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AUTHORS

Richard Tansey
Mark Neal
Ray Carroll

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Patent Aggression: High Risk Intellectual Property Strategies in the Semiconductor Industries

Richard Tansey[1], Mark Neal[2], Ray Carroll[3]

Abstract

This article identifies "aggressive patent litigation" as a key strategy in innovative high technology industries. For the purposes of discussion, the analysis focuses upon Rambus, a leading semiconductor (SIP) firm, which has famously pursued aggressive patent litigation since it was founded in 1990, up until the most recent US Supreme Court ruling on Rambus vs. Infineon 2003. The examination of Rambus' strategy over this period demonstrates that aggressive patent litigation in high-technology industries is often associated with extremely high levels of risk – levels of risk that are either tolerated or unrecognized by the executives of such companies. In terms of corporate ethics such bullishness or ignorance is problematic when one considers that the levels of risk and potential liability are rarely disclosed to stakeholders, particularly shareholders. When it goes wrong, aggressive patent litigation can threaten companies' finances, their brand and indeed their very existence. It is argued that such risks should be recognized and addressed by corporate lawyers and executives in the formulation of intellectual property strategy, and disclosed to stakeholders in corporate communications and forecasting.

Key words: intellectual property; corporate risk; patent litigation; semiconductor industry; technology networks.

Introduction

There is little doubt that Rambus's court battle is going to rank as one of the most closely watched events in the history of the semiconductor industry (Shafer, 2000).

Products or processes that utilize digital technology are systematized patchworks of subcomponent software and hardware technologies that are each protected via patent by often competing firms. At any one time, subcomponents of any particular bundle of computer technologies may thus be the subjects of inter-firm dispute centered on intellectual property rights and associated issues such as patent boundaries and payment regimes. More than any other current technology, digital technology is thus characterized by litigation and 'patent wars'.

Patent wars of course are not new. What is new is the number and intensity of suits surrounding these technologies. Such high levels of legal activity (and the consequent importance of legal strategy in determining firm performance) are related to the peculiar role of patents in the digital economy. In contrast to the discrete nature of pharmaceutical innovation where patents are granted for discovering a new molecule without referencing prior discoveries, semiconductor technologies are cumulative, requiring access to bundles of prior patents. New manufacturing entrants to the computer field, for instance, must acquire licenses from Texas Instruments for fundamental product patents, and from Fairchild Semiconductor for fundamental processes (Ziedonis, 2001).

Pioneering companies such as Texas Instruments, Fairchild and IBM established a successful patent-led strategy in the emerging digital economy, allowing other companies to utilize their technologies in return for access to further technologies, or payments in the form of license fees or royalties. In recent years, however, some companies without the capital of Texas Instruments or IBM have begun to utilize an extreme version of this strategy, one whereby the patented technologies are not utilized by the company in the production of their own products, but are 'hired out' to the manu-

[1] Ph.D., Associate Professor of Marketing, Department of Management, Marketing and International Business, Texas A&M International University, USA.
[2] Ph.D., Associate Professor, College of Commerce and Economics, Sultan Qaboos University, Oman.
[3] Ph.D., Associate Professor, Faculty of Management, Dalhousie University, Canada.

facturers of consumer computer products. What are now known as Semiconductor Intellectual Property providers (SIPs) thus develop and provide bundles or blocks of digital technology wholly patented by the firm for incorporation into other companies' final products.

Two of the most successful proponents of this strategy in recent years have been ARM and MIPs Technology, both of whom have regularly used litigation to protect their products. The most notable pursuant of SIP strategy, however, is undoubtedly Rambus, a company that specializes in high performance memory systems. Rambus has repeatedly used aggressive litigation not just to protect its intellectual property rights, but also to lever its products into other companies' final products, and to establish and sustain enhanced payment and licensing arrangements. This hyper-litigious strategy has certainly been successful, at times resulting in the out-performance of its competitors. However, it has not been without problems and costs: in the past two years Rambus has found itself successfully sued in turn by competitors and those it targeted.

This article examines intellectual property strategy in the digital economy. As a focus for this it examines Rambus' two key strategic initiatives since 1992, namely, its RDRAM[1] alliance with Intel, and its post-Intel patent litigation strategy. The analysis of these strategic initiatives is done in three stages: firstly, it identifies the divergent strategies used by semiconductor manufacturers and SIPs towards using patent portfolios as revenue generators; secondly, it examines Rambus' aggressive patent litigation strategy after Intel withdrew from its commitment to sell only Pentium processors with RDRAM; and, thirdly, it discusses how Rambus' behavior precipitated an avalanche of negative litigation outcomes that, in turn, led to a Federal Trade Commission suit and civil suits on insider trading (Table 1).

An examination of the Rambus controversy in this way tells us a great deal about how innovation is protected and contested in the digital economy. Certainly, it shows just how important legal expertise and strategies are in determining the success of SIP products and companies. It further allows us to examine and assess the costs, benefits and knock-on effects of high-risk aggressive litigation in intellectual property management, thus gleaning lessons applicable to innovative industries generally. In such a way, this article examines the aggressive protection of intellectual property rights as a key corporate strategy in the semi-conductor industry, gleaning hard lessons for the analysis, assessment and practice of strategic management in the wider innovative industries.

Rambus and SIP strategy

Rambus was founded by two engineering PhDs in 1990. By 2003 it was one of the top three companies in the SIP sector. Strong growth and its (related) aggressive strategies ensured a ballooning reputation in the financial sector, where it was increasingly recognized as being strategically as well as technologically innovative. Notably, in response to Rambus' new royalty strategy of collecting fees on all S(synchronous)DRAM (dynamic random access memory) and DDR (double data rate) memory, Mark Edelstone, Morgan Stanley's chief semiconductor analyst, stated to investors:

> *"Rambus has the long-term potential to become the most powerful intellectual-property company on the planet" (Varchaver, 2001).*

Rambus' activities, growth and reputation have to be understood within the context of the short history of the semiconductor industry as a whole. Within more traditional digital firms, Integrated Device Manufacturers (IDMs), semiconductor research and development were vertically integrated within a manufacturing system, usually of digital subcomponents or consumer products. Within the context of this vertically integrated structure, IDM firms came to rely on their patents as bargaining chips to gain access to each other's patents. Patent cross-licensing thus came to sustain a dominant industry theme that "No Company is an Island" as articulated by Intel's CEO (Vogler, 2000). Cross-licensing thus became established IDM practice for new product development, and created a culture in which firms gained inexpensive access to each other's patent portfolios.

Some IDMs, however, did not fully embrace cross-licensing. Notable exceptions such as the big players IBM and Texas Instruments instead aggressively pursued licensing fees. On the

[1] Rambus Dynamic Random Access Memory (copyrighted).

whole, such strategies were successful, and in the case of IBM the revenue from licensing fees grew to the point where they were annually generating $1 billion in patent income – an increase of 2000% over 1988 (Sandburg, 2001).

Econometric studies (Hall & Ziedonis, 2001; Lanjouw & Schankerman, 2001) have identified several further trends in U.S. semiconductor firms' patent portfolio strategies. IDMs such as Intel have substantially enlarged their patent portfolios over the last 15 years as a defensive response to shorter product life cycles (Carroll & Tansey, 2000). As part of its intellectual property management strategy, Intel has also erected a "thicket of patents" (Hall & Ziedonis, 2001) to protect its huge investments in state-of-the-art wafer fabrication plants (fabs). Fab investment is an important but costly arm of IDM investment and growth. Between 1980 and 1995, new fab construction costs increased from $100 million to $1 billion despite a fab's decreasing useful life from 10 to 5 years. Construction costs per operating year increased 20-fold during this period. As a further gauge of the importance and cost of fab investment in IDM strategy, Intel, in 2003, faced a $3 billion price tag for constructing a new overseas Pentium fab.

As well as being costly, Fab investment is also risky. Fab production embodies hundreds or even thousands of patentable technologies, held anywhere along the semiconductor value-chain (suppliers, manufacturers in other industries, rivals, SIP, and independent vendors). Any of these value-chain members potentially can use patent infringement suits as a means of obtaining a court order to close down IDM fabs.

IDM patent strategy after the 1985 U.S. Supreme Court Kodak infringement case

> *If they [Infineon and Micron, two of the four largest global memory manufacturers] lose, they will need to reach a settlement with Rambus, or face an almost total shut down of their DRAM business (Kumagai, 2002).*

A 1985 U.S. Supreme Court patent-infringement decision against Kodak played a pivotal role in making intellectual capital and patent management a top priority for semiconductor executives (Hall & Ziedonis, 2001). Kodak had intentionally infringed on Polaroid's instant-film camera technology, assuming that they would escape paying royalties. In the worst-case scenario, they expected to face a maximum penalty of paying retroactive royalties to Polaroid. Much to Kodak's consternation, the Supreme Court imposed an almost $1 billion fine against them, ordering the closure of their instant camera production facilities.

Understandably, in the wake of this ruling, semiconductor IDMs feared that similar court actions would impose huge financial burdens if their factories were closed down even temporarily. Reviving memories of the Kodak decision, Rambus' litigation campaign now posed a similar risk for the much larger IDMs.

IDMs' arm-length tactics against SIP patent trolls

> *In the sleepy village of Santa Clara, there lived a very wealthy but very frightened giant named Intel. Intel was plagued by a fearsome band of evil trolls – patent trolls, to be exact – who wanted a glittering pot of gold in exchange for doing absolutely nothing. And they were very powerful because they said they owned the patent on some of the magic Intel used to become rich (Sandburg, 2001).*

IDM firms have used industry standard groups to create a mechanism for avoiding excessive fees charged by IP design firms. Under the rules of the JEDEC Solid State Technology Association (JEDEC)[1], the leading U.S. semiconductor trade association, member firms agreed to cross-license patents for reasonable fees in a nondiscriminatory manner. Traditionally, JEDEC members accessed each other's patents for fees of 1-2 % of gross sales revenues.

[1] JEDEC Solid State Technology Association was formerly known as the Joint Electronic Device Engineering Council. Founded in 1960, it has grown to become the most important standardizing trade council for the semiconductors industry.

Despite JEDEC's protective umbrella, Intel currently faces multiple patent infringement lawsuits from IP design firms that could potentially halt its new Pentium microprocessor fabs. Firstly, TechSearch, a highly successful company based on the buying, licensing and leasing of high-tech patents, acquired microprocessor patent rights in 1998 from Meta Systems Inc., a defunct computer chip designer, and immediately sued Intel for patent infringement, seeking $2-$7 billion in damages, and an injunction against Intel to stop production of its Pentium processors. Intel resorted to extreme legal tactics to undermine TechSearch's claims, including the creation of a Cayman Islands-based shell company. A second antagonist, Intergraph, won a major patent case against Intel in the federal Circuit Court of Final Appeal. Intergraph claimed that some Pentium processor innovations were covered by its patents rather than by the patents that Intel inherited 26 years ago from National Semiconductor Corporation (Graham, 2001).

Strange bedfellows, broken promises, and negative memory IDM reaction

> *Desi Rhoden, JEDEC chairman, stated: From the beginning, Rambus has been arrogant. Rambus used to say, 'We're going to bury the memory industry.' The company was also known for its heavy-handed tactics. Rambus' contracts forbade customers from saying anything negative about Rambus in public. Rambus threatened unspecified retribution on several occasions when people made statements that Rambus took exception to. Lots of people got slapped around (Varchaver, 2001).*

Why then did Intel, given its Pentium patent problems, sign a strategic alliance in December 1996 with Rambus, the most legally "aggressive" SIP firm? Intel entered this alliance with mixed motives. It publicly revealed its technological needs for RDRAM to support its new Pentium processors. But – crucially – it did not disclose the financial incentives received from Rambus for including RDRAM in its Pentium PCs (Semiconductor Technology License, 1997).

Intel realized that computer performance, and thus market penetration, were driven by memory and microprocessor speeds. Faced with technological blocks in achieving enhanced performance, Intel's only option in 1996 was to enter a strategic alliance with Rambus: no other memory standard utilized Pentium's processor speed improvement, from 400 megahertz to 2 gigabytes. Other memory suppliers, Infineon and Micron increased memory speeds annually by less than 10%, versus 60% for microprocessor performance (DEW Asssociates, 2002). Thus, Intel struck a Faustian bargain by aligning itself with a legally aggressive SIP while exposing consumers to higher prices and drastically altering future technology roadmaps. As a reward, Intel gained access to critically essential high-speed bandwidth memory for accelerating Pentium 4 sales.

Despite incomplete disclosure about its motives, Intel scrupulously followed JEDEC's pricing policy in structuring its new Rambus alliance. Intel adhered to JEDEC's policy of reasonable and non-discriminatory licensing fee rates by including a provision restricting Rambus' opportunistic pricing propensity against itself and memory IDMs. To shield itself, Intel received a 'most favoured customer' price status, guaranteeing that it received the lowest Rambus customer price (Robertson, 2000). Intel included another clause, capping the direct RDRAM royalties (2-2.5%) that Rambus charged memory IDMs (Samsung, Toshiba, and Infineon). This clause guaranteed that fees above this cap flowed to Intel, not Rambus.

As part of the deal, Intel promised to use its chipset patents for promoting RDRAM acceptance among memory IDMs. As the largest global chipset producer and patent holder, it strongly influenced which memory devices emerged as the PC standard. RDRAM was competing against two alternative memory standards (SDRAM and DDR).

To Rambus' dismay, Intel was unable to protect its chipset patents from Via, a Taiwanese firm (Murphy, 2000). As a consequence, SDRAM achieved a global market share of 90% in 2001. Intel's bargain with Rambus had thus been undermined because of Intel's inability to enforce its patents, its failure to develop cost effective chipsets in a timely fashion (Burstiner, 1999), and its failure to develop RDRAM motherboards (Henning, 1999). Recent revelations about Intel's financial motives for entering this Faustian bargain have also embarrassed Rambus executives by exposing their mercenary tactics for obtaining Intel's support.

Rambus had agreed to issue 4 million common shares at $2.50 each to Intel for shipping over 20% of its Pentium PCs with RDRAM memory in 2 consecutive quarters. If they had reached this quota in June 2000, Intel would thus have earned $508 million simply by selling these warrants at $127, compared to Rambus' 1997 IPO $3 price (Rambus, 2000 SEC Form 8-K). Understandably, semiconductor analysts were infuriated when this hidden license clause came to light. They charged that Intel had aggressively advertised RDRAM as the best memory standard based on its technological superiority without disclosing its financial interests (THG, 2002).

A Different Kind of Business

We're an innovation company. If you're going to sell ideas, you'd better have innovative stuff. If your ideas are just ho-hum, people are going to say, "Why pay Rambus for that?" (Geoff Tate, Harvard MBA and Rambus CEO quoted by Kumagai (2002)).

In order to assess Rambus' strategies, it is necessary to go deeper into the nature of its products, particularly RDRAM. As has been mentioned, Mark Horowitz and Mark Farmwald, PhDs and electrical engineering professors, founded Rambus in 1990, filing patents that introduced innovations for radically changing the protocol, electrical signaling and components in PC memory. RDRAM speeds up data transfer rates over 8 times from PC memory to a microprocessor. Rambus' vision of increased transfer rates occurred "long before anyone else . . . Rambus' 1990 vision was as sci-fi as the PlayStation 9 is to us in a world of the PlayStation 2" (Jacobs, 2001).

Rambus' supporters emphasized that RDRAM offered superior features including pure bandwidth, memory granularity, and pin-count. Such benefits explained why this technology became a key component in over 250 workstations, desktop PCs, game consoles, and high-definition TVs.

Rambus' cofounders however lacked the $1 billion necessary for building a memory fab in the $32 billion global DRAM industry. To compete, they established an IP firm to license its technology, charging royalties and consulting fees to memory IDMs. By 2002, Rambus collected royalties on 104 U.S. patents.

Marketing expensive RDRAM as a premium specialty product was challenging in a commodity memory market. Most memory IDMs compete on price by selling 128Mbit SDRAM, now described as a "pure commodity". In the memory industry, "there's incredible pressure to keep costs low. There is nothing in DRAM that hasn't been around for years" (Kumagai, 2002).

SDRAM and DDR, in contrast to RDRAM, are incremental advances incorporated as JEDEC open memory standards. Since they build on existing designs, they are cheaper, smaller, and sometimes even faster than RDRAM in current PCs (Shafer, 2000). A low price strategy was a necessity during 1996-1999 when memory IDMs lost billions of dollars in the Asian financial crisis and semiconductor cyclical market slump

Infineon (a spin-off from the Germany company Siemens) and Micron thus rejected Rambus' call for a new technological leap forward. For them, memory IDMs operated under the banner of "evolution, not revolution."

"In order to make it dirt cheap, we tend not to use technology on the bleeding edge"(Kumagai, 2002).

Origins of the Infineon - Rambus dispute

Rambus' vision was to transform the memory industry from a low price commodity business to a premium price specialty market. Rambus' RDRAM however was a "disruptive technology" whose adoption entailed large-scale changes in chip testing, packaging, and motherboard design. This new vision provoked a negative response from memory IDMs. Indeed, a 1992 Siemens memorandum referred to RDRAM as "a deadly menace to the established computer industry" (Kumagai, 2002).

In 1990, Siemens signed a nondisclosure agreement (NDA) regarding Rambus. Rambus' attorneys had alleged that Siemens engineers had knowledge of their client's new technology prior to the 1992 JEDEC meetings. This is known because, just hours after the 2001 Judge Robert E. Payne's ruling against Rambus, Infineon finally complied with a court-ordered search request: this subsequent search uncovered a 1992 Siemens' memo that proposed making a public domain ver-

sion of RDRAM. Rambus' attorneys alleged that Infineon had thus "cherry-picked" by breaching its earlier NDA, and used this knowledge to draft JEDEC open standards in which SDRAM and DDR each incorporated key RDRAM patented features.

Rambus' proactive litigation strategy as a patent troll on SDRAM and DDR

> *Incredibly, Rambus – which designs its own version of DRAM technology – was attempting to claim ownership of a competing DRAM design, one that Rambus had long maligned as inferior. Rambus' design was a Ferrari, to use the company's own analogy; its competition a Volkswagen. Rambus wanted to be paid, not just for the Ferraris, but also for the Volkswagens (Varchaver, 2001).*

In 1999, Rambus faced a strategic dilemma for pursuing its RDRAM strategy: the 3 largest IDMs refused to adopt RDRAM as their standard memory device, and Intel followed their lead by abandoning its strategy of using RDRAM as its main memory device for its Pentium computers. Despite investing $850 million in memory IDMs, especially Samsung and Micron, Intel had failed to convince memory IDMs about RDRAM's superiority: IDMs believed that SDRAM and DDR were cheaper, smaller and faster. Reacting to IDM truculence, Intel finally capitulated by relegating RDRAM to a niche product status for its high-end desktop PCs and network equipment.

Rambus reacted to this Intel decision by initiating an extended litigation campaign against memory manufacturers claiming that IDMs had illicitly incorporated RDRAM features (delayed lock loop, variable block size, delay line latency, and dual edge clocking) into JEDEC-approved SDRAM and DDR standards. As part of this campaign, Rambus issued an ultimatum to Infineon, Micron and Hynix: pay a DDR royalty fee of 3.5% (almost double normal fees) and a 0.75% SDRAM royalty fee, or face Rambus patent infringement suits (Jacobs, 2001). A semiconductor columnist described this strategy as the "new-millennium Rambus – wielding a patent club in one hand and beckoning 'come join us' in the other" (Lammers, 2000).

The "new-millennium strategy" thus used legal coercion to achieve its pricing goals. Rambus' high DDR royalty fee was a heavy-handed tactic to pressure IDM adoption of RDRAM as their future memory standard. Rambus also used its SDRAM royalty fee rate to generate substantial revenue. This initiative's cornerstone was Rambus' demand for IDMs to comply or face costly patent litigation. Rambus punctuated this demand, threatening to impose 10% license fees, or even worse, refusing licenses to non-complying IDMs. Rambus implemented this threat by filing cases against the world's three largest memory manufacturers in U.S., German, French, and British courts.

Rambus' undisclosed legal liabilities

Patent and intellectual property cases are complex, especially when dealing with a highly technical subject like integrated circuit design. It is clear that Rambus made some mistakes in the first trial that they are not likely to repeat, but there is also reason to believe the non-technical judge was out of his league when he attempted to dissect the patents and determine their applicability to Infineon's products which he knows little about. There is also speculation that political pressures had more influence on the case than the technology itself (Pitcaim, 2001).

As the opening salvo in its patent litigation campaign, Rambus filed a suit in the U.S. Eastern District Court of Virginia against Infineon in 2001 for infringement of 4 patents and 57 claims (McDaniel, 2002). Nicknamed the "Rocket Docket" for its speed in resolving civil cases, this court offered Rambus the hope of obtaining a summary judgement or a short trial (6-8 months). Several semiconductor analysts agreed that Rambus' litigation strategy was well grounded since its patents were well written with several pages each of detailed technical references (Lammers, 2000).

The IDM litigation campaign was thus initiated and sustained by a bullish belief that aggressive litigation would result in the desired outcome. There were however severe risks associated with this strategy, risks that were either ignored or covered-up. Certainly, Rambus executives did not produce a detailed disclosure of the nature and scale of the risks and potential liabilities of litigation. Their accounting disclosures downplayed the economic costs (Table 1) and omitted a factual discussion of the legal risks Rambus incurred by suing Infineon. Instead, Rambus' disclo-

sures emphasized that its legal case was strong and that it would quickly and decisively prevail (Rambus, 2000, Annual Report).

Table 1

Negative Consequences of Rambus Patent Litigation

Issue	Rambus legal Activity	Financial/Legal Costs
1. Wall street shares coverage	1a. Filing civil lawsuits against Infineon, Micron, and Hynix in Virginia and Deleware federal circuit courts 1b. Rambus analysts predicted that if successful in its suits, its annual sales revenue would increase from $72 M to $1 B in IDM royalties	1a. Dan Niles semiconductor analyst at Lehman Brothers in San Francisco stated: " I think these lawsuits were based upon desperation." Lehman dropped its coverage of Rambus stock in May 2001 (Wade, 2001)
2.Fraud conviction for illegally concealing its SDRAM patents from JEDEC standard setting deliberations	2a. Between 1999 and 2001 8 major DRAM firms agreed to pay SDRAM royalties to Rambus 2b. The 3 largest memory IDM (Infineon, Micron, Hynix) filed counter suits against Rambus based on Judge Payne's fraud ruling.	2a. Jury award of $3.5 million in Virginia District Court as a penalty for fraudulently deceiving JEDEC. Subsequently, this award was automatically reduced to $350,000 under a punitive damage cap 2b. Judge Payne ordered Rambus to pay Infineon $7.1 M for legal fees. In essence, Payne's award amounts to a "pay for play" penalty that many U.S. lawyers advocate to reduce frivolous patent infringement suits
3. High legal fees	3a. In 2001 Rambus spent between $1-2.5 M per month on these suits 3b. Rambus' quarterly legal costs increased from $660 T in Q2 of 2000 to $7.3 M in Q2 of 2001.	3a. Legal fees "devoured a scary 23% of Rambus' revenues" in April-June, 2001 (Varchaver, 2001) 3b. Rambus had $153 M in cash reserves and was able to absorb increased legal fees. However, the increased legal fees seriously reduced Rambus' reported EPS
4. Threat of Federal Trade Commission probe	4a. Rambus is facing the possibility of appearing before a FTC hearing on the charge that nondisclosure of its SDRAM patents during 1992-1996 JEDEC hearnings constituted a restraint of trade- violating U.S. antitrust laws	4a. High legal costs for FTC hearings 4b. 1996, FTC charged Dell with hiding patents from a standards setting body and ordered Dell to surrender these patents

The initiation of the IDM litigation campaign was a strategic juncture, beyond which the company was exposing itself not just to potential gains, but also to high levels of risk and potential liability. There is no doubt that the significance of this juncture went either unrecognized, or was underestimated by the executive; for beyond it lay not just threats to its balance sheet, but threats to its brand.

At this strategic juncture, several factors should have encouraged caution in Rambus' strategic thinking. Rambus executives however careered through and past the juncture of no return, and soon found themselves facing problems that either they had not anticipated, or issues for which they were under-prepared.

The main issues were as follows:

1. *Judge vs. jury driven patent litigation process creating an adverse legal environment for plaintiffs*

The U.S. Supreme Court Markman II ruling stipulated that "patent claim construction is a matter exclusively for the trial judge, not the jury" (McDaniel, 2002, p.20). Rambus thus exposed

itself to multiple legal risks by filing the Infineon case in the Eastern District Court of Virginia. In particular, its attorneys were unable to anticipate the assignment of the presiding judge. This court randomly assigned patent cases to all available judges and had opted not to designate a single judge as a patent specialist. Less than 1% of all U.S. civil court cases involve patent litigation (Lee and Evans, 2002). As a consequence, most judges lack the court expertise to preside over complex patent infringement cases. To sum it up, Rambus' attorneys thus faced an adverse legal environment favouring defendants' rights, since judges tend to rule in favour of defendants and their claims that patents should be narrowly construed (Lee and Evans, 2002).

2. *The misfortune of being assigned a conservative judge*

In Rambus, Inc., Plaintiff v. Infineon Technologies AG, et al., 2001, the plaintiffs' attorneys confronted Judge Payne who, in his Markman rulings, rigorously pursued a narrow interpretation of the claims and artwork contained in the disputed patents. A Markman hearing is a critical stage in a U.S. patent infringement case, whereby the judge decides on both the scope and meaning of key terms in the patents (Lee and Evans, 2002). In the Infineon case, Judge Payne made several Markman rulings that severely hindered the ability of Rambus' attorneys to prosecute their case:

M_1) Judge Payne ordered that the entire discovery process be completed before beginning the Markman hearing. In its Markman II ruling, the U.S. Supreme Court had encouraged district courts to conduct Markman hearings early in the trial process so attorneys could more effectively conduct their search presentations within the parameters defining the disputed patent's scope. This however did not happen. Thus, Rambus' attorneys presented evidence in the discovery process without knowing how the judge would interpret the scope and content of their memory patents.

M_2) Judge Payne relied heavily on extrinsic legal evidence provided by technical experts to arrive at his Markman decisions. Judges in this district court usually relied on intrinsic evidence to render such decisions (McDaniel, 2001). Because of Judge Payne's reliance on extrinsic evidence, Rambus was at a serious disadvantage in the discovery process for presenting evidence to influence the judge's Markman rulings. Rambus literally had to guess what types of witnesses and information would be useful for obtaining favourable rulings (Final Pre-Trial Conference, 2001).

M_3) Judge Payne adopted a narrow interpretation of Rambus' patent claims, ruling that Infineon's bus technology[1] was not covered by Rambus' RDRAM tripled multiplex bus technology. After this ruling, he dismissed Rambus' patent infringement claims. But the examination did not stop there. Judge Payne focused the remainder of the trial on Rambus' fraudulent activities while a JEDEC member between 1992 and 1996.

3. *Class action lawsuits triggered by Judge Payne's fraud ruling*

From conception, Rambus' litigation strategy was reminiscent of another legal quagmire (Watergate cover-up) because of its questionable behaviour at JEDEC meetings, especially its use of a secret informer nicknamed Deep Squirrel (Stern, 2001b). Rambus' rivals focused their subsequent counter-Rambus legal strategy on its fraudulent participation in JEDEC meetings, especially its misappropriation of other members' SDRAM trade secrets (Stern, 2001a). In the light of this counter-evidence, the jury in Judge Payne's court finally ruled that Rambus was guilty of fraud.

This verdict exposed Rambus to a flood of investor class action suits. Under the 1995 Private Securities Litigation Reform Act (PSLRA), Rambus had been shielded from frivolous investor lawsuits. The law required a plaintiff's attorney to include specific details of fraudulent corporate actions as a necessary condition for filing a class action lawsuit (Price Waterhouse Coopers, 2000). This fraud verdict stripped away Rambus' immunity from the following negative effects relating to investor lawsuits (IL):

IL_1) After the Infineon case, 15 civil cases were filed against senior Rambus executives for insider trading. These suits alleged that Rambus executives concealed information from investors on the firm's fraudulent JEDEC activities. For example, a legal firm, representing the Teach-

[1] Bus: a set of wires that allows communication between the main microprocessor and memory, ie. addressing or instructions. In the Rambus vs Infineon case, Judge Robert Paine ruled that Infineon did not infringe Rambus' memory patents because Infineon used an ordinary bus in its SDRAM and DDR DRAM memory devices. He ruled that the term 'bus' in Rambus' patent referred to a multiplexed bus.

ers' Retirement System of Louisiana, was appointed lead attorney in a consolidated class action suit against Rambus (Toiv v. Rambus INC., Geoff Tate et al., 2001).

IL_2) Rambus did not disclose adequate estimates of the future class action lawsuit costs. If Rambus were to win an appellate reversal of the SDRAM fraud verdict, it might escape the huge litigation costs incurred from investor lawsuits. If unsuccessful in obtaining a reversal, however, it would have to defend itself in class action suits. The plaintiffs had hired major law firms specializing in patent infringement cases. These same law firms represented a formidable foe, especially after their recent tobacco litigation victories in which they collected contingency fees amounting to hundreds of millions of dollars. To illustrate the potential legal whirlwind facing Rambus, consider the qualifications of William S. Lerach, who had been recently appointed lead attorney to prosecute Enron in a civil case (Iwata, 2002). He also filed a class action suit against Rambus claiming fraudulent executive conduct and insider trading (Matthew Greenblatt and Charles A. Harad, v. Rambus INC., Geoffrey R. Tate et al., 2001). Lerach's suit claimed that Rambus executives earned an illicit $125 million profit through insider trading. As a small firm, Rambus thus faced an uphill struggle against Lerach's powerful firm, a firm that employed 2-3 times more attorneys than the number of engineers employed at Rambus.

Looking into the abyss

True to its nature, Rambus appealed, and the case was sent up to the U.S Court of Appeals. In the meantime, Rambus found itself circled by potential litigants, and faced the prospect of spiraling legal costs, multiplying suits, and its reputation, indeed, its brand, indelibly tarnished. Industry commentators at the time noted with some glee that Rambus had lived by the sword, and faced the prospect of dying by the sword.

More than any other SIP, Rambus had pursued a strategy of 'hyper-litigation' in protection and promotion of its intellectual property rights, a strategy that Rambus had pioneered but which had become increasingly prevalent in the SIP industry. This strategy however had caused huge disruption and turbulence to anyone associated with it. The brand name Rambus had become synonymous not just with litigation, but with turbulence, with risk, with trouble. This was at once ironic and appropriate, for, as we have seen, its main product, RDRAM was itself a highly disruptive technology. The consequences of these bad public relations for Rambus were enormous: although IDMs were still hungry for RDRAM, they were increasingly wary of dealing with Rambus, something that not only had implications for Rambus' revenue, but for the memory industry as a whole.

The pursuit of hyperlitigation to protect its patents and to lever them into established or developing products, can be seen as an ultra high risk strategy. In the pursuit of this strategy, Rambus' executives showed either naivety or huge courage. They certainly showed a huge disregard for the enormous risks associated with their campaigns – risks to shareholders (as seen by the wild stock swings), risks to the brand-name, and even risks to the existence of the company itself. Certainly, after the Virginia ruling, the indictment for fraud, and the surge in potential class actions, the strategy seemed to have failed. Rambus had lived by the suit, and looked about to die by the suit. The ultra high risks Rambus had exposed itself to threatened to undermine the company itself.

A wild swing in fortune

In January 2003, the Federal Court of the US Court of Appeals overturned much of the Virginian ruling. Effectively it disagreed with Judge Payne's decisions on the scope of Rambus' patents (one of the main factors in undermining Rambus in the Infineon case), leaving Rambus free to pursue its original case against Infineon. It also overturned Judge Payne's ruling that Rambus had committed fraud. It disagreed about the need for full disclosure at the time of Rambus' dealings with JEDEC, and instead criticized JEDEC for unworkable, vague guidelines that led to confusion among all parties and led to the need for resolution of the issues in the courts.

This then was a wild swing in fortune for Rambus. Not only was it free to pursue its case against Infineon and other IDMs, it was free of the finding of fraud, thus protecting it from the class action suits it had lined up against it. This was good news for Rambus, and was perceived to

be so by commentators and the markets – in the two days following the news, stocks in Rambus almost doubled in price at a time when semiconductor stocks were in relentless decline.

The 2003 Supreme Court ruling thus changed the fortunes of Rambus from potentially desperate to excellent, a further indication of the extreme risks and turbulence associated with aggressive SIP litigations. Had the ruling gone against them, the future would have been very different for Rambus, and indeed for the semiconductor industry as a whole, particularly SIPs.

But the ruling was positive, and was welcomed gleefully by the company's executives, who immediately began preparations for a re-run of the Infineon case, another costly and risky endeavour which will lead inevitably to one of two outcomes for Rambus – a huge increase in income from punitive penalties to be paid by Infineon; or, a huge increase in Rambus' financial liabilities and a corresponding slump in investment.

Not many companies in mature, mainstream industries would entertain such 'do-or-die' strategies. Such strategies are however increasingly common, not just in the semiconductors industries, but in other innovative technology sectors. Certainly, the nano-technology and gene-technology sectors are increasingly riven with intellectual property disputes, both 'vertical' (small innovative company vs. large established company) and horizontal (small innovative company vs. small innovative company). Rambus' aggressive and high-risk legal strategy can thus be seen as a model for small innovative companies in emerging high-technology industries. The model can be summed up as 'innovate, patent and sue'. The fact that many of these innovative companies are (by definition) relatively small in terms of size and investment, means that such strategy poses risks that threaten the continued existence of the companies themselves. Furthermore, the fact that such companies play the game of suing much larger companies (companies that have greater resources and are much better able to accommodate the costs of failed litigation) means that they are often exposing themselves to greater level of risks that those they are suing. Innovative companies such as Rambus are thus pursuing policies that would give executives in more mature industries nightmares. An important ethical question is thus whether such companies disclose the enormity of such risks to their stakeholders, particularly investors.

Conclusion – disclosing the risks associated with 'innovate, patent and sue' strategy

Fabless intellectual property firms are significant participants in the global semiconductor industry. SIP firms such as Rambus play a critical role in providing new reusable and retargetable digital designs required in advanced electronic devices. IDMs rely on SIPs to provide state-of-the-art techniques to develop next generation PCs, wireless chips, and systems on a chip. IDMs do not possess the financial and human resources to develop these new technologies. Increasingly IDMs must form strategic alliances with SIPs to reduce testing and validation costs, accelerate time to market for new products, and reduce their fab operation costs.

The failure of the Intel/Rambus strategic alliance explains why Rambus aggressively initiated a new patent litigation strategy against memory IDMs, especially Infineon. Initially, this strategic alliance accommodated Rambus' aspiration to emerge as a major participant in the global DRAM market. Intel's cooperation promised not only to validate RDRAM as a memory standard, but also to confirm Rambus' status as a premier semiconductor firm.

The demise of this strategic alliance encouraged Rambus executives to expand their patent licensing programs to SDRAM and DDR. In announcing this new strategy, Rambus failed to disclose a detailed list of potential legal risks threatening this strategy's viability. Wall street analysts are experienced in assessing economic risks but have shown less expertise in the assessment of litigation risks. Traditional disclosure measures tend to be primarily financial, often sacrificing relevance for reliability. To be relevant, information must be timely, provide feedback value, or have predictive validity (Carroll and Tansey, 2000, pp. 301-302).

Certainly, Rambus executives did disclose the strength and detail of their RDRAM patents. But were these disclosures timely? Did they contain feedback value? Did they have predictive validity? Regarding the timeliness issue, both Intel and Rambus disclosures were deficient. Neither party reported the financial incentives offered to Intel for participating in their strategic alliance. Rambus also failed to disclose its JEDEC behaviour to investors in a timely fashion.

Regarding Rambus disclosures' feedback value, information should report how well Rambus managed legal resources and how efficiently and effectively its patent litigation strategy achieved its goals. Rambus exaggerated the speed and ease of implementing its litigation strategy. They did not warn investors about the pitfalls facing any patent lawsuit in an adverse U.S. legal climate, the role of luck in being assigned a judge who was favourably predisposed to plaintiff arguments, and the lengthy litigation process from the federal district court to the final appeal court. These risks were magnified by the fact that Rambus suits were filed in at least 4 countries. Finally, their disclosures had poor predictive validity, since investors were unprepared for Judge Payne's denial of Rambus' SDRAM rights and his imposition of substantial fraud penalties.

The accounting profession should thus consider adopting new disclosure rules for SIPs (Carroll and Tansey, 2000). Increasingly, SIPs will seek court injunctions against IDMs for patent infringement. Reported patent litigation is almost a daily event in the global semiconductor industry. Investors need sufficient information which allows them to adequately assess litigation risks and uncertainties created by patent infringement suits. Without such information, investors will continue to overreact and create artificial short-term volatility in the market. In recent years, academic and practitioner attention has been riveted to the Enron criminal case in which accounting reformers were calling for stricter financial reporting guidelines. Public attention has so far overlooked the implications of the Rambus civil verdicts and thus there is little political momentum to require SIPs to adopt stricter legal reporting guidelines.

From the evidence discussed in this article it is not clear whether the executives of innovative high-tech companies are fully aware of the risks they take through pursuing strategies of aggressive patent litigation. What is crystal clear from the evidence, is that stakeholders to such companies are not.

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