tallwood Venture Capital acquiring MIPS and the rest of the business being sold to PE fund Canyon Bridge in November 2017.

Imagination has suffered from reliance on a "mega customer" and has been buffeted by shocks from those mega customers – Sega in 2001, Texas Instruments in 2012 and Apple in 2017. Another development was the consolidation amongst Imagination's traditional customer base of fabless and IDM chip companies – driven by "margin migration", as the profits to be made moved away from the chips, towards the premium OEM brands, software and service providers. With fewer customers came increased buyer power over Imagination, which left it rendered as a "price taker" – this was exacerbated by the years of instability, with some customers choosing not to take the risk of licensing from Imagination. Investments made during the period 2012-2015 investment did not create the returns anticipated, impacting Imagination's competitive position in its core product area by 2017.

Strategic Direction

According to industry research firm Gartner, the global semiconductor industry was worth - in revenue terms - $418B. According to Deloitte, China consumes over 50% of all semiconductors, making it the biggest market for chips. As the World's leading factory for electronic systems, China assembles products (TVs, smartphones, games machines, etc) around these semiconductors, for both internal use and for eventual export. It imports ~85% of the chips it consumes from Europe, Japan, Taiwan, and the USA. As shown in figure 3, US chip companies have the greatest market share. China spends more on importing semiconductors than it does on importing oil and is keen for its import substitution

efforts to be successful. While the USA represents the biggest market for advanced IP, China represents a small, but fast-growing market centred on more mature, trailing-edge IP that is likely to be manufactured on older manufacturing processes.

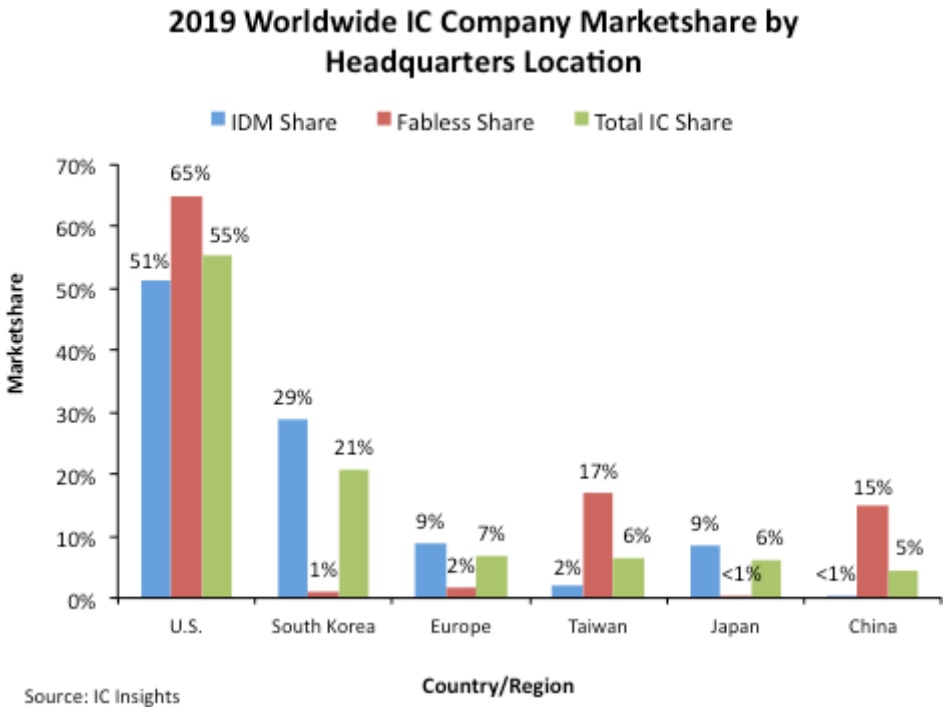

Figure 3: 2019 Worldwide Chip Company Market share by HQ

The issue of "margin migration" was mentioned earlier. Much of the profit to be made from electronic systems moved away from chips and flowed towards software and services. It is therefore important that Imagination scales up its revenues by maintaining its relevance in the "technology stack" (figure 4, overleaf), leveraging its domain expertise in different ways.

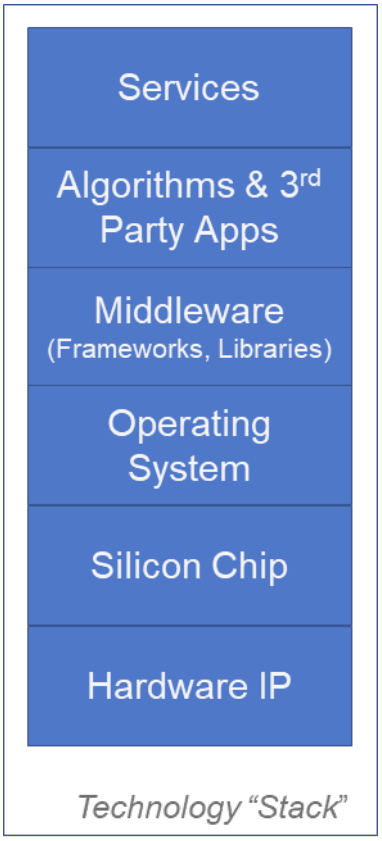

Figure 4: Technology Stack

So, there are several imperatives for Imagination's strategic direction:

- Diversify customer concentration, reducing reliance on a single mega customer
- Continue penetrating the largest base of chip customers for our most advanced IP, in the USA & Japan
- Tap into the fast-growing Chinese market, although the revenues will be lower due to the demand for older IP and the relative inexperience of the vast majority of Chinese chip designers
- In addition to expanding our lines of business in hardware IP, develop additional value propositions

Questions

1. *Is it easy to redomicile IP?*
   Re-domiciling of IP is something of a misnomer. IP can be licensed for use globally. However, IP can only be maintained and further developed by sophisticated engineers - typically those who developed the original IP, as tacit skills are essential to the innovation process. An effective development of the licensed IP would almost certainly require the cooperation of Imagination.

2. *Can China reverse-engineer your IP or pick it up and develop it further without Imagination?*
   For complex IP such as GPUs, with extremely sophisticated circuits, requiring a close coupling with software tools, it is very difficult. Legitimate efforts by well-heeled chip companies to develop their own GPUs have resulted in IP that is much less efficient in terms of Power, Performance and Area, and may also infringe patents. The experience of two joint ventures is instructive. Most of the world's PCs use CPUs conforming to the Intel X86 architecture. Few people realise that there are other vendors who developed their own X86-compatible CPUs

under license. One is AMD from the USA, the other is Via Technologies of Taiwan. Both companies entered JVs in China – AMD in THATIC, and Via in Zhaoxin. In both cases, the JVs were given old versions of X86 CPU IP. The JVs have been running 4-7 years and their latest products lag several generations behind the state-of-the-art.

3. *Is your IP used in defence or medical applications?*
   No. Our business model biased towards royalties and therefore high-volume consumer applications. Also, as an IP company, we would like to avoid the legal liabilities involved in healthcare settings. In terms of defence applications, the likes of China, Israel, Russia and the USA have the capability to develop their own custom devices suited to specific applications. They would not have the need for a GPU suited to playing games on a smartphone.

4. *Is your IP used in games consoles?*
   No. In theory it could be if we invested very significant amounts, but the major console vendors – Microsoft, Nintendo and Sony – use very large, high-performance, power-hungry GPUs from the likes of AMD and Nvidia of the USA. Our IP is targeted *mostly* at small form-factor battery-powered devices.

5. *Is your IP used in supercomputers?*
   No. In theory it may be possible for Imagination to invest significant capital and time in developing its IP for use in supercomputers. However, we have no intention of doing so and we have no domain expertise in this area, which is served by Arm, Intel and Nvidia amongst others.

6. *Is your AI/ML technology unique?*
   No. Taking the analogy of a car, our GPU and NNA IP is the engine. The rest of it – the interior, external bodywork, suspension, steering, etc – comes from the algorithm, which is what our customers (or their 3rd party ecosystem partners) would provide. Our GPU is highly programmable and flexible, but it cannot do anything without an algorithm to run. Our NNA IP can accelerate several popular neural networks (just as our competitors do), but it will do nothing without that network and training data.

7. *Is your IP used in surveillance applications?*
   The World's top 3 surveillance camera makers are Hikvision, Dahua and Uniview, all of China. The chips they use have come from the US and China, and do not contain Imagination IP. The "brains" are in the algorithms, which are developed by Chinese companies. Imagination has no domain expertise in this area. Imagination has no domain expertise in this area. Imagination has one Russian customer which has developed two chips, containing Imagination IP, for use in computer vision applications that encompasses consumer and industrial applications, the latter includes (non-state) surveillance of airports, shopping malls and infrastructure.

8. *Are Chinese engineers cheaper?*
   No, they are quite expensive and staff turnover is quite high. It would be cheaper, more efficient (same time zone) and less disruptive (lower turnover) to recruit in the UK, but we do not produce enough STEM graduates in this country

9. *Why do you want Chinese engineers?*
   We do not. We just want the best engineers that we can get, and with the best talent at a premium, we must go to where the talent is. That is why we perform R&D in places as far apart as Sydney and Stockholm.

10. *Do you have any IP for cybersecurity?*
    No. We are interested in the area but have no offerings or domain expertise in this area.

11. *What is IMG Edge?*
    IMG Edge is a concept encompassing verification methodologies, expert consultancy, hosting services and verification services. The economic model will be a mixture of licensing, ongoing service fees and hosting fees. It is not specifically an EDA service although some of the products and service are related to EDA and EDA vendors may be re-sellers of some of the capabilities. This concept is still being validated internally, from both a technical and business point of view.

12. *What is your relationship with Huawei?*
    Huawei has two main business lines: (i) 4G and 5G telecom data networks. We do not develop or offer or plan to develop or offer products in that area; (ii) Smartphones. Huawei is not an Imagination customer, although its subsidiary HiSilicon has been previously, for a smartphone chip it developed. The CPUs and GPUs used in Huawei smartphones are, we believe, supplied by Arm, not Imagination. Imagination is developing GPUs that may support the ability to create photo-quality images out of graphics (known as ray tracing) which may be of interest to smartphone makers such as Huawei and Apple.

First Name	Last Name	Job Role	Location	Start Date	End Date
STATUTORY DIRECTORS					
Ray	Bingham	Chairman of Board & Interim CEO	N/A	03/11/2017	
John	Kao	Board Director	N/A	03/11/2017	
Peter	Kuo	Board Director	N/A	03/11/2017	
Ron	Black	Chief Executive Officer	UK Kings Langley	01/01/2019	10/04/2020
Liyou Leo	Li	Chief Executive Officer	UK Kings Langley	18/07/2018	31/12/2018
Jonathan	Lewis	Chief Financial Officer	UK Kings Langley	03/01/2018	18/07/2018
Guy	Millward	Chief Financial Officer	UK Kings Langley	21/12/2015	03/01/2018
Andrew	Heath	Chief Executive Officer	UK Kings Langley	01/08/2012	02/11/2017
EXECUTIVE MANAGEMENT BOARD (ADDITIONAL TO CEO AND CFO APPOINTMENTS)					
Nigel	Leeder	Chief Innovation Officer	UK Kings Langley	01/07/1996	
David	Harold	Chief Marketing Officer	UK Kings Langley	04/08/1998	
Steve	Evans	Chief Product Officer	UK Kings Langley	08/08/2019	
David	McBrien	Chief Revenue Officer	UK Kings Langley	08/04/2002	
Wasim	Ahmed	Chief Strategy Officer & Chief of Staff	UK Kings Langley	25/06/2018	
John	Rayfield	CTO - Compute	US HOME OFFICE	09/10/2019	
Gerry	Conlon	EVP - Ensigma	UK Kings Langley	16/04/2018	
Michele	Byron	HR Director	UK Kings Langley	20/10/2014	28/02/2020
Stuart	Black	EVP of Finance	UK Kings Langley	20/09/2018	31/01/2020
Babak	Bastani	EVP - Ensigma Research & Development	UK Kings Langley	25/06/2018	30/09/2019
Martin	Woodhead	Chief Technical Officer	UK Chepstow	01/03/2000	31/07/2019
Oshin	Cassidy	Group HR Director	UK Kings Langley	03/05/2016	16/11/2018
Mark	Dickinson	EVP - PowerVR R&D	UK Kings Langley	01/12/2016	22/02/2018
Jim	Nicholas	Executive Vice President - MIPS Business Uni	US Santa Clara	07/05/2014	06/10/2017