Intellectual Property Business Models
A Study of Xaar plc, 2000 to 2009

Ian P. Hartwell
Engineering Intellectual Property Research Unit, School of Engineering
Cranfield University, Bedfordshire MK43 0AL, UK
Email: i.hartwell@cranfield.ac.uk

Abstract

A 1999 report by investment bank CSFB considered five early-stage companies operating an intellectual property (IP) licensing business model and proposed certain success factors for such companies. The performance of one of the five companies, Xaar plc, has been studied for the ten years since the CSFB report was written, revealing that only some of the factors actually made a positive contribution to Xaar's success. The role of IP in Xaar's income has also been considered, together with the various non-IP factors acknowledged by Xaar as contributing to its success. The results are relevant to today's early-stage engineering companies looking to use IP to best effect.

I. Introduction

In October 1999 the Equity Research Unit of investment bank Credit Suisse First Boston (CSFB) issued a report on five UK small cap intellectual property (IP) licensing companies entitled "*Technology Licensing – Intellectual Property Rights and Wrongs*". The report concluded that *"IP is an increasingly important element of business today"*, that *"the IP model has distinct benefits over the more traditional product-sales-based strategies"* and that *"investing in IP stocks can bring potential benefits to investors"*.

One of the five companies considered in the report was microengineering company Xaar plc, the report noting that:

> *The company is both an IP licensing and a product sales company, active in the ink-jet printing device market. We believe there are significant growth opportunities for Xaar in the office equipment market and, more importantly, the fragmented industrial printing sector. Seven printhead and two ink licensing agreements have been signed to date. In addition, Xaar has three strategic partners in the development of a page-wide array printer … However, the company has been slow to win further licensees.*

This study considers the extent to which the conclusions reached by CSFB in 1999 have been borne out by Xaar's performance in the subsequent decade. In particular, it considers the contribution (or otherwise) of intellectual property to Xaar's success. In the words of the CSFB report: Intellectual Property – What went right? What went wrong?

Methodology

As a publicly listed company, Xaar is legally obliged to publish annual reports, copies of which are typically available on the company's website. By law, each annual report must contain a business review for the year in question including a fair review of the development and performance of the business and a description of the principal risks and uncertainties that it faces. Each review must be prepared to the best of the directors' knowledge. Xaar annual reports for 2000 to 2009 thus provide a useful record of the company's performance over that ten-year period.

To answer the question of how IP has contributed (or otherwise) to Xaar's success in the period from 2000 to 2009, Xaar's annual reports for those years have been analysed from four perspectives:

1. Sources of Xaar's income where IP would appear to have contributed;
2. Other, non-IP factors that have contributed to Xaar's income;
3. The relevance to Xaar's actual performance of the factors identified in the CSFB report; and
4. Other factors, not mentioned in the CSFB report but acknowledged in Xaar's annual reports, that have proved in some way relevant to IP or any other issues raised by the CSFB report.

The first perspective reveals the different ways in which Xaar has used IP. Such insight into "IP business models" is valuable to those, typically company directors, tasked with realising maximum value from a company's assets. This insight is of course also valuable to IP managers and IP consultants/attorneys tasked with advising company management. The second approach is also important as it allows the contribution of IP to be put into perspective relative to other, non-IP contributors. The third and fourth approaches should be of particular value to investors and financial analysts, providing data to facilitate their assessment of the likely future performance of today's IP-dependent companies.

II. Investor Profile

However, before considering how IP has *actually* contributed to Xaar's performance over the years, it is interesting to consider the *profile* given to IP in Xaar's annual reports for the period in question. Investors are arguably the target audience for the annual report of any UK public limited company and, in 1999 at least, CSFB noted the potential for investors to value companies based on sheer numbers of patents filed[1].

From 2000 to 2007, intellectual property was given a high profile by means of a statement on the introductory page of each year's report referring to the size of the Xaar patent portfolio. In early years the portfolio was described as being "substantial" while in later years reference was made to "over 700 patents". Patent profile peaked in 2007 when the introductory page opened with the statement:

> *The beginning: Xaar was established in 1990 to acquire, develop and commercially exploit a new digital inkjet printing technology arising out of work done by Cambridge Consultants Ltd. At the time, the IPR consisted of four granted patents and 84 patent applications in various jurisdictions.*
>
> *Today: as a result of further development of the core technology there are now over 700 patents and patent applications in the Xaar IPR portfolio and the 300 employee-strong company continues to improve and expand this portfolio. Today the company's core business is to manufacture and sell its wide range of printheads and peripheral equipment to leading OEM companies, in addition to licensing the Xaar technology to global brand companies.*

The reports for 2008 and 2009, however, contained no mention of patents on their introductory pages, nor was there any discussion of patent portfolio size in the body of those reports (in contrast to the reports for 2000 to 2007). Rather, there was only reference to specific patented features of certain printhead models, namely "*Xaar-patented, multi-pulse greyscale technology*" and "*Xaar patented TF Technology*".

[1] The implicit assumption being that the more patents a company filed, the greater the chances of its overall success. CSFB also noted that this could incentivise some companies to produce patents for the sake of filing, without regard to the possible utility of the IP.

It is not obvious from the 2007 report why the patent portfolio was given such emphasis that year. Certainly, there was no lack of good financial results to report. One possible reason for stressing the size of the portfolio in 2007 might have been to counteract any adverse publicity associated with the expiry, early in 2008, of at least one of the "*four granted patents*" referred to in the opening statement (the earliest entry on the European Patent Office Espacenet database under the name "Xaar" is EP0278590, filed 08.01.88 and thus expiring on 08.01.08). The fact that such emphasis has not been repeated since suggests that Xaar's management is no longer convinced that a large IP portfolio is effective in impressing investors. As to whether it actually does is beyond the scope of this study.

III. Sources of Xaar's income where IP would appear to have contributed

The CSFB report identified the following business models for generating income:

- "*Product Sales*" providing "*additional revenue from bespoke projects and ink sales*". The report notes that "*while the company continues to develop both the standard and page-wide array printheads, this product revenue is a useful source of cash*".

- "*IP licensing*" involving seven printhead licensing agreements and two ink licensing agreements.

- "*Strategic Development Partnership*" with Kyocera, DuPont and Agfa-Gevaert in the development of a page-wide printer.

III.1 Printhead Sales

1. Manufacture and sale of high performance specialized printheads was identified in Xaar's 2000 report as one of three distinct ways of exploiting Xaar's technology. However, the effect of IP on manufacture/sales was first raised in the 2008 report which noted:

> *[a] decline and change in mix of revenues … due to the shift in market share in China. Xaar technology remains dominant in this market; however, in 2008 our licensees gained market share from Xaar, resulting in a reduction in product revenue whilst boosting royalty income. These licensing arrangements were put in place in the mid 1990s, prior to Xaar becoming a direct manufacturer and supplier of its own products …*

The reference to "licensing arrangements" would seem to be an implicit acknowledgement that, had the competitor not been a licensee, Xaar might have been able to use its patent rights to exclude the competitor and thereby prevent loss of market share and associated revenue.

2. However, as noted in II. above, at least one of the "*four granted patents*" on which Xaar was founded would have expired by 2008. Moreover, it is not clear whether any patents still in force and covering competitor printheads would necessarily have extended to China: according to the Espacenet database, the first European patent (EP0278590) in the name of

Xaar did not have had an equivalent in China, although an equivalent in Hong Kong is indicated.

Were it indeed the case that competitor printheads were not covered by Chinese Xaar patents, one might have expected the market to have been overrun by local competitors (as noted in more detail below, Xaar's solvent inks had become commodity items in China by 2006). The fact that this was not the case and that Xaar's main competitor in China was actually a Japanese licensee[2] suggests that there may have been other barriers to entry.

It seems unlikely that such barriers could be commercial: for example, it would be surprising if a Japanese licensee could have had significantly better distribution networks in China than an indigenous Chinese company. This leaves the technical barrier of manufacturing know-how IP; in other words, Chinese companies without manufacturing know-how IP (much of it presumably originally generated by Xaar) would be unable to manufacture Xaar-style printheads.

This interpretation is supported by the fact that royalty income did not drop in the year following the 2008 patent expiry mentioned above (see figure 1 below), suggesting that Xaar's licensees were paying royalty not only for use of patent rights but also for use of know-how (unlike patent rights, know-how does not expire after 20 years, as long as it remains confidential).

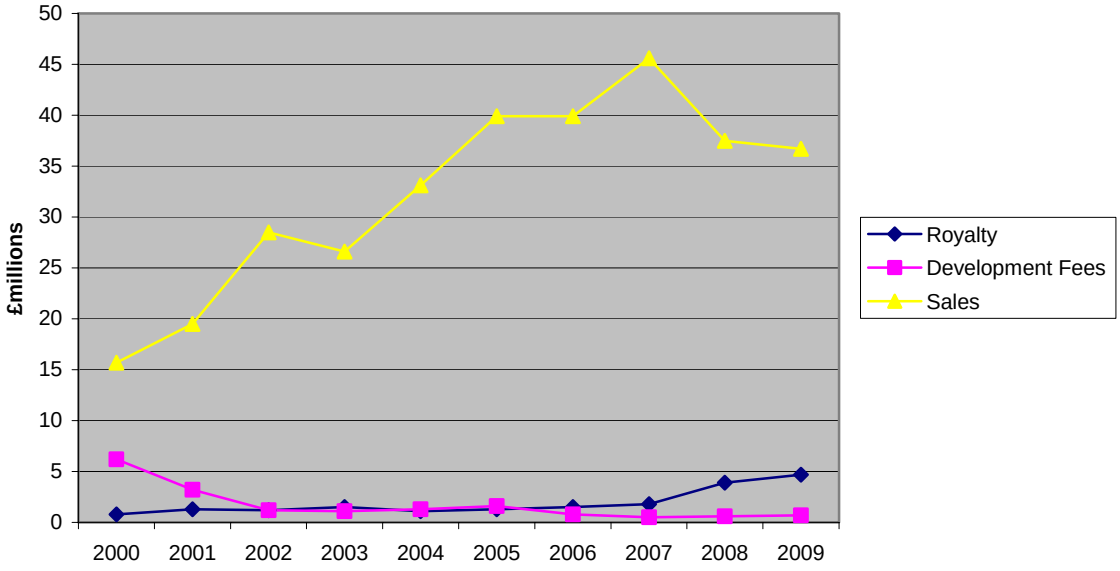

Figure 1: Revenue of Xaar plc by source

The value of Xaar know-how (which will to a greater or lesser extent reside in the heads of Xaar employees) is broadly acknowledged in the boilerplate "risks and uncertainties" section that appears in both the 2008 and 2009 reports and which notes that "*if we cannot attract,*

[2] With the exception of one unnamed US licensee, all Xaar's printhead licensees would appear to have been Japanese

retain and motivate key employees the performance of our business could be adversely affected".

3. The 2002 report mentioned the launch of an additional "Leopard" printhead aimed at applications requiring near-photographic quality, such as plastic cards, CD and DVD printing. According to the report,

> *The Leopard head is the result of our collaboration with Toshiba TEC, a Xaar licensee. Toshiba TEC manufactures the printheads in Japan where it will sell a version direct to major Japanese users. Xaar sells the head under its own brand name into markets outside Japan, and to customers requiring the sales and service back-up offered by Xaar through its network of regional sales offices.*

The extent to which the Leopard printhead incorporated additional Xaar technical IP beyond that previously licensed to Toshiba TEC, is not clear. If such additional IP was provided, this may have earned Xaar the exclusive rights to markets outside Japan.

4. Either way, the above statement highlights the value of the Xaar brand (as protected by trade mark IP) in helping to sell product. The Xaar network of regional sales offices is included in the "non-IP factors" section below.

Xaar's individual product brands would not appear to be so valuable, however, given the indication in the interim 2005 report that the Leopard printhead had been renamed "OmniDot 318". This was presumably to tie in with the OmniDot 760, co-developed with Agfa as explained in more detail below. However, by the 2006 report, the two printheads were referred to as the "Xaar 318" and "Xaar 760" alongside the "Xaar 1001" printhead, which had been known in development as the "HSS". These numerical designations were still being used at the time of the most recent, 2009, report.

III.2 Ink Sales

1. Insight into Xaar's early ink sales business model was provided in the 2003 report which explained that:

> *In response to customer feedback, and the logistical problems presented by stocking and shipping volume inks on a global basis, Xaar has agreed with its suppliers that they will ship high volume inks direct to the customer, with Xaar receiving a commission on the sale. For lower volume and development inks, however, Xaar will continue with its current purchase and resale model.*

The report for 2000 had previously indicated that:

> *Ink revenues are important to our continued growth and increased profitability. We continue to work closely with our ink licensees, Toyo Ink and Avecia, and, in*

> *addition, at the end of 2000 Xaar signed an agreement with Sericol, a division of Burmah Castrol and a leading supplier of industrial inks.*

The report for 2001 subsequently explaining that:

> *We have increased the ink product portfolio during 2001 by working with partners to provide inks specifically matched to XaarJet printheads. The benefits of this work are beginning to materialize with ink revenues increasing by 50% during 2001.*
>
> *The first inks from the partnership with Sericol were launched and we added Sunjet, the ink jet division of the world's largest ink company, to our list of partners.*

The 2003 report also announced Xaar's introduction of "*a new value-priced solvent ink specifically for the Chinese market, manufactured locally by a new Chinese ink partner. Volumes are expected to be strong and Xaar will take a commission on sales.*" The above paragraphs suggest two IP business models:

Contract Manufacture and Sale of Ink

According to this business model, suppliers manufacture ink for Xaar, which then re-sells the ink (at a mark-up) to customers.

The full extent to which Xaar IP supported this first model is beyond the scope of this study. Information on Xaar printhead customers to whom ink could be sold appears to be key (and are included in the "non-IP factors" section below). The ink formulations may have been covered by Xaar patents, in which case the supplier would have been prevented from independent manufacture and sale of such formulations. It seems likely that Xaar's technical know-how regarding its printheads would have been necessary to enable suppliers to formulate inks "specifically matched to XaarJet printheads". Access to such know-how could have been given in return for an undertaking from the supplier that it would only sell the resulting formulations to Xaar. Whether such formulations were then patented (ownership being shared between Xaar and the partner) is beyond the scope of this study.

Commission

According to this business model, suppliers manufacture and sell ink directly to customers, with Xaar taking a commission.

This business model would appear to have evolved from a contract manufacture relationship of the kind discussed above. Again, printhead customer details seem to be key. Xaar patents and technical know-how may also have played a role, the latter attracting partners with whom Xaar could formulate inks specifically matched to those printheads. Whether such formulations were then patented (ownership being shared between Xaar and the partner) is beyond the scope of this study.

It is not immediately apparent from the reports how – if at all - the commission relationship with "partners" such as Sericol and Sunjet differs from the royalty relationship with licensees Toyo Ink and Avecia.

2. The report for 2004 mentions a further source of commission that seems to rely on Xaar approval rather than Xaar IP (and that is consequently discussed in the "non-IP factors" section below).

Following on from the changes reported in 2003, the 2004 report also notes that:

> *The volume of ink shipped direct by Xaar also reduced, and overall the gross margin earned on the ink business was down £0.6m. We are addressing this decline by adding to our sources of supply around the world to give end-users a wider choice of Xaar-approved inks …*
>
> *… Development of printhead sales into new areas of the packaging market, such as cartons and flexible packaging, also introduces the opportunity to supply higher-margin UV inks, use of which has grown strongly in recent years.*

The reason why UV inks have higher margins - and in particular whether such margins are attributable to Xaar IP – is not clear from the reports.

3. In contrast to the bullish statements in 2000 and 2001 regarding ink revenues, the 2006 report noted that:

> *Xaar's ink business continues to contribute positively to the group's results, albeit modestly. To date, the largest market for the company's printhead sales has been Asia and, in particular, China where its printheads are used for printing solvent-based inks onto vinyl for the outdoor advertising market. Solvent inks in Asia have now become commodity items, with prices falling significantly over the last few years.*
>
> *As a result, our ability to generate profitable revenue from ink in these circumstances is limited.*

It is not clear whether this commoditization resulted from the increase in the number of Xaar-approved suppliers announced in 2004 and/or the loss in commercial significance of Xaar ink formulations or Xaar-approval for third-party inks. Nevertheless, the 2006 report repeats the 2004 assertion that:

> *As UV ink applications become more widespread and customers launch higher resolution UV printers for these markets … the opportunity to generate sustainable ink revenues from these applications should increase.*

Again, it is not apparent why the company believed that it could generate sustainable revenues from UV inks when it had not been able to with solvent inks. Patent protection may

have a role – UV formulations, having been developed later, may have been patented in China where the earlier solvent formulations had not. This is beyond the scope of the present study.

4. Arena and Carreras (2008) suggest that, in the personal inkjet printer market at least, printheads and ink correspond to the two elements of the so-called "razor and blades" business model in which low margins on a non-consumable item (the razor) are offset by high margins on an associated consumable item (the blades). Whether the model is also applicable to the industrial inkjet market where ink is used in much greater quantities is beyond the scope of this analysis. Certainly, Xaar would not appear to have been able to implement the model since, by its own admission, inks had become commodity items in Asia by 2006. As noted above, the extent to which this may have been due to deficiencies in IP is beyond the scope of this study.

III.3 Printhead Licence Fees

1. The 2000 report identified *"Licensing the technology to major global corporations for high volume consumer and office applications"* as one of three distinct ways of exploiting Xaar's technology. Specifically, the report noted that *"Office printing … is serviced mainly by major corporations which manufacture and sell products in high volume. Xaar's route into this market is through its licensing programme."* The same report noted that two major new licences were signed during the year resulting in licence and development fee income of £6.2m, corresponding to 27% of revenue for that year.

2. No new licenses were reported in 2001, although there were two licence upgrades to Seiko Instruments Inc. and Toshiba TEC giving them access to all Xaar intellectual property including the most recent innovations at that time. Licence and development fees were indicated to be £3.2m, corresponding to 13% of revenue. The report noted that:

> *It is encouraging that existing licensees should wish to extend their involvement with Xaar technology.*
>
> *We believe that digital press type printing will move more quickly into the general office, replacing some trade printing. As a result, Xaar's patents surrounding this area are becoming key in ongoing licence discussions.*
>
> *A key motivation for developing our core technology is to generate further licence fees and royalties. Xaar's Technology Development Group is working with our licensing team to support ongoing discussions with interested parties.*

In 2002, the presentation of licence income in the report was changed, with upfront licence fees being grouped with royalties rather than with development fees as in 2000 and 2001. Indeed, the body of the 2002 report suggested that the only upfront licence fees that year were a "further small stage payment under an existing licence agreement". Moreover, the 2002 report acknowledged that:

> *… efforts to secure licence revenue continue but, given the difficulty in predicting both quantum and timing, we are planning our business without relying on new licence revenues. In future, we intend to comment on new licences only as and when they arise.*
>
> *Royalty income is expected to remain at around current levels for the foreseeable future. Longer term, the company continues to look for new licensing opportunities and to develop new patentable technology.*
>
> *We continue to work towards securing new licensees but we are no longer relying on new licence income as a fundamental part of our business plan.*

This strategy statement was repeated in subsequent years' reports, which indicated a modest growth in royalty income but no further licence signings. The office market entry predicted in the 2000 report was realised in 2003 with the launch of the ORPHIS HC5000 office printer developed by Olympus and manufactured by Riso using a printhead manufactured by licensee Toshiba TEC, the 2004 report noting that that initial sales in Japan had been very successful. The 2005 interim report indicated that "*our licensees use Xaar technology across a range of markets including graphic arts, document printing and mailing.*"

The 2008 report announced a doubling of annual royalty income to £3.9m (9% of total revenue). However, this was due to one of Xaar's licensees taking market share from Xaar product sales in China, contributing to a 18% fall in product revenue compared to 2007. The report noted that:

> *These licensing arrangements were put in place in the mid 1990s, prior to Xaar becoming a direct manufacturer and supplier of its own products.*

III.4 Printhead Development Fees

As noted in the section on licence fee income, development fees were only indicated as a separate item from 2002 onwards: in the 2000 and 2001 reports, development fees were lumped together with upfront licence fees. The 2000 report noted that:

> *It is only feasible for a company to license our technology if it has the available R&D and manufacturing resources to develop and produce ink jet printheads. In the past this has prevented some companies from working with us. Our solution is now to offer a Custom Printhead Programme under which Xaar will design a printhead for a specific customer on a consultancy basis and then bring it to manufacture either at Xaar or through a third party.*

The phrase "R&D and manufacturing resources" covers Xaar's R&D laboratories and manufacturing plant but also Xaar's knowledge of how to use those laboratories and plant. It seems reasonable to assume that the value of the latter "know-how" IP is reflected in the consultancy fees paid by a customer. The 2001 report went on to note that:

> *Development of a custom printhead for a specific customer was started in 2000 and has continued on schedule. Production for this customer is planned to commence at our Swedish facility in 2003*

the 2003 report suggesting that the specific customer was Agfa Gevaert, viz:

> *The group finished the year by agreeing an important new five-year research, development and manufacturing programme with Agfa-Gevaert…. Both parties have for some time been engaged on a joint development programme to produce a new range of high specification printheads, capable of satisfying a variety of different application requirements within both companies. … Xaar will sell the new range of printheads under the OmniDot tradename.*

The development fees paid by Agfa were indirectly acknowledged in the 2006 report which noted a reduction in development fees for 2006 *"as a result of a reduction in fees from Agfa, following the successful launch of the co-developed Xaar 760 product"*. The report went on to note that:

> *Volume sales of the Xaar 760 to Agfa also began during the year. Although these sales generate a lower gross margin than sales of other products, it should be remembered that Agfa funded the development of the Xaar 760 and has also paid for some of the production equipment used in its manufacture at our plant in Sweden.*

This latter statement suggests that the earlier development fees paid not only for access to Xaar's know-how IP but also for an option to buy printheads at reduced cost. The extent to which the later cost reduction offset the earlier development fees cannot be determined from the limited information in the reports.

III.5 Application Development Fees

The 2006 report also noted a reduction in development fees due to Vivid Print Innovations Inc. - whose sales had previously been reported under development fees - being sold to one of Xaar's "integration partners".

Vivid was originally acquired in 2002, the report for that year noting that:

> *We have recognized that many customers, especially in the important US market, often require assistance in integrating digital printing technology into their business before they can become significant users of Xaar products. To that end, I am pleased to report that Xaar has reached agreement in principle to acquire for a nominal sum Vivid Print Innovations … comprising an established engineering team with considerable experience in designing and integrating digital printing systems, mostly using Xaar products.*

"Experience in designing and integrating digital printing systems" suggests know-how IP. A search in the Espacenet patent database has not identified any patent filings in the name of "Vivid Print Innovations".

The 2003 and 2004 reports noted that the sales of application services through Vivid generated "modest revenues". However, the 2005 report noted that Xaar's "*increasingly close relationship with other integrators makes it unnecessary for us to continue to own our own integration business."*

III.6 Application Licence Fees

The above statement suggests that Xaar was not interested in using IP in printhead *applications* to make money (although a detailed review of Xaar's patent portfolio is beyond the scope of this study). In particular, although new potential applications are mentioned in practically every report, there is no suggestion of Xaar trying to obtain IP on those applications (assuming, of course, that there was actually IP to be had – patents, for example, will only be granted for solutions that are both new and non-obvious). Rather, the reports highlight features *of the printhead* that enable entry to those markets. For example, the annual and interim reports for 2005 report note that:

> *The smaller and variable drop size offered by the OmniDot allows much higher resolution printing which, in turn, opens up the indoor advertising and fine art market to Xaar.*
>
> *The recirculating principle* [of the HSS printhead] *also allows a much wider range of fluids to be used in the printhead; we believe these features will not only open up new areas of traditional printing to inkjet, but will also take inkjet into new industrial processes where patterns and images are today produced by wasteful subtractive processes rather than by direct printing.*
>
> *We are actively involved in a range of projects covering … the printing of etch masks for the manufacture of printed circuit boards, where we expect to see commercial equipment released later in the year; the printing of aerosol and beverage cans; the repair of LCD screens and other deposition related processes within the manufacture of electronic displays, and the use of inkjet in textile printing for which we have OmniDot evaluation kits on trial in the field. In each of these areas we work very closely with our approved integration partners whose skill in applying our technology to each customer's particular application is very important.*

Xaar may have had other reasons for its approach, although these are not apparent from the reports. For example, there may have been a fear that patents to applications of printheads would have soured Xaar's relationships with existing and potential printhead integrator customers. Alternatively, if "design around" solutions were readily available, then patenting of applications may not have appeared cost effective.

III.7 Strategic Alliances

"Forming strategic alliances for the development of the next generation technology with leaders in imaging systems, printhead manufacture and ink production" was the last of the three distinct ways of exploiting Xaar's technology identified in the company's 2000 report.

That report went on to explain that opportunities in the commercial printing market *"are being exploited together with key partners for developing new products or systems such as wide printhead* [PWA] *machines, with Xaar involved in both licensing and manufacturing know-how."*

The CSFB report indicated that the Xaar's partners were Kyocera (manufacturing processes), DuPont (inks) and Agfa-Gevaert (printhead technology): it would appear that the plan was to license Xaar's patents and manufacturing know-how to these partners. The following year's report explained that:

> *While the main thrust for the PWA printhead technology is the generation of licensing income, it is also expected to contribute increasingly to manufacturing and ink revenues. The first printhead and ink sales will be generated as we start to work with new partners focused on a variety of industrial and commercial printing applications during 2002.*

The reference to "manufacturing revenues" suggests an additional approach of manufacturing and selling a new range of printheads incorporating the technology developed for the PWA machines, with "ink revenues" referring to sales of ink for such printheads. The extent to which this additional approach actually helped to make money is not clear. Certainly, as previously noted, 2002 saw a change in strategy away from licensing towards manufacturing. Moreover, 2003 saw the "partnership" with Agfa Gevaert metamorphose into the development fee relationship previously described. However, it is not clear from the reports to what extent the resulting OmniDot / Xaar 760 printhead actually used the PWA technology.

As for the "main thrust" of generating licensing income, the PWA project and partners Kyocera and DuPont would not appear to have been mentioned in any reports after 2001.

IV. Other, non-IP factors that have contributed to Xaar's income

IV.1. Network of Sales Offices

As noted in III.1.3 above, the Xaar network of regional sales offices offering sales and service back-up was cited in the 2002 report as a factor that might prompt customers to buy the Leopard printhead from Xaar.

IV.2 Printhead customer lists.

The Xaar report for 2005 mentions:

> *growing commissions from partners on their sales of approved Xaar-compatible inks. During the year we added seven more commission-based ink partners, including well-known brands such as Hexion and Tetenal, to broaden the choice available to end customers by both geography and application,*

The commission would appear to be based not on Xaar's IP but rather on Xaar's ability to test and approve third-party inks for compatibility with printheads and to refuse to honour warranties for printheads that have been used with inks that have not passed such a test (that Xaar's customers relied on warranties was clear from the report for 2003). It is clear from the reference to "well-known brands such as Hexion and Tetenal" that this source of income did not rely on the Xaar brand (as protected by trade mark IP).

IV.3 Relationships with Printhead Application Developers ("Integrators")

As noted above with regard to application licence fees, the 2005 annual reports repeatedly stressed the importance of Xaar's relationship with printhead application development companies, viz:

> *We work very closely with our approved integration partners whose skill in applying our technology to each customer's particular application is very important*

> *We recently made a minority investment in Xennia Technology Ltd., one of our approved integration partners. … The investment is intended to strengthen further our relationship with Xennia … Where appropriate, it is our intention to make other small trade investments if these can speed adoption of our technology into existing and new markets.*

Subsequent Xaar reports do not shed any light on the success of the Xaar – Xennia relationship, nor do they indicate that any other trade investments were made. Presumably Xennia is one of "partners" referred to in the statement in the 2009 report that:

> *The company is now focusing its resources on the specific partners and markets that will bring faster material returns and, at the same time, act as role models that other OEMs may follow.*

The monetary value of "*skill in applying* [Xaar's] *technology to each customer's particular application*" was also emphasised in the 2009 report, which noted "*an unexpected level of costs associated with the deployment of new products into diverse applications"* suggesting that once a Xaar printhead had been implemented in a particular application, a competitor printhead might – at least partially - be barred from that application by the costs associated with redesigning the application to accommodate the competitor printhead. The question of whether Xaar ever attempted to consolidate its position by seeking to patent the details of a particular implementation is beyond the present analysis.

IV.4 Relationships with End Users

In addition to relationships with companies that integrate Xaar printheads into machines for end customers, the 2005 report also suggests that the relationships with the end users themselves are also a source of value, viz:

> *We continue to see progress in the development of inkjet as an industrial manufacturing process in non-print related industries such as packaging, electronics, three dimensional modelling and biotechnology. We now have the products that enable us to address the requirements of these markets and we continue to build strategic partnerships with the main players in these sectors.*

IV.5 First to Market

The 2004 report noted a reduction in the volume of ink shipped directly by Xaar and indicated that the company was addressing this decline by addressing new geographical markets such as India and South America. Presumably, there were few if any competing ink suppliers in those markets at that time (whether Xaar had IP in those markets that could exclude competing ink suppliers is beyond the scope of this study). The 2006 report suggests that this approach was not particularly successful, however, noting that:

> *Xaar's ink business continues to contribute positively to the group's results, albeit modestly. … Solvent inks in Asia have now become commodity items, with prices falling significantly over the last few years. As a result, our ability to generate profitable revenue from ink in these circumstances is limited.*

IV.6 Product Innovation

The potential importance of product innovation was acknowledged in 2002 when, with reference to record sales of the XJ128 printhead, the report noted that "*this is particularly encouraging given the fact that it* [the XJ128 printhead] *is now a mature product"*.

However, the financial implications of product innovation were not felt until 2008 when, as already noted above with respect to printhead sales, Chinese market share was lost, the report for that year noting that "*A combination of product differentiation and keen pricing was the primary driver in this shift*". In other words, competitors produced new products that attracted customers away from existing Xaar products. However, the 2009 report announced a recovery in Xaar's share of the Chinese market, noting that:

> *The Proton launch in China boosted sales especially in H1 and we have recently added a second variant (the higher speed "Electron") to this range intended to further stimulate demand in 2010.*

In other words, new Xaar products attracted customers back. There is no suggestion that the 2009 sales boost was helped by IP; indeed, the 2009 report does not mention whether these new "P1" models were actually patented (a detailed patent portfolio analysis is beyond the scope of this study).

Product innovation was also acknowledged in the list of "risks of uncertainties" in the financial results section of 2008 and 2009 reports, viz:

> *if we cannot effectively anticipate technology trends and develop new products to respond to changing customer preferences, this could adversely affect group revenues;*

V. The relevance to Xaar's actual performance of the factors identified in the CSFB report

V.1 Address a clear market need, Target a large market

1. The CSFB report identified five "critical success factors for IP companies", the first two being "address a clear market need" and "target a large market". The report noted that "w*e believe there are significant growth opportunities for Xaar in the office equipment market and, more importantly, the fragmented industrial printing sector."*

As previously discussed, Xaar strategy was to address the office market by licensing and the industrial printing sector by sales. In the event, some of the predicted markets did not materialise while success was found in other markets that had not been predicted. In particular, the 2001 report noted that:

> *The original focus for the PWA printhead was professional "digital press" printing, delivering the flexibility of digital ink jet to traditional commercial printing applications. … The digital press market has not developed at the speed originally envisaged by market forecasts.*

The 2003 report noted that:

> *In-line printing for industrial and packaging applications continues to develop more slowly and is some way behind the graphics market in terms of drop-on-demand ink jet adoption. In these applications inkjet must be integrated into existing industrial processes and operating facilities, but as that adoption gains momentum these areas are expected to offer significant growth opportunities.*

While the 2007 report noted that:

> *whilst there are many potential opportunities for inkjet to become adopted in non-print related areas, the commercial returns are on a longer timeline. … However, in the non-printing industrial space we continue to support a set of developers exploring many possibilities including applications such as flat panel displays, flexible electronics and 3D material deposition, to ensure that when real commercial opportunities present themselves, Xaar is well positioned to take advantage.*

The development of revenue by source is shown in earlier figure 1 while the development of product sales revenue by market is shown in figure 2 below. It is notable that, in spite of earlier market predictions, the majority of Xaar's income in 2009 still came from the relatively small graphic arts market.

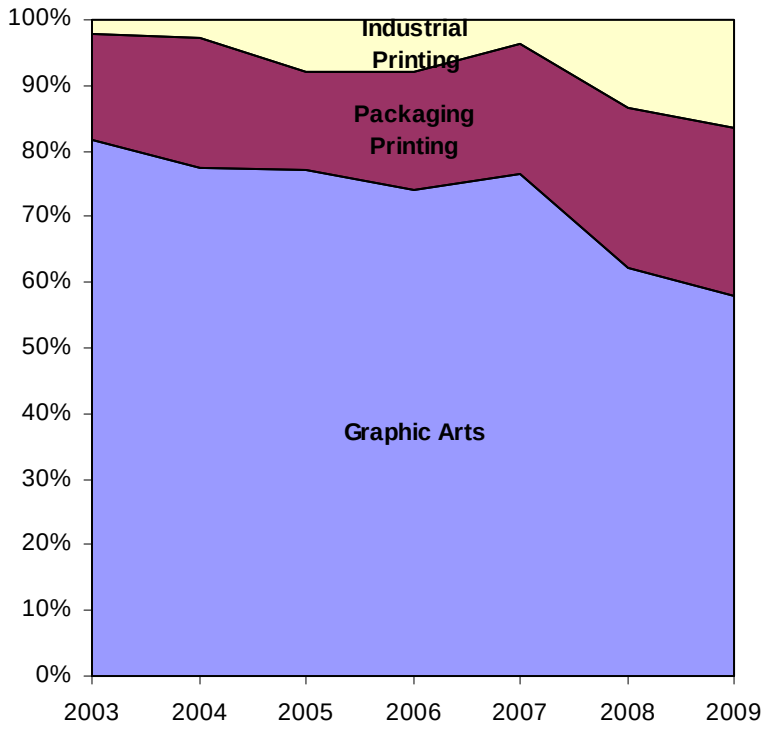

Figure 2: Relative evolution (in terms of sales income) of "Graphic Arts", "Packaging Printing" and "Industrial Printing" markets. Data for 2000-2002 not available.

V.2 High barriers to entry

This was listed by CSFB as a third "critical success factor", the CSFB report noting that *"these barriers to entry can be in many forms, such as ownership of the key skills required to recreate the IP elsewhere, patents, financial backing or even a low royalty fee."* Xaar's particular barriers were not referred to elsewhere in the CSFB report. However, Xaar's 2001 report did note that:

> *While the cost of a licence has not been an issue in any recent discussions, it is important to recognize that a significant investment is required to effectively exploit any new technology platform. In the second half of the year we detected a short-term reluctance to undertake such a commitment attributable, at least in part, to the prevailing global economic situation.*

The significance of Xaar's know-how IP has already been discussed above.

V.3 Appropriate business model

Regarding this fourth critical success factor, the CSFB report notes that "*having set out to develop and license IP to others, it is clearly important that the company establishes an appropriate business model in order to function correctly."* This factor is arguably *sine qua non*, since an "appropriate" business model would seem to be one that leads to company success. However, with a view to achieving success as soon as possible, it behoves a company to set out with the business model that it believes is most likely to succeed. In respect of Xaar, the CSFB report noted that:

> *Xaar is keen to retain its XaarJet product sales division as it provides additional revenue from bespoke projects and ink sales. While the company continues to develop both the standard and page-wide array printheads, this product revenue is a useful source of cash*

The evolution of Xaar's business model has already been discussed in detail above. As illustrated in figure 1, far from being just a useful source of cash, product revenue has turned out to be the main source of income. Conversely, rather than serving as the backbone of the business, licensees have reduced Xaar's income by competing with Xaar in key markets.

As noted in the 2008 report, product manufacture was not envisaged at the time Xaar concluded licence agreements in the mid-1990s. Had it been, Xaar would presumably have structured those agreements to exclude licensees from those markets it intended to service itself.

The subsidiary question of whether Xaar had any patent filings covering the use of its printheads in graphic arts applications that might have been used to exclude competitors from those markets is beyond the scope of this analysis.

V.4 "Markets take longer than expected to mature", "Lack of focus by a customer or partner"

Under the "appropriate business model" heading, these two issues are mentioned in the CSFB report as impacting on profitability. In respect of Xaar, the CSFB report notes that:

> *The expected depressed performance in 2000-2002 is indicative of the time taken for licensees of the technologies to develop products of their own incorporating the innovation and for these products to reach their end markets.*

This issue was acknowledged in Xaar's 2000 report, viz:

> *It is clear … that royalty streams are currently not developing as we had hoped. We have concluded that if we work more closely with each licensee, provide specialized technical support and continue our successful licensee seminars, our licensees may be able to accelerate the rate at which they introduce volume products into the marketplace. This work is being coordinated by our office in Japan, however ultimately the timing of product launches by licensees remains in their hands.*

And in the 2003 report which noted that:

> *The potential success of licensees such as Toshiba-TEC and Konica-Minolta, who are actively developing products based on Xaar's technology, may see royalties improve over the medium to longer-term.*

The move away from licensing to product sales, discussed above, did not eliminate this issue. The 2006 report noted that:

> *Future revenues from Platform 2 and Platform 3 products are dependent upon customers launching machines incorporating these printheads; we look forward to such launches over the next one to two years.*

With Xaar continuing to acknowledge in 2009 that:

> *… the time from an OEM announcing a Xaar-based printer to it becoming a commercial success is frustratingly long. However, as experience and expertise grow we expect these lead times to shorten.*

As noted above with regard to application development fees, Xaar did acquire printhead integration capability in the form of Vivid Print Innovations in 2002. Presumably, Xaar could have used Vivid to build printers using Xaar printheads for sale to end users, thereby cutting out the OEM and avoiding the problems with OEM delay mentioned above (so-called "Vertical Integration"). In fact, Xaar disposed of Vivid in 2005, which might suggest that OEM printer manufacturers were not as great an obstacle as had initially been thought.

V.5 "Cash Flows are Lumpy"

1. Again under the "appropriate business model" heading, "cash flows are lumpy" was mentioned in the CSFB report as a reason why IP licensing businesses needed to be initially well-funded. In respect of Xaar, the CSFB report noted that:

> *Seven printhead and two ink licensing agreements have been signed to date, but the company has been slow to win further licensees. We initiate coverage with a Hold recommendation.*

In the short term, this assessment proved incorrect. Two major licences were signed during 2000, generating up-front licence and development fee income of £6.2m, and two licence upgrades were signed in 2001. However, Xaar's 2001 report did acknowledge that:

> *While the cost of a licence has not been an issue in any recent discussions, it is important to recognize that a significant investment is required to effectively exploit any new technology platform. In the second half of the year we detected a short-term reluctance to undertake such a commitment attributable, at least in part, to the prevailing global economic situation.*

And the 2002 report indicated that

> *efforts to secure licence revenue continue but, given the difficulty in predicting both quantum and timing, we are planning our business without relying on new licence revenues.*

No further lump payments for new licences would appear to have been received after that date. However, royalty income continued as illustrated in figure 1.

2. This distinction between up-front lump payments for new licences and royalty payments under existing licences has a bearing on the aforementioned critical success factor of "target a large market". If the main source of income is considered to be up-front lump payments, then the "market" in question must be that of companies able to take a licence and a "large market" needs comprise a large number of companies able take a licence. If, however, the source of income is considered to be royalties, then the "market" is that of end users of licensees' products. In the case of Xaar, whilst the office and industrial markets for licensees' products were potentially very large, it would appear that the number of potential licensees was relatively small.

V.6 Technology Adoption

1. The CSFB report also referred to work by Moore (1999) on technology adoption life cycles and the apparent "chasm" between the early market, comprising technology enthusiasts and "visionaries", and the mainstream market of "pragmatists" and "conservatives". In respect of Xaar, the CSFB report noted that "*Xaar* [is] *spending the longest in the chasm phase of technology adoption and therefore must wait longer for revenues to grow and drive value up."*

Moore's book "Crossing the Chasm" argues that the marketing strategy and tactics of a technology company must adjust as the market evolves from early to mainstream markets. The evolution in Xaar's approach to its licensees and its customers is already discussed above in the sections on relationships with printhead application developers, end users and the lack of focus by a customer or partner. This evolution culminated in the statements at the beginning of the 2009 report that:

> *Xaar … has matured in its understanding of what it takes to make the new technology a success for our OEM customers*
>
> *The adoption of inkjet technology by the wider printing industry continues cautiously although certain applications are now moving forward more quickly.*

the report subsequently explaining that:

> *The company is now focusing its resources … Part of this focus is to place greater emphasis on market requirements, product definition and the processes to design and manufacture for a better customer experience.*

This latter statement finds resonance in Moore, who notes that "a better customer experience" is one of the key demands of customers in the mainstream market as compared with customers in the early market. It is notable, however, that the statement relates to the Xaar's product sales rather than to the licensing activities referred to in the CSFB report.

2. As regards Xaar's licensing activities, the CSFB report noted that:

> *Delays in signing up new licensees and continuing development of its page-wide printing array also place Xaar some way from mainstream markets.*

This statement could be read as suggesting that the market of *licensees* discussed above can be divided into "early" and "mainstream" markets and that Xaar's licensee companies, namely Brother, Sharp, Toshiba TEC, SII Printek and Konica Minolta, represent "early" market, i.e. "technology enthusiast" or "visionary", licensees. However, there is nothing in Xaar's annual reports to support this interpretation.

3. For completeness, and as mentioned above with regard to application development fees, it is noted that Vivid Print Innovations was acquired by Xaar in 2002, inter alia to serve "as a technical sales tool to open up and support new applications", i.e. promote adoption of Xaar technology. The disposal of Vivid in 2005 suggests that it was not successful in this respect.

V.7 Industry Standard

Again referring to the technology adoption life cycle, the CSFB report asserted that, for Xaar, "*the establishment of a standard is key to winning over the pragmatists, thereby establishing a long-term presence in the mainstream market"*, whereby by "standard" the CSFB report meant a critical mass of end users. This assertion appears to be supported by Moore, who notes that a "*focus on standardization is, well, pragmatic."* It seems reasonable to assume that potential licensees would be more inclined to take a licence were Xaar technology to be seen as the standard, not least to avoid their products being perceived as sub-standard.

However, "standard" status alone would not appear to be sufficient for long-term commercial success: 2007 saw the Xaar annual report assert that the Xaar "P1" printhead was

> *recognised as the defacto standard throughout the graphic arts and industrial sectors. Compatible with a wide range of oil-based, solvent and dye sublimation inks, the Xaar 128 is extensively utilised across the C&M and wide format graphics industries.*

However, a year later, Xaar's revenue from the XJ128 dropped as it lost market share to competing printheads manufactured by licensees (cf. "Printhead Sales" and "Product Innovation" sections above). As previously mentioned, this was not a situation envisaged at

the time the CSFB report was written in 1999. Nevertheless, it emphasises the need for some kind of barrier to entry if maximum value is to be extracted from an industry standard situation.

V.8 Focus on product, not simply IP

The last critical success factor listed by the CSFB report was "focus on product, not simply on IP", the CSFB report noting that:

> *Customers tend to prefer products to paper IPR. Embodying one or more elements of IP in a product means that much of the production risk is removed for the end user and accelerates further market penetration. Hence, IP companies tend to enter strategic partnership agreements that give them access to production facilities. The partner may also contribute in translating the IP portfolio into products based on its industry knowledge and experience. In such cases, the royalty rates can be higher as production costs and risks are decreased for the end customer and a high IP content within the product means that competition can still be locked out (or significantly reduced).*

In respect of Xaar, the CSFB report noted that:

> *The expected depressed performance in 2000-2002 is indicative of the time taken for licensees of the technologies to develop products of their own incorporating the innovation and for these products to reach their end markets.*

In the event, and as illustrated in figure 1, royalties did not climb significantly in the years directly following 2002. This was in spite of licensees' new products as discussed above. Rather, a significant increase in royalty income only came in 2008 when, as previously discussed, a particular licensee promoted a competing product in the Chinese graphic arts market that had previously been dominated by the Xaar XJ128 printhead.

This episode supports the CSFB suggestion that growth in royalty income can be promoted by a product designed by the licensor: had Xaar not manufactured the XJ128 but instead offered the design to its licensees (rather than leaving them to design products of their own), those licensees may have entered the Chinese graphic arts market sooner and generated significant royalty income sooner.

In this particular instance, not only would Xaar appear to have designed a key product, it would also appear to have identified a key market, namely Chinese graphic arts. This is in spite of the licensees' "industry knowledge and experience" mentioned by CSFB. Again, had Xaar not supplied that market but instead offered it to licensees, those licensees may have generated significant royalty income sooner.

V.9 Long-term, recurring revenue

The CSFB report concludes with the observation that "*the IP model has distinct benefits over the more traditional product-sales-based strategies. It enables a company to develop multiple*

revenue streams from the same R&D base … These revenue streams tend to be long term and recurring in nature." As previously noted, this was not the view of Xaar in 2002 when it announced that "*given the difficulty in predicting both quantum and timing [of licence revenue], we are planning our business without relying on new licence revenues."* However, this attitude had changed somewhat when, in 2004, Xaar proposed the payment of Xaar's first dividend since becoming a public company on the grounds that:

> *with royalties from licensees increasing, the group has a non-trading source of income from which to fund dividend payments, without affecting its ability to reinvest trading profits back into the growth of its core business.*

V.10 Global Presence

Another conclusion of the CSFB report was that "*compelling technology will attract global, blue-chip partners which can help in areas such as further IP development, production and design and marketing, giving a small company global presence."*

Xaar certainly attracted global blue-chip companies: at the time the CSFB report was written, Xaar licensees/partners included Toshiba-TEC, Brother, Agfa-Gevaert, DuPont and Kyocera. As previously noted in III.3, it is also unlikely that Xaar technology would have been able to penetrate the Japanese office printer market without Xaar's Japanese licensees.

However, it is not apparent that these global licensees necessarily promoted Xaar's global presence: certainly, as previously noted in respect of printhead sales, Toshiba-TEC helped Xaar with the design and production of the "Leopard" printhead (whether this resulted in further, joint IP is beyond the scope of this study). However, Toshiba-TEC sold this printhead under their own name, leaving Xaar to sell the head under its own brand name into markets outside of Japan. Similarly, Xaar sold its printhead directly into the Chinese market and indeed in competition with licensees' printheads.

V.11 Quality

Under the heading of "Partnerships", the CSFB report also suggests that IP companies tend to join up with larger players who may *inter alia* take on product manufacture, thereby ensuring quality for the end customer. Quality is certainly acknowledged in the boilerplate "risks and uncertainties" section of Xaar's 2008 and 2009 reports which note that "*if our reputation is damaged through product quality or other issues our ability to generate sales may be harmed"*. Earlier reports also mention two manifestations of this risk, the first - in 2002 - relating to Xaar's own manufacturing activities, viz:

> *somewhat higher than expected warranty returns for the XJ500 product during the latter part of the year. The product has now been modified, with all claims settled or provided for in the results for 2002.*

While the second, in 2004, relates to an ink supplier:

> *The volume of ink shipped direct by Xaar also reduced … We are addressing this decline by … moving away from a product where quality has been unsatisfactory and which necessitated a change in suppliers.*

It is not clear whether the supplier was a contractor or a licensee. In the latter case, this would contradict the CSFB assertion regarding licensees ensuring quality.

VI. Other factors, not mentioned in the CSFB report but acknowledged in Xaar's annual reports, that have proved in some way relevant to IP or any other issues raised by the CSFB report.

VI.1 "Transition from first to second generation products"

The 2009 report noted that *"sales in Europe were depressed by the ongoing transition from P1 to P3 products"*. As previously explained, Xaar "P1" printheads had become the industry standard in certain markets by 2007, while "P3" was the new name for the "HSS" second-generation printhead discussed above with regard to application licence fees.

The report went on to describe a decline of P1 business in both graphic arts and coding/marking business but a growth of P3 printhead sales into the ceramic printing market. However, there was no mention of any customers in any particular market *transitioning* from a P1 printhead to a P3 printhead, suggesting that the "transition" was in fact within Xaar, namely from a position where the majority of income came from P1 products to a position in which the majority of income came from P3 products.

As to why the P1 business in Europe was declining, the 2009 report notes that:

> *The decline in P1 sales seen in 2008 has been halted and this business has stabilised, albeit at a lower level and at lower margins than historically achieved due to the increasingly competitive environment. For P1 products in 2009, there was growth in China, offset by some decline in Europe and South America*

As previously noted in III.1 above, the 2008 decline was primarily attributed to competition from one particular licensee. There was no suggestion of any drop in sales due to increased competition resulting from the expiry of early IP.

VI.2 Lack of focus by company

The CSFB report suggests that one of the benefits of the IP business model is that it "*enables a company to generate multiple revenue streams from the same R&D base, frequently leveraging this IP into new application areas focusing on new IP licensees."* However, Xaar's 2009 report suggested that servicing multiple customers could be problematic, noting:

> *an unexpected level of costs associated with the deployment of new products into diverse applications. These costs were predominantly incurred in solving final*

> *stage performance and quality issues, which were exacerbated by the demands of supporting multiple end product developments in parallel.*

And announcing an increase in focus, viz:

> *In order to overcome the 'commercialisation' difficulties referred to earlier, we have also focused more on achieving success with fewer applications, putting our resources behind those markets that we believe have the best chance of early success.*

VI.3 Variability of Licensee Pricing

The 2006 report noted that "*Royalties from licensees were little changed from the first half of 2005 due to lower pricing by one licensee for a specific market application.*" It is not clear whether this change in pricing was within Xaar's control. Variability of licensee pricing was not an issue identified in the CSFB report.

VI.4 Enforcement / Infringement

The "Financial Review" section of the 2008 report included for the first time a list of "Risks and Uncertainties", one of which explicitly mentioned IP, viz:

> *if we cannot enforce the intellectual property rights on which our business depends or if third parties claim that we infringe their intellectual property rights our revenue and profit may be adversely impacted*

Apart from this apparent "boilerplate" clause, the only explicit mention of patent infringement in the reports was in 2000 where it was noted:

> *When we acquired MIT in Sweden in March 1999, there was a US patent infringement action against MIT which we believed to be entirely without merit. However, in order to avoid the enormous time and expense of US litigation which would have been necessary to prove our case, we have taken a paid up licence to a limited number of US patents. This has been capitalised in the year as an intangible asset.*

A corresponding licence fee of £533k is indicated elsewhere in the report.

VI.5 Cost of IP

The cost of securing IP was not raised as an issue in the CSFB report. By Xaar, it was only raised once, in 2002, when it was mentioned as a cause of higher expenses alongside the running of the Hong Kong office, marketing costs and external project-related R&D costs.

VI.6 Other "Risks and uncertainties"

For completeness, the other issues mentioned in the "Risks and uncertainties" section of the 2008 and 2009 reports are identified below. Since the focus of this analysis is on IP, the extent to which these other risks were actually realised has not been considered.

- failure to grow the business
- under-performance of IT infrastructure
- inability to complete, integrate and manage any acquisitions or disposals
- changes to the economic/political environment
- failure to manage working capital
- failure to manage relationships with third party suppliers
- competition from direct competitors or third party technologies
- failure in product distribution
- exchange rate variation
- natural disaster

VII. Conclusions for today's early stage engineering companies and their investors

As this study only covers the experiences of one company, it is not be appropriate to attempt to extract any general lessons. Nevertheless, the study does provide an empirical data point to complement the general advice in the CSFB report. In particular, the study has established that whilst some of the factors, problems and possibilities identified in the CSFB report have been relevant to Xaar, others have not.

For those factors etc. that *have* proved relevant, the study serves as a practical example which may help the management of early stage engineering companies, their investors and IP advisors better understand the implementation of those factors. Where factors have *not* proved relevant to Xaar, the study should again help early-stage engineering companies to judge whether a particular CSFB recommendation is relevant to their own circumstances. The study has also identified two additional problems that have been acknowledged by Xaar but not mentioned in the CSFB report.

One of the success factors cited by the CSFB report is "an appropriate business model". To establish what might be "appropriate", the study has considered the various ways in which Xaar has earned income and the extent to which each way has been facilitated by IP. The resulting list of seven ways provides early-stage engineering companies with suggestions for ways in which they might employ their own IP to generate income.

The list also identifies the relative contribution to Xaar's income of the different types of IP, in particular patents and confidential know-how. This has important implications for the (typically restricted) budgets of early-stage engineering companies: protection by confidentiality, although not cost-free, is nevertheless substantially cheaper than protection by patent. Xaar's experience should help early-stage engineering companies to appreciate the importance of confidential information and to devote appropriate resources to its protection.

Investors may also be helped to view IP as a whole and not just to focus on numbers of patents.

With a view to putting the contribution of IP into perspective, the study has also identified a further six, non-IP factors that have contributed to Xaar's income. Again, this should help early-stage companies to better allocate their limited budgets between IP and non-IP assets with a view to maximising their chances of commercial success. It will also help investors to view a company's competitive advantage as a whole and not just in terms of IP and, in particular, patents.

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