

An Audit Tool for Intellectual Property Management: IP Management in the Queensland Department of Primary Industries

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Abstract

Smart State is a Queensland Government initiative that recognises the central role of knowledge-based economic growth. In this context, the management of intellectual property (IP) within Queensland and Australian government research and development agencies has changed dramatically over recent years. Increasing expectations have been placed on utilising public sector IP to both underpin economic development and augment taxes by generating new revenues. Public sector research and development (R&D) management has come under greater scrutiny to commercialise and/or corporatise their activities. In a study of IP management issues in the Queensland Public Sector we developed a framework to facilitate a holistic audit of IP management in government agencies. In this paper we describe this framework as it pertains to one large public sector Agriculture R&D Agency, the Queensland Department of Primary Industries (QDPI). The four overlapping domains of the framework are: IP Generation; IP Rights; IP Uptake; and Corporate IP Support. The audit within QDPI, conducted in 2000 near the outset of Smart State, highlighted some well developed IP management practices within QDPI's traditional areas of focus of innovation (IP Generation) and IP ownership and licensing (IP Rights). However, further management practice developments are required to improve the domains of IP Uptake and Corporate IP Support.

Introduction

The Smart State policy initiative of the Queensland Government recognises that the world is rapidly moving to a new knowledge-based economy, where knowledge creation and utilisation are fundamental drivers of economic growth. In this environment, intellectual resources need to be developed and channelled to provide maximum economic and social benefit. While initiatives have primarily focussed on programs to stimulate and support the private sector, government agencies are not immune from these same forces. They need to develop ways to leverage their intellectual resources, and specifically, their intellectual property (IP) assets - both directly through commercialisation mechanisms, such as user fees and licensing agreements, and indirectly through economic development stemming from private sector uptake of government generated IP.

Public sector IP management differs significantly from that of the private sector. While the private sector is fundamentally driven by competition and the need to create competitive advantages, the public sector is driven by broader societal needs and improvements. IP created or funded and owned by government is managed to:

- stimulate economic growth by transfer of the IP to the private sector leading to competitive advantage for one or more firms in the government's jurisdiction;
- create societal benefits by having government created IP adopted by the wider community; and,
- augment department and program budgets by having IP generated revenues offset reductions in public operating budgets.

Like the private sector, governments need to do more than just reactively manage the IP assets they own. Intellectual property is the tangible outcome of creative and innovative processes or activities. Governments must harness the intellectual capital residing in their organisations by proactively generating and utilising IP in an appropriate way in the pursuit of their objectives.

In a recent report of IP management issues in the Queensland Public Sector, we developed a holistic framework for managing IP in government agencies (Steffens et al. 2000). This paper develops the application of this framework as a tool to audit, or evaluate, the IP management practices of a government agency. We examine the utility of this audit tool using the Queensland Department of Primary Industries (QDPI) as a case study.

The Research Context - QDPI

The Queensland Department of Primary Industries (QDPI) is focussed on supporting agricultural producers to ensure their competitive and economic viability in national and world markets. Over many years the Department has employed biological research and development and extension (RD&E) services, such as engineering, to enhance and extend Queensland's agricultural industries' capabilities and to solve problems created by Queensland's unique economic, climatic, environmental and

geographic factors. Historically the agricultural sectors have been fragmented worldwide and QDPI's role in providing publicly funded R&D services attempts to support producers who would otherwise be uncompetitive against larger producing regions and nations. The Department's budget of \$100 million and workforce of over 1500 professional and support staff is focussed on agriculture, forestry and fisheries.

IP Management Framework

We develop a conceptual framework for public sector IP management - that is, management of IP by public sector agencies, not government's role in establishing regulatory and legal frameworks for private sector IP. A full description of the framework and its development is provided in Steffens et al. (2000).

Most work on government IP management has focussed on two areas - IP rights and commercialisation of government IP, either directly by government or through technology transfer to the private sector. IP rights management deals with issues of IP ownership, user rights, confidentiality and freedom of information. This work tends to focus on two key activities of public sector organisations - developing contracts and agreements with other organisations and collecting, storing and disseminating information from and to the public (DCAT 2000). The other stream of literature regarding commercialisation of government funded R&D arises due to the enormous expenditure by governments internationally on R&D. This literature deals with both commercialisation policies (FPTT Canada, 1997) and mechanisms (Brown, Berry and Goel 1991).

Our recent study confirmed that these two areas, IP rights and commercialisation, are important issues within Queensland Government (Steffens et al. 2000). However, the scope of IP management issues clearly extended beyond these two areas to the broader field of innovation management. To develop an extended framework of IP management that provides this broader perspective, we draw on two types of normative models from the innovation literature.

The first type of model is 'innovation process' models. These describe innovation as a series of 'stages', albeit acknowledging the process is not linear, usually starting with the inception of an idea, through to the end user adoption. Models provide a different focus whether concerned with R&D management (Schmidt-Tiedemann 1982), new product development (Cooper 1983), technology commercialisation (Jolly 1997) or technology management (EC 2000). These models cover the operational activities of innovation.

The second relevant class of models is those concerned with the strategic management of technology and innovation. These models provide a perspective for organisations to manage their strategic direction, develop internal capabilities and manage the interface with their external environment and stakeholders. Again, specific models focus on different themes. Third generation R&D models (Roussel, Saad, and Erickson 1991) focus on providing a strategic direction for portfolios of R&D projects, managing risk and relationships with stakeholders. Third generation

New Product Development models (Cooper 1994) emphasise external relationships and flexibility while management of technology models (Tabrizi and Walleigh 1997) stress the importance of the relationship between business and technology strategy and building a firm's technological capabilities.

Based on this literature, we developed a framework to capture the complexity of practices that need to be considered to improve IP Management in the Public Sector. We categorise IP management activities into four management domains:

- IP Generation - creating work environment and processes for innovation and problem solving in an on-going and self-managed way;
- IP Rights - defining and protecting owner and user rights;
- IP Uptake - encouraging the uptake of the innovations by relevant end-users; and underpinning these,
- Corporate IP Support - the establishment of supporting corporate structures, priorities, policies and reward and recognition systems to support these activities.

The IP Generation Management Domain

The IP Generation Management Domain focuses on operational level management practices to enable the generation of new IP within an agency. IP generation encompasses *creativity*, the origin of the new ideas, *invention*, the initial transformation of that idea into useable technology and the *development* or refinement of that technology into a product, process or service. Management of these IP generation activities is concerned with stimulating creativity and invention and directing and controlling development efforts. IP creation may be purposeful or incidental. Purposeful IP creation occurs as a result of planned problem-solving activities of the agency. Creativity tools may be used in this context (Rickards 1997). In contrast, incidental IP emerges as a result of serendipity, a result of random creativity of individuals or groups performing their everyday activities. An important aspect of corporate support for IP generation, often lacking in public sector organisations, is creating an appropriate innovation orientated culture (Quinn, Anderson and Finkelstein 1996). Also important is appropriate resourcing and top-level management support of development efforts (Wheelwright and Clark 1992).

The IP Rights Management Domain

The IP Rights Management Domain revolves around defining, clarifying and legally protecting intellectual property rights associated with existing or emerging IP and outlining licensing terms and conditions for how it can be used and exploited. IP rights include processes to define ownership; preparing and administering licensing agreements, including access rights and user restrictions, royalty conditions and administration; control and accountability mechanisms; and infringement policies and procedures penalties supported by commercial law, to ensure appropriate levels of compliance and protection.

IP rights are important throughout the entire IP generation and IP uptake processes. The concern with ownership can predate the actual generation of IP.

Many R&D contracts are written with IP rights being declared before the innovation has been developed. In the case of 'incidental' inventions, disclosure may be important before the value of the invention is even recognized, IP rights management continues through the uptake of the IP. For example, license agreements are often renegotiated long after initial uptake of the IP.

The IP Uptake Management Domain

The IP Uptake Management Domain is concerned with encouraging the adoption and use of the IP or technology that has been developed by appropriate end users. These end users may be either internal or external to the organization that developed the IP. The intent is to generate value from the IP. In a public sector context, this includes commercialisation, technology transfer to the private sector or other government jurisdictions and diffusion of the technology through the adopting population, IP uptake is focussed on minimizing the obstacles and creating incentives for the IP to be adopted by the targeted client groups. In instances where private sector uptake of government owned or funded IP is involved, governments must balance multiple objectives of the public socio-economic benefit of widespread adoption and use; and appropriate revenue generation where private benefit is received (e.g. through license fees) (Fuglie et al. 1996). Government R&D agencies, and others generating valuable IP, must consider a range of mechanisms for effective technology transfer to the private sector in order to maximise economic outcomes. Characteristics of both the technology and adopting population influence the effectiveness of techniques to promote diffusion (Rogers 1995).

Corporate support for IP uptake needs to define IP uptake objectives, principles for balancing public and private sector benefits and the agency's role in commercialisation. Establishing appropriate relationships with both end users and channels is crucial for effective uptake to occur (Athaide, Meyers and Wilemon 1996).

The Corporate IP Support Management Domain

The Corporate IP Support Management Domain is concerned with executive responsibilities that support IP related activities. It provides an IP related perspective to all the elements normally associated with corporate or executive management. Broadly, it has two main functions - to direct and to support IP related operations and innovation. First, corporate support provides an overall direction, or focus, for the organization's innovation efforts. It must ensure that the three IP management operational domains act in a coordinated, integrated fashion. Second, corporate support creates an organisational environment that supports the operational IP practices to achieve this direction. This is achieved through leadership, organisational culture, structures and systems (Burgelman, Maidique and Wheelwright 2001). In particular, as reflected in the intellectual capital literature (Bontis 1996), management attention should be focussed on developing and maintaining human, organisational (i.e. strategy, structure, systems and culture) and relational resources, to effectively

enable operational IP management. Corporate IP support must commit and mobilise resources to enable the organisation to achieve its IP objectives. In summary, corporate support must (i) provide an integrative, holistic scaffolding to support the organization's IP management, and (ii) specifically provide support for each of the three operational domains, as described above.

The Relationship Between Domains

The relationship between the four management domains is depicted in Figure 1. Operationally, IP Generation precedes IP Uptake (albeit often cyclic in practice), with IP rights important throughout the process. Corporate IP Support provides a foundation for the operational activities. While these domains are drawn as distinct, in reality there are many areas of overlap.

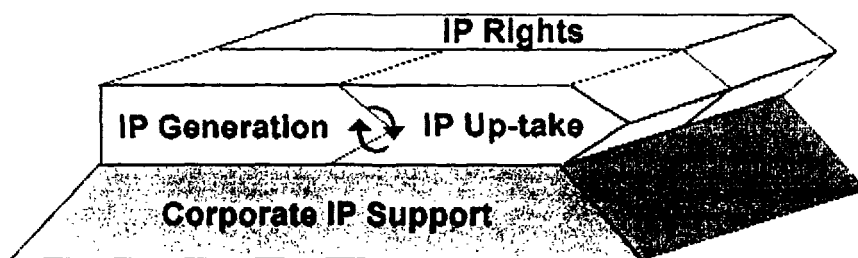


Figure 1: Intellectual Property Management Domains

The Audit Tool

We use the above framework as the basis to develop an IP management audit tool (or scorecard). The tool is designed to be used as a mechanism to summarise those areas where IP management is well practiced and to identify areas for improvement where management attention should be focussed. The audit may either be conducted internally by senior management, or externally by a management consultant. Management can utilise the audit tool in two important ways. First, areas of strength and weakness within each of the four domains can be identified and second, to ensure all four domains are integrated and working synergistically to achieve common objectives.

For the purpose of the audit, the Corporate IP Support domain has been divided into three sub-domains. Corporate activities that specifically support one of the operational domains (IP Generation, IP Uptake and IP Rights) are considered separately. Corporate support designed to integrate each of the operational domains in a holistic, strategic manner is designated Integrated Corporate IP Support.

We designed the tool to be used as follows. A number of questions are posed in each of the domains of the model shown in Table 1. These questions are designed to facilitate a detailed assessment of IP management practices within each

domain. This detailed assessment provides a basis for an overall evaluation of the health of management practices for each domain. This evaluation of management practice is rated on a 1 to 5 scale from under-developed to excellent.

We recognise that the resulting evaluation is highly subjective. This is not designed to be a quantitative benchmarking tool. Rather, the intention is that the relative rating of each domain reflects the assessor(s) opinion of strengths and weaknesses, which in turn are guided by the audit questions. As such, the audit is designed to highlight areas that require management attention. The detailed assessment then provides a fuller description of the areas or issues requiring this attention.

Research Method

The purpose of this study is to examine the value of this audit tool as a means of evaluating IP management practices within a public sector organisation. A case study approach is used. This is justified on the grounds that IP management involves a complex interaction of processes. Consequently, the audit tool requires a rich, holistic and detailed analysis of these phenomena. The case study method lends itself to such an analysis (Gummesson 2000; Miles and Huberman 1994; Yin 1994). Further, the case study method provides the ideal vehicle to explain contemporary issues within a real-life context (Yin 1994).

The case study utilised multiple sources of data to allow triangulation. The research team worked with an IP steering committee established by QDPI. This group had representation from across the department. This group purposefully selected nine mini case studies of technology commercialisation that illustrated a broad cross-section of management issues in the department. Project managers (or equivalent) either wrote short case studies, or participated in an interview. A follow-up focus group was conducted with the four authors to better understand some key issues. An interview with the manager from the Contract and Compliance section provided information on organisation-wide systems support services. This was augmented by some supporting documentation. In particular, two 1999 internal reviews were relevant, *The Alignment of DPI's R&D Effort with Government Priorities* (QDPI 1999a) and *An Evaluation of DPI's Five Internal Institutes* (QDPI 1999b) and a draft IP policy *Draft Policy Statement on the Development and Commercialisation of Intellectual Property* (QDPI 1999c). Further insight to important IP issues was gained through two further focus group meetings with the IP steering committee. Themes from these case data were organised using the framework in Table 1.

Table 1: IP Management Audit Framework

IP GENERATION

Are formal tools and/or training effectively used to stimulate creativity and invention?

Are effective mechanisms in place to recognise incidental IP?

Is IP effectively evaluated? Do we have an effective selection process for development projects?

Do we have an effective development process? Are projects effectively controlled?

Are development teams effectively organised and managed?

Do we effectively network with other organisations during development processes?

Corporate Support - IP Generation

Are corporate guidelines sufficiently clear for units to effectively interpret them in a manner that is congruent with generating and recognising IP?

Does the organisational culture value innovation?

Does individual creativity attract appropriate rewards and recognition?

Do systems provide adequate support for the exchange and sharing of ideas?

Are development projects adequately resourced? Do they receive support from senior management?

IP RIGHTS

Does the organisation have established procedures for:

IP Ownership Rights; IP User Access Rights; IP Procurement & Brokering

IP Conditions of Use and Public Good Benefits Rights

Confidentiality, Disclosure and Privacy Conditions of IP

Employee Contracts and IP Access and Use Rights

Jointly Created IP Ownership; Commissioned IP Ownership

Consultant Created IP Ownership

Infringement of IP Rights (created and acquired)

Maintenance and Up-Grade IP Requirements and Conditions

Do we have an IP Register? Do we regularly conduct IP audits?

Do our IP procedures acknowledge National Competition Policy, Freedom of Information Act, Privacy and Regional Benefits Requirements?

Have we established IP Rights Dispute Resolution Mechanisms?

Corporate Support - IP Rights

Does the agency have suitable policy and guidelines for IP rights management?

Is adequate legal expertise available for IP rights management activities?

Are staff provided appropriate training in IP rights?

IP UPTAKE

Are the target adopters of our technology clearly specified?

Do we utilise the most effective mechanisms and/or channels (e.g. licensing, direct/extension, joint venture etc.) to deliver the technology to the target adopters?

Do we utilise effective communication tools or incentives to accelerate the adoption/diffusion process?

Should users pay for the technology? How should revenues be distributed?

Corporate Support - IP Uptake

Are the objectives for the IP uptake domain clearly specified? Is it clear how public and private benefits are prioritised?

Do our organisational and legal structures and relationships allow effective technology transfer mechanisms to occur?

Does the organisational culture support the agency's uptake objectives?

Are sufficient resources provided to support uptake initiatives?

Does the agency have appropriate relationships with potential target adopters to assess their requirements?

INTEGRATED CORPORATE IP SUPPORT

Are the IP management objectives and expected outcomes associated with the agency's activities in IP generation, Rights and Uptake domains clear to staff?

Are the IP objectives effectively aligned with each other and the agency's overall objectives?

Is the leadership, organisational culture, structures and systems that are required to effectively support the organisation's IP operational domains in place?

Is the organisation's intellectual capital (human capital, relational capital and organisational capital) being effectively utilised to support the organisation's IP operational domains?

Are resources committed to support the organisation's IP operational domains?

We provide a very brief description of the nine case studies of technology commercialisation. Most involve a licensing arrangement with a commercial partner - QDPI's preferred mode of commercialisation.

1. Controlled Atmosphere Kit - licensed to an industry partner following an open tendering process. Technology protected through commercial secrecy, as it was judged as unsuitable for patent protection.
2. Low Cost Heat Disinfestation Project - licensed to an industry partner following an open tendering process.
3. Lucilure & Lucitrap for Sheep Blowfly Control - licensed to a commercial partner. The partner was involved in the project from an early stage when approached by QDPI to provide complementary resources.
4. Commercialisation of Eimeria Vaccines for Chickens - licensed to a commercial partner. The partner was involved with the project from an early stage after expressing strong interest in the project when QDPI consulted industry to establish market interest and requirements.
5. Commercialisation of Plant - an attempt to develop long-term relationship with an industry partner to license successive generations of seed varieties from a breeding program.
6. Commercialisation of New Horticulture Plant Varieties - similar environment with Case 5.
7. Respiratory Disease Vaccine for Chickens - The first generation of vaccine was freely given to both industry players (some 10 years ago). One of these partners now fully funds a research project to develop another generation of the vaccine.
8. Tick Fever Research Centre - history of production of a commercially non-viable vaccine by QDPI. Partial cost recovery through sale of the vaccine, the price negotiated with industry to ensure widespread adoption.
9. Queensland Agricultural Biotechnology Centre - the new global environment of patenting genetically modified organisms (GMOs). Gaining and maintaining access to technologies through 'horse trading' of patents from the perspective of a relatively small research player in a small domestic market.

Findings

The presentation of findings is structured as follows. For each IP management domain key issues identified during the audit are discussed. Areas of strong performance and areas for improvement are highlighted. Finally, this information is used to provide an overall assessment of the current health of management practice for each domain.

IP Generation Domain

Innovation is a core QDPI activity. They have established a strong reputation for generating research and IP for over 30 years. The IP generation management domain is well established and very few issues emerged from the nine case analyses. Hence we devote only a small amount of space to discussion of this domain.

Only two significant issues emerged. First, corporate and government R&D priorities remain very broad, somewhat motherhood statements. They provide limited guidance for operational R&D managers considering how to adjust caseloads or to allocate R&D resources. There is a lack of formal mechanisms to translate upper level priorities into actionable programs for the institutes. Second, the industry-based structure of the research institutes disadvantages two types of research. First, cross-industry issues may receive insufficient attention. Second, priorities may tend to favour a value chain orientation, focussing on the needs of stakeholders within the production value chain, ahead of societal, community and environmental considerations.

IP Rights Domain

QDPI recognised the importance of establishing their own patent attorney and IP Rights group about 15 years ago which led to the formation of a Contract and Compliance (C&C) Group in 1991. Consequently, support for IP rights is well developed within QDPI. Establishing IP ownership and user rights routinely involves negotiation with other stakeholders in the technology. Over the years the department has developed a range of standardised IP Rights management practices. These include the retention of IP ownership as a preferred position; the preferred use of licensing agreements for commercialisation; and an established tender process to identify commercial partners via either public notification or selected invitation.

Several small IP Rights issues arose from the case data. QDPI's preferred position is to retain crown ownership of IP and provide rights of use to private sector firms through license agreements. This provides a strong deterrent against infringement. The expense of IP infringement litigation is a greater obstacle to IP protection for companies (particularly SMEs) than the state. Performance clauses ('use it or lose it') in license agreements are normally included requiring the commercial partner to achieve agreed sales or other market-based targets, at the risk of having the license rescinded. The majority of QDPI's projects are jointly funded and/or jointly conducted with other organisations. In those instances sole IP ownership is not usually possible. Subject to public interest considerations, QDPI negotiates an IP ownership, licensing and revenue-share agreement between the partners. Such agreements are designed to facilitate industry take-up of the resulting IP. IP ownership is further protected through the use of confidentiality agreements before disclosing IP and discussing right-of-use agreements. Effort is taken to ensure negotiation of agreements does not unduly delay or compromise the development and commercialisation efforts.

IP Uptake Domain

The IP Uptake domain generated the highest number of issues and attention as a result of QDPI's shifting emphasis towards commercialisation and industry up-take of its R&D. Discussion of issues is divided into a number of sections below.

Managing Competing Objectives

A number of QDPI-developed technologies and IP have international commercial potential. However, international commercialisation can negate the technology's competitive advantage and economic benefit to the Australian rural sector in the short-term. On the other hand, limiting access to the Australian market may restrict financial returns thereby discouraging private sector participation and ultimately obstruct the uptake of the IP completely.

QDPI normally addresses this conflict by including an exclusive market clause in the licensing agreement. This clause requires the commercial partner to initially undertake market development within the local market (Queensland and/or Australia) for six months to two years, before pursuing offshore (or interstate) markets.

Mode of Commercialisation

The dominant mode of commercialisation is exclusive licensing of the technology to an industry partner. While the department has, in the past, offered IP 'free-of-charge' to all industry participants, today's competitive environment requires financial incentives, such as exclusive licenses, before companies are willing to substantially invest in new IP. In a very limited way, QDPI is willing to undertake contract R&D with the resulting IP automatically claimed by the commercial sponsor.

QDPI recognises that other structures for commercialisation, while available, are not accepted practice in the public sector. For significant technologies, establishing subsidiary commercial companies that can be sold or privatised, as either solely owned or joint ventured, could be considered in the future. Although there is a growing international trend in larger producing regions towards joint R&D projects with commercial R&D partners, opportunities in Australia are very limited with its lack of private sector R&D expertise in the key fields of research at QDPI.

Managing Uptake Through Licensing

As mentioned above, licensing represents the most prevalent form of commercialisation at QDPI. The key implementation issues identified in the case studies are presented below.

Selection of Commercialisation Partner(s). When selecting commercial partners, QDPI is guided by government purchasing principles and the need to have sufficient 'transparency' to withstand examination by stakeholders.

QDPI's preferred option is to use an open tendering process that most governments employ for contracting of all services allowing equal opportunity for all interested parties. However, for most of QDPI's development, there are few organisations in Australia that have the capacity to perform the required commercialisation activities. Consequently, QDPI and other government agencies have recently adopted a more targeted approach of inviting companies for expressions of interest in commercialisation proposals. Selection criteria for commercialisation

licenses include what the bidder is offering for the license (i.e. royalties, fees, sales targets, further development, timing of market entry) and the company's proven capabilities (i.e. track record of commercialisation, working with government, financial stability, knowledge of industry and manufacturing, distribution and marketing capacity).

In some early research projects, the open solicitation process is pre-empted by inviting a commercial partner having the research capabilities that, when added to QDPI's capabilities, allows the research and IP Uptake to be undertaken. Alternatively, when a 'speculative', early-stage and high risk research project is proposed by a private business, QDPI is willing to negotiate an IP agreement without seeking alternative proposals.

Cannibalisation. Product cannibalisation is a potential source of conflict of interest for a commercialisation partner. For example, QDPI develops a series of plant varieties each superseding earlier varieties. In this case, the commercial interests of the industry partner (e.g. seed company) may be best served by delaying the release of the newer technology to delay cannibalisation of their existing product. To achieve rapid industry uptake, QDPI normal practice includes requirements in the license agreement for the commercial partner to release the new variety.

Long-term relationships. QDPI has many research programs involving long-term focussed research. A new plant variety development program can take up to 15 years to develop with field testing of each plant variety taking three to five growing seasons. A five-year program is likely to produce about three varieties and require external research funds of approximately \$200,000. In some of these programs, QDPI has established longer-term relationships with commercial partners that have been operating successfully. However, government agencies can be called to account for such long-term agreements. In one instance a QDPI long-term agreement came 'unstuck' through stakeholder lobbying of an equity sponsor in the research program (a federal research development council). The primary objection was the risk of inequity in such a long-term agreement with government preventing access to competitors, even though the partner was selected in a transparent and open manner.

Involvement in the Commercialisation Process. Traditionally, once a license agreement is signed, QDPI has little involvement in the commercialisation process. Some managers in QDPI voiced a strong opinion that a more pro-active involvement in the commercialisation process would lead to improved outcomes. However, a significant barrier to QDPI's increased involvement throughout the commercialisation process is the reassignment of already limited resources.

Royalty Payments - Seed or Produce. In some crop industries, the preferred method of royalty collection is in dispute - whether it should be applied on the sale of seed or on the sale of the resulting produce. A particular variety of seed is usually sold only once with the farmer banking seed from the harvest, known as 'brown bagging', for sowing in the coming season. Farmers favour royalty on seed on the simplistic assumption that they will pay less. However, if royalties are collected at the sale of the seed the one-off royalty fee could be large and prove an obstacle to adoption. By contrast, royalties applied to produce are not a barrier

to adoption since they are paid regardless of whether the newest variety is adopted by the farmer. Similarly, product cannibalisation concerns of seed producers are reduced since they receive the royalty annually even if a farmer 'skips' a generation.

Corporate Support for IP Uptake

Corporate support for commercialisation at QDPI is developing. At times, resources are not provided to support QDPI's direct involvement in commercialisation. Rather, technology is "thrown over the fence" to a private firm. Resources are not provided to bridge the gap where the technology is not sufficiently developed. The adjustment of reward and recognition mechanisms for research staff to reflect the greater emphasis on commercialisation has been limited. Traditionally, both the formal rewards, in terms of advancement, and peer recognition for research staff, were heavily linked to their performance in terms of research publications. Indeed, publications and conference presentations are important for the reputation of QDPI as a whole, as well as its individual staff. However, these traditional rewards are often in conflict with commercialisation considerations. The need to protect IP for commercialisation results in the delay, dilution of quality, or possibly prevention, of some research publications. This can be seen as impeding 'good science'. This conflict has naturally led to a small degree of cynicism and resentment among some staff towards this new emphasis on commercialisation within the research cultures of QDPI.

The policies for distribution of revenues from commercialisation activities varied between institutes. An overhead was allocated to central administration. Some institutes directed the majority of revenue back to the relevant research group(s), while others maintained the commercialisation revenue as discretionary funds.

Integrative Corporation IP Support Domain

Some specific aspects of support for each operational domain were discussed above. This section discusses QDPI's integrative, overall corporate support for IP management.

The mandate of QDPI and each of its research institutes is 'a rural economic development agency bringing together government and industry in partnership to increase the profitability of primary industries-based enterprise on a sustainable basis' (QDPI 1998). Under this mandate, QDPI undertakes R&D and extension with the clear objective of improving the competitiveness of Queensland's rural industries.

Technology transfer of QDPI's R&D outputs is clearly required to achieve this overarching corporate objective. Increasingly, commercialisation is the vehicle for technology transfer. Like all public sector agencies commercialisation involves juggling several objectives. For QDPI these include:

- Encouraging the wide adoption of research outputs (IP) by the Queensland (and Australian) primary industries, to strengthen its economic competitiveness. This is widely acknowledged as the primary objective;

- Securing a financial return for the government's investment in public sector research either through licenses, royalties, improved economic development, and/or good will;
- Enhancing the Department's reputation as a cost-effective research organisation, as measured in the number of patents, plant varieties developed and licensed, and research capability, so as to draw additional research funds from sponsoring industries and private organisations;
- Development and acquisition of GMO patents whose licenses can be exchanged with other patent holders, especially large international corporations and research groups, to obtain access to a wider gene research capability.

QDPI has placed increasing importance on commercialisation activities over recent years, as a mechanism to enhance industry uptake. However, adjustments in corporate support have lagged in a number of ways as discussed in the IP uptake section above. In addition, QDPI's research agendas themselves are shifting, albeit commitments to ongoing research need to be fulfilled. Existing structures and HR considerations act to constrain these shifts.

Another important corporate element to support commercialisation is the establishment and maintenance of organisational relationships and networks. QDPI's organisational structure and external relationships are well developed to support its RD&E activities. These RD&E are organised around research institutes such as Horticulture, Farming Systems (i.e. broad acre crops, primarily Wheat), Sheep and Wool, Beef, and Food Technology with each institute being guided by an industry-based Advisory Board along with priority setting provided by Industry Development Councils.

These bodies provide industry input into both establishing R&D priorities and effectively conducting RD&E. In addition, many of QDPI's research and extension staff work closely with the different industry groups. A national perspective is maintained with national agricultural R&D Corporations (RDCs) being a significant funder of QDPI's RD&E activities. RDCs also establish their R&D priorities by consultation with a wide range of industry stakeholders. Strategic plans are developed in consultation with a broad range of stakeholders and these drive the selection of new projects and other allocations of resources.

QDPI provides central IP support services through their C&C Group. This small group of three to four people is responsible for protecting the department's intellectual property. Their responsibilities include:

1. Providing assistance in contract negotiation and drafting, including research contracts and license agreements;
2. Providing advice on patents, plant variety rights, designs, copyright and trade secrets;
3. Providing advice on IP issues and their implications for QDPI;
4. Maintaining the department's IP register and contract databases;
5. Collecting and re-distributing licensing royalties on behalf of the department and its clients; and,
6. Providing staff training and education with respect to IP management.

The C&C Group has designated a staff member to liaise with each research institute. This arrangement allows the C&C Group to understand the unique business needs

of each institute while ensuring standard departmental management principles and practices are followed for IP contracts, policies and administration. For example, the C&C Group satisfies one institute's IP needs by devoting one day a week to becoming familiar with their business and advising and supporting their IP needs.

With the exponential interest in IP exploitation, the C&C Group is showing signs of becoming overloaded, with increasing delays in satisfying all IP assistance requests. Only limited levels of educational activities are supported with the current resources.

The Audit Scorecard

The preceding discussion provides a detailed assessment of IP management practices at QDPI within each domain of the guiding framework. This assessment is used to subjectively develop an overall evaluation of the level of development of IP management practices at QDPI. Table 2 presents a summary of this evaluation on a 1 to 5 scale from under-developed to excellent.

In summary, QDPI over many years has developed successful IP Rights and IP Generation practices. At the time of the research (2000) QDPI's IP Uptake domain was in a development stage following a shift in emphasis towards commercialisation. By working incrementally on a 'case-by-case' basis, QDPI had evolved their commercialisation practices using an iterative learning process. Corporate IP support for commercialisation was not yet well developed, leading to a lack of integration in the agency's IP management activities.

Table 2: Summary of IP Management Audit

MANAGEMENT DOMAIN	<i>Excellent</i>			<i>Under-Developed</i>	
	5	4	3	2	1
INTEGRATED CORPORATE IP SUPPORT			✓		
IP GENERATION	✓				
Corporate IP Support		✓			
IP RIGHTS		✓			
Corporate IP Support		✓			
IP UPTAKE		✓	✓		
Corporate IP Support			✓		

Concluding Remarks

The paper describes a framework to conduct a holistic audit of an organisation's IP management practices and capabilities. It illustrates how this audit framework was applied to QDPI, a government rural R&D and extension agency.

The audit provided a useful assessment of both areas of strength and areas for improvement of QDPI's IP management practices. As such, it provided a holistic, integrated picture of IP management practices. While some of the areas for improvement had been identified already by management, and some were being actively addressed, other issues had not been as obvious. Most importantly, however, the analysis was useful in highlighting the inter-related nature of many of the issues.

The paper is limited to examining the audit tool within a single government agency, largely focussed on agricultural RD&E. It would be an interesting avenue for future work to investigate the utility and adaptation of the audit tool in other public sector contexts and indeed, within the private sector.

End Notes

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