



# EXECUTIVE BRIEFING

## Towards an Approach to 'Intellectual Property'

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### ABSTRACT

'Intellectual Property' is a complex subject. In working to define a global open system for the automatic identification of physical objects by computers, the Auto-ID Center is creating common platform technology in some areas, such as software, and specifying common interfaces in others, for example radio frequency identification tags. 'Open system' means that these common linking technologies should be available for use by all, ideally without royalties, and certainly without punitive royalties or discrimination.

Providing this availability requires an intelligent, practical approach to considerations such as licenses, patents, copyright and trademarks. Without such an approach, the emerging competitive market for products and services compatible with the Auto-ID Center's open system may be impaired or restricted, for example by lawsuits and countersuits among vendors and patent holders, or by pollution by non-compliant or 'partially compliant' technology.

This question touches on a number of interesting philosophical issues, such as the role and provision of common goods in capitalist societies, the ownership of ideas, the use of law to restrict or encourage competition and innovation, and the importance of open infrastructure in an age of globalization and 'high' technology. The Auto-ID Center is not charged with addressing these issues: its mission is to provide technology that its sponsors and others can actually use, and soon. This paper acknowledges that these questions exist, but it does not seek to address them. Instead, it outlines the opportunity; summarizes some helpful precedents; and discusses possible practical approaches. It is not an agreed position, nor a legal one. It is not written by, or with the help of, lawyers. It does not represent or claim to represent any policy of the Massachusetts Institute of Technology, or any other University, Corporation, Organization or Individual involved with or affiliated to the Auto-ID Center. It offers no opinion, either express or implied, on whether any particular patent is valid, or infringed. It is only intended to summarize some relevant questions and possible answers and, by so doing, to take the Auto-ID Center and its sponsors closer to a sensible conclusion. It is a discussion document, and nothing more.

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### Biography

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**by Kevin Ashton**  
Executive Director

Kevin Ashton is Executive Director of the Auto-ID Center. He is on loan to the Massachusetts Institute of Technology from the Procter & Gamble Company. He is a graduate of University College London, and a Visiting Engineer in MIT's Department of Mechanical Engineering.

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## 1. INTRODUCTION

<sup>1</sup> Sarma et al, 2000

‘Intellectual Property’ is a complex subject. In working to define a global open system for the automatic identification of physical objects by computers<sup>1</sup>, the Auto-ID Center is creating common platform technology in some areas, such as software, and specifying common interfaces in others, for example radio frequency identification tags. ‘Open system’ means that these common linking technologies should be available for use by all, ideally without royalties, and certainly without punitive royalties or discrimination.

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### 1.1. Organization of the Paper

This paper is organized in five sections, including this introduction, which comprises the first section.

Section two provides essential background on ‘Intellectual Property’ and related strategies. It discusses the role of Intellectual Property in creating free markets, and its relationship to competitive advantage.

Section three discusses ‘Third Party’ patents and their relationship to the work of the Auto-ID Center – that is patents wholly owned by entities other than Auto-ID Center affiliated Universities or any individual user or vendor of Auto-ID technology. This can include patents granted to companies that sponsor the Auto-ID Center. To the extent that they can be claimed to establish ownership of common elements of the Auto-ID Center’s proposed system, third party patents could be a source of suit and countersuit among patent holders and technology vendors seeking to provide products and services that comply with the Center’s system and specifications.

Section four, ‘Licensing and Compliance’, very briefly outlines ways to make the Auto-ID Center’s technology available to all while also protecting system integrity. A constructive approach to this question is essential. The Auto-ID Center’s system is intended to be the foundation of a highly competitive and constantly innovative new mass market, and a key enabler of efficiency for businesses worldwide. As such, the Center’s technology must be made available in a way that encourages multiple sources of supply; provides guaranteed interoperability; ensures both user and vendor confidence; and balances the importance of control with the need for freedom to innovate and seek competitive advantage.

Section five offers some provisional conclusions as a basis for further discussion.

## 2. 'INTELLECTUAL PROPERTY'

<sup>2</sup> Lemley, 1997

<sup>3</sup> The term 'Intellectual Property' also includes many things that are not strictly 'intellectual' – pop songs, action movies and cartoon characters are all included, for example – but this is much less important.

The term 'Intellectual Property' is relatively new. Its first recorded use was in 1967<sup>2</sup>. It is not a technical term, but a popular simplification, generally used to refer to legal concepts such as patents, trademarks and copyright. It can be misleading, as it does not refer to 'property' in either the legal or popular sense. A patent infringement is not the same as a theft, for example. This may seem trivial, but the distinction is fundamental and important. The use of the term 'property' to describe things like patents and trademarks can lead to many misconceptions and misunderstandings, particularly among non-specialists.<sup>3</sup>

The details of these laws vary from country to country, but the general intent is similar everywhere. Patent laws, copyright laws and trademark laws all exist for the same basic reason: to provide rights and remedies that help guard against unreasonable imitation. Patents help protect inventions. Copyright helps protect creative works such as books and songs. Trademarks help protect business and product identities, for example the name and logo of a particular company or product.

### 2.1. Intellectual Property and Free Markets

From the point of view of government policy, these laws as they exist today are intended to help create competitive markets by incentivizing innovation, and protecting creativity and reputation. In their application and legislation such laws must be balanced against laws to prevent monopoly positions that could harm the market. Some degree of imitation must be allowed to ensure competition, but allowing too much imitation can lessen the incentive to compete. This is a very fine line. Debates about where to draw it account for many discussions and news stories in the area of 'Intellectual Property', and differences in how these laws are drafted and applied in different countries are often the result of different approaches to the creation and regulation of free markets.

Why must some imitation be allowed? There are many reasons. For the purposes of this paper, one stands out above all the others: common infrastructure is vital in any market. There are no markets, companies or products that do not depend on common infrastructure. And although it seems counter-intuitive to some, the more common the infrastructure, the more competitive the market. This is especially true in new technology. Competitive mass markets for new technology can only emerge once common infrastructure has been established. These two factors are in direct proportion: the more common the infrastructure, the bigger and more valuable the market.

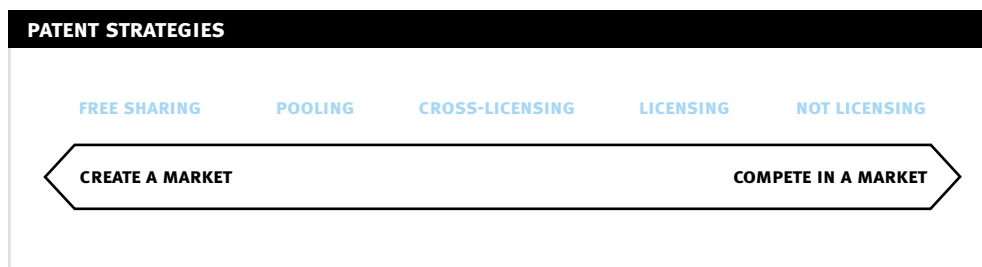
Examples from the twentieth century include the automobile, the radio, the television, and the computer. To pick just one example: the automobile industry depends on common infrastructure including roads, laws, fuel, and layout of controls. It should be obvious that without these common elements the automobile market would be much smaller, and automobiles would be much less useful. In its earliest form, the Ford Motor Company was one of the most vertically integrated companies the world has seen, but it took advantage of common infrastructure, and never attempted to create a world where Ford Cars only travelled on Ford roads, only accepted Ford fuel, and unique driver controls meant that Ford drivers did not know how to drive any other car. Other examples illustrating how common infrastructure enables free markets are discussed below.

### 2.2. Intellectual Property and Corporate Competitive Advantage

Just as governments have to balance Intellectual Property and competition, so do companies. Striking the right balance is vital. Business history is littered with the remains of companies who have misjudged or misunderstood this relationship – almost without exception by making the mistake of retaining rights

they should have shared. There is often a fierce belief among managers and inventors that retaining ‘ownership’ of ‘Intellectual Property’, specifically patents, is directly linked to competitive advantage and profit. In fact, the relationship between profit and patents is not as direct as is often believed. There are many strategies a company can adopt to gain competitive advantage from patents – and these range from using them in collaboration with other companies in order to create a market, to retaining and protecting them in order to compete in a market. In many cases, sharing rights with competitors is likely to be a more profitable and appropriate strategy than retaining them. (Figure 1)

**Figure 1:** There are many strategies a company can adopt to gain competitive advantage from patents

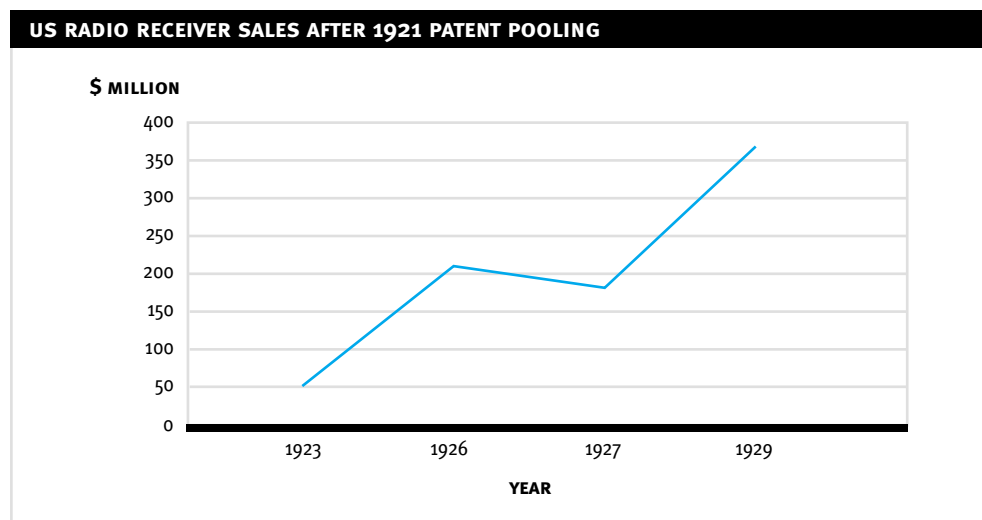


The introduction of fundamental new technology is an area where this balance is particularly important. For a number of reasons, the success of a new technology is often closely related to whether or not a mass market develops around it. As mass markets for technology necessarily require common infrastructure to be shared among competitors, the fate of a new technology often rests on whether or not some kind of collaborative approach to patent sharing can be achieved. Before the twentieth century, collaboration and common infrastructure was often the result of intervention by governments acting to provide common goods or economic stimulus. During the twentieth century, partly as a result of the increasing pace of innovation and the expansion of the free market economy, industry began to find ways to collaborate without government help.

<sup>4</sup> Chandler, 2001

The radio industry, for example, provides a helpful illustration. Here, the need to create a market led to the use of a new corporate entity, Radio Corporation of America, or RCA, as a vehicle for sharing patents. RCA was initially a subsidiary of General Electric (GE), formed in late 1919 when GE bought the US subsidiary of Britain’s Marconi Wireless and Signal Company. One of its main purposes was to hold GE’s radio-related patents. By early 1921, Westinghouse and AT&T had also contributed their patents to the RCA pool, in return for stock in RCA. Non-US companies including Philips, Marconi and Telefunken also signed agreements with RCA. These collaborative arrangements, negotiated by RCA commercial manager David Sarnoff, were made because Owen Young, GE’s General Counsel, ‘believed that the growing number of legal battles over patents could only slow the continuing development of radio technologies’.<sup>4</sup> It is hard to dispute that the creation of RCA led to explosive growth for the radio industry. The first US Radio Station was licensed 7 months after the pool was formed, in October 1921. A further 26 stations were licensed in 1922. By the end of 1923, there were 556 stations, and the radio receiver sales were \$50 million. The next year sales were over \$200 million, and in 1925, the radio receiver market was worth over \$360 million (Figure 2). All the key members of the patent pool – especially the six companies named above – benefited from this explosion, and to a far greater extent than would have been likely had they refused to collaborate. It is hard to imagine how these companies, the radio market, and subsequent related innovations including television and computers, would have fared without the creation of RCA, or some equivalent vehicle for collaboration among patent holders. It is also probably fair to say that the creation of a radio-related patent pool at RCA laid the foundation of the electronics revolution of the twentieth century.

Figure 2: Source: Chandler 2001



### 2.3. Rights of Patent Holders

Holding a patent does not provide any guarantees of rights. Patent Offices around the world make reasonable attempts to identify prior patents that may invalidate an application for a patent, but do not pretend to have extensive knowledge of prior art, nor detailed technical expertise in the many research areas that give rise to patent applications. The grant of a patent means that a minimum of filtering has been done, but nothing more. A patent can be invalidated by a court for reasons including obviousness and lack of originality, even after it has been granted. In the informal view of one patent lawyer, ‘90 per cent of patents aren’t worth the paper they are printed on’. Ownership of a patent, therefore, does not necessarily prove a claim of ownership.

Even if a patent is likely to be valid, it has to be proven to be infringed before it can be used to force revenue or other remedy from another company. Infringement can be difficult to establish. Patent claims are often typically written to be as general as possible, and this can make them ambiguous and difficult to interpret, even among technical experts who may be called as witnesses in a dispute. Asserting a patent against another company is a risky business, therefore, and very expensive. Patent disputes are rarely clear cut or straightforward. Legal strategy and finances are at least as important as anything else. In short, a patent provides a potential basis for action, but no guarantee of success. Asserting patents can be expensive and risky.

These basic facts lead to some common patterns. First, as there is no obligation for a patent holder to assert a patent against an infringing company, patents are often only asserted after a defending company has generated enough money to make a dispute worth winning. Some lawyers cite an annual revenue of at least \$100 million as a rule-of-thumb threshold. The expense of asserting a patent means that going after a company with less revenue than this may not be cost effective. This is why patent disputes can be less common in emerging markets. Second, the cost of seeing an action through to a court decision means that many disputes are settled out-of-court, often with an exchange of patent rights or an agreement not to enter certain markets. Here, settlements have to be careful not to fall foul of anti-trust laws. Last, patent disputes are threatened far more frequently than they are initiated. Talk is cheap. Lawyers are not. Threats of this kind can be used to deter potential competitors from entering a market, to make it harder for competitors to raise funding, or to dissuade customers from buying a rival product. Such tactics generally prove unsuccessful, but can they cause delay and confusion and raise doubts, especially among the inexperienced.

### 3. THIRD PARTY PATENTS

#### 3.1. The Current Situation

The Auto-ID Center is proposing a system, not a single technology. This system necessarily spans technical areas including RFID (Radio Frequency Identification), DSP (Digital Signal Processing), computer networking, and computer software. The field of RFID alone is the subject of many patents and has been since at least the 1970s, with new patents being applied for almost daily. This discussion will use the patent scenario in RFID as an example, and seek to make observations that can be generalized to the other areas as necessary. It is important to note that RFID is not the only area of the Auto-ID Center's proposals where Third Party Patents may be a consideration.

<sup>5</sup> [www.uspto.gov](http://www.uspto.gov)

A cursory search of the United States Patent and Trademark Office <sup>5</sup> database in June 2002 showed 729 granted patents featuring the words 'RFID' or 'Radio Frequency Identification', with another 307 such patents applied for. This is just in one country. Similar situations also exist in, for example, Europe, parts of Asia, and Australia. Further, many substantial patents that pertain to the field of RFID do not contain these words at all.

Not all of these patents are likely to be valid or defensible. As recently as June 2002, for example, a US Patent Application was filed claiming ownership of the idea of putting RFID tags into packaging. A month earlier, another applicant claimed to have invented the idea of using RFID for inventory management purposes, despite many years of prior art describing exactly these ideas, ranging from academic papers to best-selling books to major magazine and newspaper articles and – doubtless – prior patent applications as well.

Of those patents that are potentially valid or defensible, many will clearly and unequivocally not be infringed by any proposal of the Auto-ID Center. This likely still leaves a number of patents that are potentially valid, and that could be used to make potentially defensible claims against all or any vendors of Auto-ID Center compliant technology. To stress, this paper has been written without examination of any such patents, and makes no claims or assumptions about any individual patents or patent applications. The term 'potentially defensible' will be used throughout this paper. It simply indicates any patents that may be asserted as a basis for suit, regardless of whether they are valid, or defensible, or being infringed. The term 'potentially defensible' does not refer to any specific patents or patent holders. The patent scenario in RFID is sufficiently complex and confused that we can even allow for the possibility that no such potentially defensible patents exist, although, based on probability alone, this seems unlikely. One analysis has identified some 35 such patents, spread over a dozen or so patent holders. This analysis excludes patents that may be asserted despite being less defensible, and provides a reasonable estimate of the likely situation today.

With so many patents and so many patent holders, no one making RFID related products can be completely certain they have a risk-free position. Any RFID vendor may have to defend itself in law at any time, possibly after becoming a large and successful company. Such a defense, no matter how justified, no matter how great the chances of success, could be costly and distracting. Legal disputes of this kind can be protracted, poisonous and emotional. They can also be contagious. A common defense against an infringement claim may be a counter-suit, or an attempt to invalidate patents. This makes the costs and consequences of asserting patents very hard to predict in advance. In a very worst-case scenario, the fragile emerging market for RFID could collapse under the weight of multiple suits and countersuits. Existing capital would be spent on lawyers. New sources of funding would dry up due to market risk. Potential customers would lose interest and walk away. All potential benefits to users, vendors, investors, and the economy as a whole would be lost.



This worst-case scenario is unlikely. In most countries, the market, and the legal system, will probably resolve any disputes in ways that allow the technology to emerge. Other pitfalls – such as delays and increased costs – are more real. To the extent that freedom to practice is at risk, the emerging free market for low-cost, standardized RFID is at risk as well. The Auto-ID Center and its many sponsors have an opportunity to minimize this risk, an opportunity to innovate, and an opportunity to show leadership. There are many precedents for dealing with patents that could block the growth of a mass market based on common technology, some more successful than others. If none of these can be applied to this situation, or if a better way is available, then we are of course free to create a new solution and set a precedent of our own. But, if the opportunity is to be taken, it must be taken now.

## 3.2. Precedents and Options

This is not a new problem, although inevitably the current situation has nuances and differences that we must be sensitive to. Precedents can be a helpful guide to deciding on a solution. It is vital that we learn from the past, but we should not expect history to simply provide us with an off-the-shelf solution. This sub-section names and briefly summarizes the approaches mentioned in figure 1, shown previously.

### 3.2.1. Free sharing

Patent holders may determine that creating a new market confers such advantage that it is reasonable to simply make patents available without charge. In this case, there are two basic options. A patent-holder can either donate patents to a non-profit administrative entity, or issue royalty-free licenses to all comers. Donation frees a patent holder from the cost of administering patents and licenses, but is an irrevocable transfer of rights. Royalty-free licenses allow a patent holder to retain rights, but involves an administrative overhead. Free sharing is attractive as a way to remove barriers to market development quickly. All patent holders need to be confident that there is advantage in free sharing, and need to act decisively in making their patents freely available. This requires very advanced management skills, as the strategy is a subtle one. Free sharing is most likely to work when patents are concentrated in the hands of a few patent-holders, who all agree the approach is advantageous – if, for example, it creates a market for some other, more proprietary product. Examples include Sun Microsystems, who provide royalty-free licenses in many areas, including Java™. Other common mechanisms for free sharing also exist, each with their own standards for terms and conditions. These include Open Source<sup>6</sup>, Copyleft<sup>7</sup>, BSD (Berkeley Software Distribution)<sup>8</sup> and GNU (GNU's Not Unix)<sup>9</sup>. These mechanisms do not necessarily require patents, and are popular in academic and non-profit communities. They can be somewhat anarchic, and may not be appropriate for industrial applications which need more structured administration and support. The drawback with all such free sharing arrangements is that if a holder of any related 'defensible patent' refuses to co-operate in such an arrangement, free sharing can quickly become unattractive to all patent holders. In addition, licensees may have to deal with a number of different licensors before they can practice, and terms and conditions may vary.

### 3.2.2. Pooling

The term 'pooling' covers a variety of approaches. 'Pooling' approaches generally aggregate rights to assign relevant patents under the administration of one licensing body, which then issues a single license and, if royalties are charged (a pool can also operate on a free sharing basis), divides royalty revenue among patent holders according to a pre-agreed schedule. A generic patent pool is illustrated in figure 3. The RCA case, discussed above, is an early example of pooling. Patents are not usually transferred to the licensing body. In many cases, a patent-holder allows the pool to issue sub-licenses, or agrees not to assert its patents against licensees, subject to certain terms and conditions. In this way, the pool acts as a kind of peacekeeper, or protection mechanism, which provides licensees with some assurance against suits from major patent holders. Pooling of various kinds is common in the electronics industry, and is used in some form by common infrastructures such as Digital Video Discs (DVD)<sup>10</sup>, Compact Discs (CD)<sup>11</sup>, and some graphics compression standards produced by MPEG<sup>12</sup>.

<sup>6</sup> [www.opensource.org](http://www.opensource.org)

<sup>7</sup> described at [www.dsl.org/copyleft](http://www.dsl.org/copyleft)

<sup>8</sup> [www.bsd.org](http://www.bsd.org)

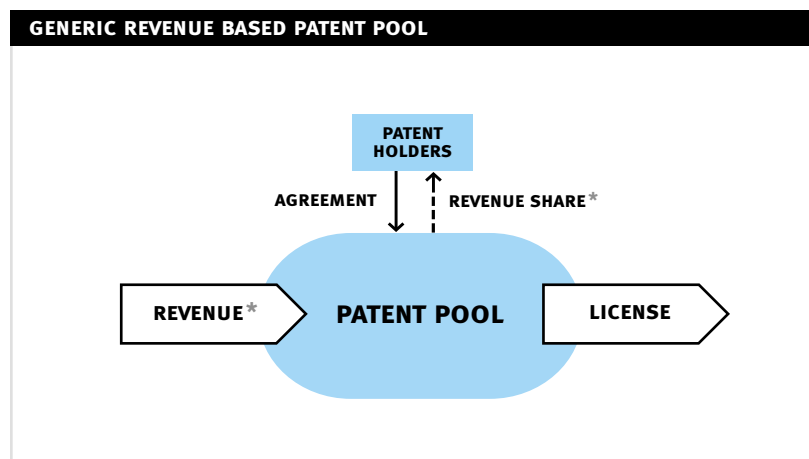
<sup>9</sup> [www.gnu.org](http://www.gnu.org)

<sup>10</sup> The DVD standard is administered by the DVD Forum ([www.dvdforum.org](http://www.dvdforum.org)). Interim licenses were initially available from Toshiba, who acted on behalf of all patent holders, until the formation of the DVD Format/Logo Licensing Corporation in April 2000 ([www.dvdfllc.co.jp](http://www.dvdfllc.co.jp)).

<sup>11</sup> The CD standard was jointly developed by Philips and Sony. Philips acts as licensor for both companies ([www.licensing.philips.com/licensees/conditions/cd/](http://www.licensing.philips.com/licensees/conditions/cd/))

<sup>12</sup> The Moving Pictures Expert Group of the International Standards Organization (ISO) and International Electrotechnical Commission (IEC). Different approaches to Intellectual Property exist for different MPEG standards. Many MPEG-2 patents are covered in a pool administered by MPEG LA, a private company who are also proposing a pool for MPEG-4. MPEG layer 3 requires a license from Thomson Multimedia which covers the patents of Thomson and the Fraunhofer Institute ([www.mp3licensing.com](http://www.mp3licensing.com)) but may also be covered by other patents.

Figure 3: \* if applicable



Pooling has many advantages. Pools have proved to be a highly successful mechanism for creating new markets and establishing new technologies. They are also efficient, as there is a single license and a single licensor. In some cases, the licensor can also act as a marketer for the technology. Further, the license can be used to do more than just grant rights. It could potentially also be a vehicle for ensuring consistent compliance to technical specifications and for defining and enforcing self-regulation. The pool members could also collaborate on future innovations to the technology. Pools can be complex, however. Creating and administering a pool is not always a straightforward task. Points to be considered include what the source of revenue will be, how it will be distributed, who will administer it, how the pool will be governed, what patents and which patent holders are to be included, and who decides this. Different patent holders may have different agendas, and attending to all of them without making unreasonable compromises requires deft and creative deal structuring. And, once properly established, successful pools can become powerful mechanisms for collaboration and market creation, and may attract the attention of governments on the look out for trusts or monopolies. This was one development in the RCA case, for example. The US Federal Trade Commission (FTC) launched an investigation into RCA's alleged 'radio trust' in 1921, and filed an anti-trust suit against it in 1924. In response, RCA introduced a simplified licensing scheme that provided revenue for all major patent holders, and the FTC dropped its suit in 1928.

### 3.2.3. Cross-licensing

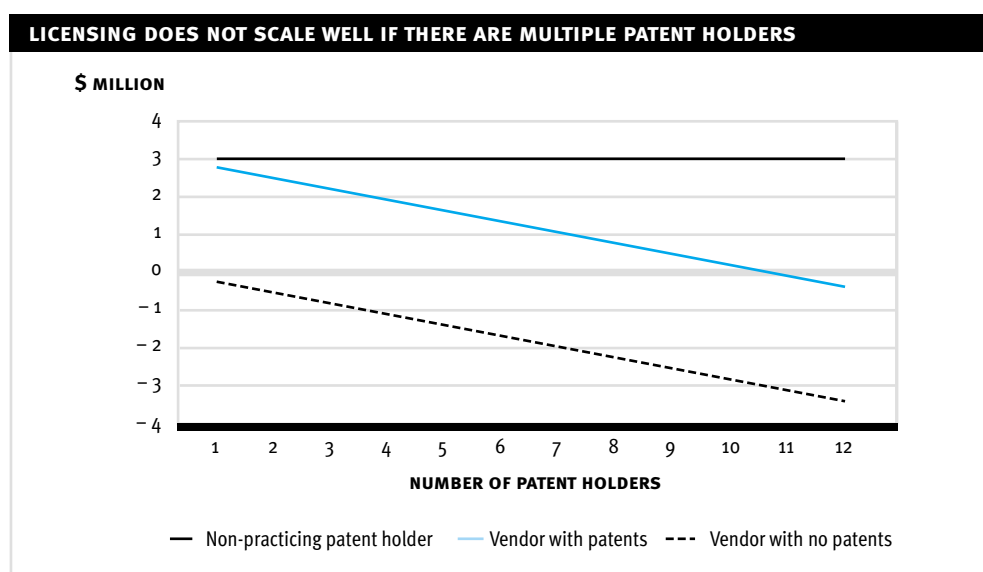
Cross-licensing is essentially an exchange of rights among patent holders. It is a frequent outcome of out-of-court settlements involving a suit and counter-suit. It is more competitive than pooling, because entities that do not hold patents are excluded. It does not require the administrative overhead of a separate pooling body, because patent-holders reach agreements directly. Cross-licensing is really a subset of licensing. It can be particularly effective where patent positions are fairly clear, and where all patent-holders want to practice their patents. This is discussed in more detail below.

### 3.2.4. Licensing

Licensing is a fairly straightforward sale of rights. It is common where a patent-holder holds a clearly defensible position, and is willing to allow others to practice the patent. Licenses may be exclusive to a single licensee, or discrete territories, or available to all-comers. Some collaborative activities, including the World Wide Web Consortium, address patent issues on common technologies by requiring 'Reasonable And Non-Discriminatory' licensing of patented technologies, a licensing approach known as RAND. This approach can prove problematic, however, as 'Reasonable' may be a matter of dispute. Licensing is most appropriate where there is a single, dominant patent holder. In cases where there are multiple patent holders with potentially defensible patents, licensing does not scale well, and becomes

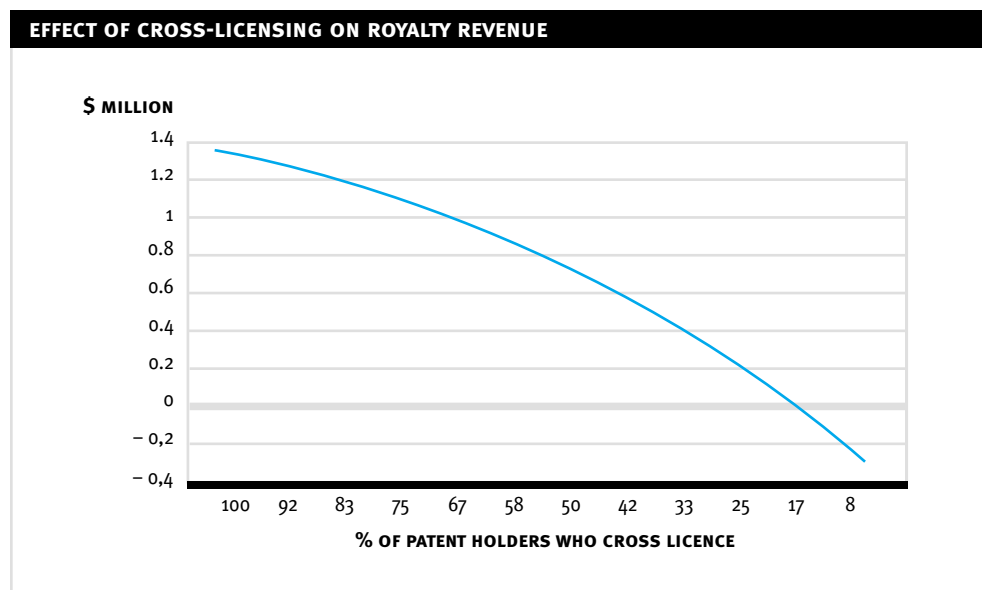
more complex. Patent holders risk paying more in royalties than they receive. Non-patent holders who want to practice may be deterred by the high cost of multiple licenses, plus the complexity of negotiating for them. Only non-practising patent holders, that is patent holders who do not want to make technology, have nothing to lose. An illustrative scenario is shown in Figure 4. This chart shows outcomes in a hypothetical, model market worth \$100 million dollars, where a typical vendor has a market share of 10%, and the royalties are 3% of sales to each patent holder. If there is a single, dominant patent holder, licensing costs for the typical vendor are modest (\$0.3 million) and the patent holder makes around 3 million dollars in royalties. If there are more patent holders, however, the situation becomes gets worse for all vendors – both those who are patent holders, and vendors who hold no patents. With as many as 12 patent holders in the mix, a possibility in the RFID area, the vendor who holds patents spends \$0.6 million more on royalties than he receives, a net loss. The vendor who holds no patents, pays \$3.6 million dollars in royalties. Both costs will most likely be passed on to the user by all vendors, potentially inflating costs significantly.

Figure 4



This is a simplistic scenario – market size, share and royalty rates will all be variable. Although none of these factors affect the basic scalability of licensing, they will reduce or increase the impact on each stakeholder. The most interesting variable for this discussion is the fraction of patent holders who also become vendors. If all patent holders enter the market as vendors, they can use cross-licensing to eliminate their licensing costs. Royalties will then come only from vendors who hold no patents, and may be a barrier to entry for non-patent holders. But cross-licensing is not attractive to patent holders who have no interest in becoming vendors. These patent holders are likely to require royalties from all participants. This balance between licensing and cross-licensing greatly affects the outcome of this approach for the patent holder. Figure 5 shows the outcome for a typical patent-holding vendor in a market where there are 12 patent-holders. Again, it assumes there are also 10 vendors who do not hold patents, and that the market is worth \$100 million. Each vendor has an equal share of the market, and royalties are 3% per patent holder. In this model, if 100% of patent holders are also vendors, and are prepared to cross-license, royalty revenue for a typical patent holder who is also a vendor is \$1.4 million. But if the number of patent holders who are also vendors, and therefore open to cross licensing, decreases, the value of royalties to a patent holding vendor also drops. Royalties paid starts to exceed royalties received, and the drop-off in revenue can be non-linear.

Figure 5



Again, this scenario is greatly simplified. It assumes that all patent holders who are vendors will cross license. Number of vendors, market share per vendor, market size, royalty rates, and number of patent holders are all variables in the real world. None of these variables alter the fundamental conclusion, however – in a scenario where there are many patent-holders, the number of practicing patent holders can have a significant effect on the value of licensing as a way to collaborate. Further, this effect has the potential to penalize patent holders who also want to be vendors – some of the most vital participants in getting a mass market started.

Finally, licensing scenarios assume that there is clarity on the validity and relevance of a patent. No licensee will pay royalties unless a patent is a likely to be valid, and unless it is unlikely that another patent holder will claim infringement. Equally, few patent holders will indemnify licensees against the risk of being sued by others. Licensing can therefore be difficult, unless patent positions are reasonably clear and unequivocal.

### 3.2.5. Not Licensing

In most cases, patent-holders are under no obligation to provide favorable licenses for their patents. (One exception to this can be when a patent-holder is found guilty of ‘equitable estoppel’ – manipulating a standards process to make undisclosed patents more valuable<sup>13</sup>. Another may be as part of an anti-trust settlement.) Patent-holders may decide to exploit their patents themselves exclusively in order to gain competitive advantage from their inventions. This strategy is most appropriate for technologies that do not need to be common in order for a market to emerge – for example, manufacturing methods, or specific products or components that work within a system, but are not essential to it. This strategy is not without costs – in addition to the costs associated with the patenting process, the patent-holder also needs to be vigilant for possible infringements and aggressive in preventing them. The patent-holder does not need to practice its patent to pursue this strategy. It can be possible to simply seek damages even if the patent holder has no intent to use or make the patented invention.

### 3.2.6. Laissez Faire

There is one option not represented in Figure 1. The Auto-ID Center, and its sponsors, are under no obligation to address the question of third party patents at all. One valid choice is to simply continue our work, and see what happens if and when patent holders begin to assert their patents against

<sup>13</sup> This and other ‘standards defenses’ are discussed in Cowie and Lavell, 2002

vendors. The complexity of the patent situation, and the nature of the market, may mean that few if any patent holders have a strong enough position to win significant victories. The likely parameters of this scenario are reasonably acceptable. At one pole, there could be a few highly publicized defeats for patent holders, which will deter others from asserting their patents. At the other, the courts and market forces, may determine which patents are valid and defensible, and set a reasonable royalty level over time. This approach has drawbacks and risks for individual patent-holders and vendors – there are individual winners and losers in the outcomes described above – but it will probably allow the market to emerge, albeit more slowly, providing there are vendors willing and able to defend themselves against potential infringement suits. The greatest risk to the market is if no such vendors appear, or if patent positions are found to be strong enough to allow for punitive royalties or damages before the market has matured. In both cases, market growth, as least as far as a low cost open system is concerned, could be stopped completely.

## **4. AUTO-ID CENTER IP: A BRIEF OVERVIEW**

The Universities that make up the Auto-ID Center project, currently the Massachusetts Institute of Technology, the University of Cambridge, and the University of Adelaide, are each producing research which at minimum represents ‘Intellectual Property’ in its broadest sense. This ‘Intellectual Property’ belongs to the University which produces it. It is protected to some extent via publication, and in some cases may also be the subject of patent applications, copyright or trademarking. It is a matter of record that technologies developed using the Auto-ID Center’s funding are intended to be made available as part of an open system. These technologies, which include specifications, reference implementations, software and languages, are not, therefore, included in the ‘third party patents’ discussion above, and will be dealt with separately from any arrangements reached among third party patent holders. The approach for making this technology available without royalty requires detailed discussion and will be the subject of a separate paper. Exact terms and conditions are yet to be decided and are dependent on many factors. Final decisions will be a matter for the Technology Licensing Office at MIT. For the sake of completeness, however, this section very briefly outlines some key points and considerations regarding Auto-ID Center developed technology.

### **4.1. Ownership of University Research**

In almost all cases, Universities own all intellectual property developed by their faculty, students and research staff, unless separate and specific arrangements have been made. Much of the technology in use around the world was developed in part at Universities, and Universities have a long history and tradition of licensing valuable technology to industry, often on fairly favorable terms. Typically, a University will have an experienced Technology Licensing Office (TLO) that negotiates license agreements in accordance with University policy. A TLO will often take the views of its inventors into serious consideration when negotiating licenses, especially if they are senior faculty members such as Professors. In recent times, it has become increasingly common for faculty members to become the exclusive licensees of their own inventions. In the case of Auto-ID Center technology, it is expected that the participating Universities will license any necessary technology research funding as part of the reorganization of the Auto-ID Center being planned for the end of 2003. This reorganization will also be the subject of a separate paper, due to be published to sponsors in November 2002.

## 4.2. Licensing Considerations

The purpose of the Auto-ID Center is to create an open system so that devices from multiple vendors can all work together easily. Ensuring interoperability will therefore be an important condition of any license agreement. It is expected that interoperability will be established by Auto-ID Center managed compliance testing, which will ensure that technologies work properly with any other technology and do not pollute the system or reduce its effectiveness. Technologies that pass compliance tests may be entitled to use Auto-ID Center owned trademarks to signal that they have been certified as compliant. In addition, license conditions may include a requirement to adhere to and participate in some form of self-regulation to ensure that the technology is not abused, or used in ways that are detrimental to, for example, public interest. Failure to pass compliance tests, misuse of Auto-ID Center owned trademarks, or breaches of self-regulation, could ultimately lead to refusal to grant a license, withdrawal of a license, or legal action. In this, as in all matters, any activities or proposals would need to be mindful of laws around the world governing trust-like and monopolistic behavior.

## 4.3. Continued Innovation

<sup>14</sup> described at [www.jcp.org](http://www.jcp.org)

One risk of ensuring strict system compliance among multiple vendors is that innovation will be stifled, particularly where common elements are concerned. To avoid this, it is expected that licensees will be invited to participate in collaborative development communities, where future, updated versions of the technology are created. The system has been designed to allow this to be done while maintaining compatibility with existing versions, so that upgrades are seamless and painless for users. Licensees should naturally be entitled to participate in and contribute to this development process. If they are holders of prior patents or patent applications that pertain to their contributions, they will likely be expected to agree in advance that they will contribute these patents to the Auto-ID Center pool, if one exists, or if there is no pool, to make licenses available on some reasonable basis. Sun Microsystems' Java Community Process<sup>SM 14</sup> provides a good model to use as a basis for developing this type of collaborative innovation.

# 5. PROVISIONAL CONCLUSIONS

This paper is intended to inform and structure discussion, and should not be viewed as a recommendation. However, some provisional conclusions can be drawn.

First, history suggests collaboration between multiple patent holders is a pre-requisite for developing a mass market for new technology where multiple patent holders exist. Such collaboration can be voluntary, or it may be a side-effect of intervention by courts and / or governments. Second, pooling is a good mechanism for voluntary collaboration, especially where there is a relatively neutral and trusted body that can be tasked with administering and leading the creation of the pool. Third, in the case of a global system for low cost RFID, the Auto-ID Center could potentially act to create such a pool, with clear benefits to all. Fourth, in the event that patent holders favor an alternative approach, or there is no way to build consensus, the Auto-ID Center probably has no formal role to play in bringing patent holders together. Such a scenario is unlikely to stop the development of a mass market, or the adoption of the Auto-ID Center's system, but it would increase risks, especially for patent holders and vendors. It is hard to see how such an outcome is beneficial, but this does not make it impossible or even unlikely.

Based on this provisional analysis, the very best case scenario for all stakeholders would appear to be a non-exclusive, broad, collaborative RCA-like patent pool, established and administered by the Auto-ID Center or its successor organization. This could greatly help in creating a highly valuable mass market for low cost open system RFID in the very near term. Creating such a pool would be require many details to be agreed, and if such a pool is to be established, work on these details should start soon.

## 6. REFERENCES

- (Chandler, 2001)
1. **Alfred D. Chandler Jr., ‘Inventing the Electronic Century’**
- (Cowie & Lavelle, 2002)
2. **Michael G. Cowie and Joseph P. Lavelle, ‘Patents Covering Industry Standards: The Risks to Enforceability Due to Conduct Before Standard-Setting Organizations’**  
American Intellectual Property Law Association Quarterly Journal, Volume 30,  
Number 1, Winter 2002. pp 95–151
- (Lemley, 1997)
3. **Mark Lemley, ‘Book Review – Romantic Authorship and the Rhetoric of Property’**  
Texas Law Review, March 1997. Cited in Vaidhyanathan, 2001
- (Sarma et al, 2000)
4. **Sanjay Sarma, David Brock, Kevin Ashton, ‘The Networked Physical World – Proposals for Engineering The Next Generation of Computing, Commerce & Automatic Identification’, October 2000. Auto-ID Center White Paper MIT-AUTOID-WH001**  
available at [www.autoidcenter.com/research/MIT-AUTOID-WH-001.pdf](http://www.autoidcenter.com/research/MIT-AUTOID-WH-001.pdf)
- (Vaidhyanathan, 2001)
5. **Siva Vaidhyanathan, ‘Copyrights and Copywrongs’**  
New York, 2001

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