

## 10 RESEARCH SUPERVISION IN INDUSTRY/PARTNERED COLLABORATIVE RESEARCH

### 10.1 Overview

It is increasingly common for postgraduate research programs to overflow the confines of an individual research group and spread into:

- Other university departments, laboratories or research centers
- University teaching hospitals or research institutes
- External research and development (R&D) organizations including government, military/defense/aerospace
- Business and industry and government departments (including welfare agencies, social services, taxation, health, etc.).

A collaborative research program involving a postgraduate research student may emerge for any number of reasons, including:

- The postgraduate research program (or an overarching research program, of which the postgraduate research is one component) is funded by an external partner
- The research program is funded through a government collaborative grant which involves both the university and the partner organization
- The research is dependent upon the use of equipment which is not available within the confines of a university research group (e.g., synchrotron)

- The research is dependent upon the use of human patients as subjects for experimentation, under competent professional supervision (e.g., in a hospital environment or clinic)
- The research is dependent on a range of different professional skills (e.g., engineering postgraduate research into an electronic biomedical implant device may require collaboration with a hospital surgical unit for implantation).

In any collaboration, there is an expectation that each partner within it will benefit in some way from the outcomes – for example, through a sharing of knowledge/intellectual property (IP) or through sales of a product or service arising from the research. Generally, this is defined in the context of some formal, documented agreement and it is unusual (risky) to have two partners (e.g., university plus commercial partner) collaborate until such a documented agreement has been reached.

There are numerous benefits to collaboration, not the least of which is that a research student is exposed to a broader perspective than he/she might encounter within the confines of a small research group. If a collaboration takes place with business/industry, the collaborative research period can also constitute an internship, wherein a postgraduate researcher can become accustomed to commercial imperatives and limitations. So, the sum of the collaborative parts can end up being greater than the whole.

A graduate emerging from a collaborative postgraduate program can be significantly more:

- Street-smart
- Confident
- Erudite
- Employable

than one who solely completes a degree within a university research group.

However, with the advantages there also emerge additional challenges for both the research supervisor and for the research student, specifically in the areas of:

- Contracts and distribution of liability
- Joint management/supervision
- Definition of outputs/outcomes/deliverables
- Utilization/management of resources and funding
- Research student preparation
- Health and safety
- Adherence to multiple (potentially conflicting) sets of

instructions and procedures

- Confidentiality
- IP
- Student welfare.

In summary, the most significant challenge with all these areas is that the research student ultimately becomes responsible to multiple masters, and there is potential for conflict, confusion and frustration. The supervisor's role is to ensure that these things do not occur in the first instance and, if they do occur, to resolve them as quickly as possible in the interests of the student.

In this chapter, we examine some of the key factors that need to be considered in order to maximize the opportunities for a successful collaboration.

## 10.2 Contracts and Distribution of Liability

Postgraduate research programs necessarily involve money, physical resources, personnel, obligations and liabilities. In the case of collaborative research programs with partner organizations, all these elements need to be documented carefully, and agreed to by each partner – preferably in writing – before the collaboration commences.

A collaboration agreement needs to cover a broad range of issues, including:

- The objectives of the collaboration
- The commencement date, duration and expected termination date (and mechanisms) for the collaboration
- The nominated representatives from the university and partner organization/s who will be responsible for oversight of the collaboration
- The mechanism by which the project will be managed (e.g., management committee with representatives from partners)
- The financial (cash and in-kind) contributions to the project by each partner, and any specific resources to be devoted to the project
- The mechanisms by which research staff (and specifically research students) can be allocated or appointed to the collaborative project
- The timeline, critical pathways and milestone dates for the project
- The specific outcomes/deliverables for the project
- The distribution of IP and/or any royalties or benefits derived from the outcomes of the collaboration, including payment terms and/or schedule
- The responsibilities for any liabilities during the collaboration.

Generally speaking, in collaborative research there can be many vagaries and unknowns associated with the process of discovery and, because any agreement is written prior to the commencement of research, it is not realistic to expect that the agreement will be an all encompassing document for the duration of the program. Nevertheless, it does represent the formal reference point from which disputes need to be resolved through negotiation, and a point of departure for ongoing agreements, as elements of the research begin to reveal themselves.

A written agreement/contract needs to be signed by authorized officeholders of the various partner organizations in order to reflect their imprimatur in the event of a dispute, and to carry organizational weight in terms of day to day project management. Unless a research supervisor is an authorized signatory for the university, he/she would typically require advice and approval from authorized officeholders of the university before any formal collaboration agreement could be signed with an external organization. This is especially true when such an agreement makes commitments of resources, staffing or funds on behalf of the institution, or when the agreement may lead to obligations or liabilities on the part of the institution – which is almost always.

The time has long passed when two organizations could simply enter into a verbal agreement on a joint program and work with goodwill towards achieving mutually beneficial outcomes. And, while many academics may consider the potential IP and royalties from a collaborative program as paramount in a collaboration agreement, in reality there are other factors which may dwarf these in terms of significance.

The reality of modern research is that the financial benefits accruing to universities from IP and royalties are generally small – with rare exceptions (e.g., development of a commercially successful pharmaceutical product). However, the potential liabilities to the university may be significantly higher.

Specifically, the following liabilities may need to be considered in any contractual arrangement between a university and partner organization:

- Personal injury arising to the research student or supervisor while working on the partner's premises
- Personal injury arising to staff of the partner organization while working on the university campus
- Penalties/sanctions arising from breach of confidentiality (e.g., on the part of the research student).

Academics often dismiss these sorts of issues as minor details – particularly when a research student is conducting research at a partner organization which appears to be relatively safe – for example, having only an office environment, rather than potentially hazardous machinery. The reality, however, is that a research student can be injured as severely by falling down on a slippery office floor, as he/she can be injured as a result of misadventure with dangerous machinery. Injuries invariably translate into significant costs and compensations, so it is necessary to understand which organization is responsible and/or insured if the worst should occur.

A research supervisor may make the assumption that a research student working at the premises of a partner organization will be covered by insurance held by the partner organization – and a partner organization may assume that its staff are covered by university insurance when on campus – neither of these assumptions are necessarily valid in practice. For example, it may be that staff from a partner organization working on a university campus may be considered as external contractors and may need to provide their own insurance. The same may be true for students in the partner organization.

Each partner to a collaboration therefore needs to determine, from the appropriate officeholder within their own organization, the conditions under which students or staff working in either the university or partner organization will be covered by insurance.

All these discussions in relation to collaboration contracts apply equally to entities which may superficially appear to be part of the university itself but may, in practice, be separate legal entities. For example, a teaching hospital with the same name as the university may, for legal purposes, have a completely different governance and insurance structure. It may also have its own cost centers and therefore may form a distinctly different entity for distribution of royalties or IP.

The following sequence of activities may be helpful in establishing collaboration agreements:

- (i) Check university processes/procedures for establishing research collaborations and formal agreements
- (ii) Gather necessary information about the project and the partner entity – including project timelines, outputs, management team, resourcing/funding commitments, distribution of intellectual property and royalties, liabilities and obligations
- (iii) Work with the partner organization/s to get informal consensus on project details before expending time on written agreements
- (iv) Ensure that contracts are prepared by suitably qualified professional staff in either the partner organization or university
- (v) Liaise with university legal representatives and authorized officeholders to ensure that any contracts satisfy university requirements – work informally with the partner organization/s to iteratively achieve a document that is likely to be acceptable to signatories from all partners, including the university

- (vi) Ensure that any formal contracts are signed by official signatories of the partner organization and the university.

## 10.3 Joint Management/Supervision

### 10.3.1 General

Research that is undertaken in collaboration with an external partner – by definition – creates additional supervisors for the research student, whether this is formally instituted or not. Once a project leaves the confines of the supervisor's research group, and enters into a different premises or organization, one needs to accept that activities in that external area will come under the jurisdiction of outsiders.

It may be wishful thinking for a supervisor to believe they have sole charge of a collaborative project, but the practical reality is that they generally do not. In any collaboration, the needs of all the partners need to be met if the project is to succeed, and this is unlikely to occur unless the supervisor takes a team-based approach to management. Notwithstanding this need for teamwork, ultimately the supervisor can have practical responsibility for oversight of:

- The health, safety and general wellbeing of the research student while he/she is at the partner organization
- Any university resources/funds that are utilized during the course of the collaboration
- The health, safety and general wellbeing of any people, from the partner organization, working in the university.

### 10.3.2 Project Management Committee

Collaborative projects are highly dependent upon goodwill between the various partner organizations. Although it is generally the case that each collaboration will have a written contract that outlines timelines, outputs benefits and responsibilities, this only serves as a reference point for project management rather than an all-encompassing, prescriptive guide. As a collaborative project progresses, and elements which were unknown/unforeseen during the preparation of the contract emerge, they need to be managed – on a case by case basis – by representatives from the university and the partner organizations.



Collaborative research projects therefore tend to be managed by a committee, composed of representatives from each of the partner organizations. It is important that such committees are not so large that they become unwieldy but they do need to have sufficient members to facilitate the smooth running of the postgraduate research program and to remove any obstacles along the way. Consider Examples 10.1 and 10.2.

*Example 10.1*

*A collaboration between a university and a manufacturing company may include engineers from the company to co-supervise and mentor the research student while on the company premises. It may also need to include a production manager or machine shop manager – who may have no direct oversight of the student's work, but will need to make prototypes and production modifications.*

*Example 10.2*

*A collaboration between a university and a teaching hospital may require a management team that includes relevant medical specialists from the hospital, and also representatives from critical supporting areas, such as pathology or perhaps medical imaging.*

As a general rule, a management committee does not need to include staff who have no direct involvement in the technical aspects of the project. For example, it is probably unnecessary to have the company accountant present at meetings, simply because he/she manages the project finances from the partner perspective.

### 10.3.3 Supervision of the Research Candidate

Staff from partner organizations who are formally accredited, by the university, as supervisors for a research candidate working on a collaborative program can have a similar role to any other joint supervisors within the university system.

Sometimes, however, representatives from partner organizations in a

collaboration may not have the necessary qualifications to act as a joint (or associate) postgraduate research supervisor, and a university may not be able to formally accredit them as such for the purposes of the project. Nevertheless, these partner representatives may still have valuable contributions to make to the student's postgraduate research program.

The university supervisor's role is to balance the input from non-accredited staff from partner organizations against the best interests of the research student in postgraduate research sense. This generally requires considerable skill.

It is all too easy for a supervisor to quantize the activities of research students into things that need to be done for the purposes of his/her research degree, and things which need to be done for the collaborative project, but which are not part of the research degree. In such a scenario, a supervisor might simply preclude a student from undertaking activities not related to the research degree. The danger with taking such a clinical approach is that it may alienate the partner organization to the extent where the entire project, including the postgraduate research elements, become unworkable. In order to understand the sorts of concessions and informal agreements that need to be made, consider Example 10.3.

### *Example 10.3*

*A research collaboration, involving a postgraduate research student, takes place between a university and an aerospace organization. The research student needs to undertake materials testing for his research, using facilities provided by the aerospace partner. A supervisor from the partner organization agrees to provide the facilities on the condition that the student undertakes some additional tests at the university, which have no direct relevance to the postgraduate research, but which do have benefit to the partner organization. What is the research supervisor to do?*

*If the supervisor flatly refuses to allow the student to work on tests which are not relevant to the postgraduate research, then that organization may withdraw facilities support for the tests the student does need to do because they are not critical to the outcomes of the project as they view them. This is where the supervisor needs to be able to tread carefully between the strict demands of the postgraduate research program, the individual-level demands of the partner organization, and the practical reality of bringing these demands together. There is also a point where a supervisor needs to differentiate and balance between goodwill, pragmatism and exploitation. For example, what happens if the collaborator wants ongoing work from the student which is not related to the postgraduate research? The*

*supervisor needs to be able to draw the line in the sand using mature judgment. One approach might be to discuss the practical realities of such a situation privately with the research student and determine his/her perspectives before even forming a position to put to the partner organization.*

Ultimately, a research supervisor has primary responsibility for the student and the conduct of his/her postgraduate research. This needs to be made clear from the outset. Without such delineation of responsibility, a research student is likely to receive instructions from multiple sources and this will create confusion and disillusionment. In the context of the collaboration, a supervisor needs to act as a filter between the various instructional sources and the student. A good approach is to ask the partner organization to run any requirements they have for the student through the supervisor in the first instance – before discussing them with the student. This issue is re-examined in Example 10.11.

In many collaborative research programs the research student may be invited as a member of the management team and may have a role to play in providing input to the project directions. This makes the role of the supervisor more complicated because the student becomes both a peer and an apprentice researcher at the same time.

Overall, however, the supervisor always needs to place at the forefront of his/her supervision the best interests of the research student – continuously finding the delicate balance between the theoretical requirements for the research and the practical realities of the collaborative environment. If these balances are explained to the research student then the student should benefit from the professional learning that comes from managing conflicting/contradictory objectives and competing interests. These are a practical reality of the professional world and both the supervisor and the student can benefit from dealing with these challenges.

## 10.4 Definition of Outcomes/Deliverables

In defining the outcomes/deliverables of a collaborative research program, it is important for research supervisors to keep in mind the old adage that, *in order to avoid disappointment, one should always promise less than one can deliver, and always deliver more than one promises.*

Over-promising is a key mistake in research collaborations, particularly on the part of a university, which has its reputation at stake when it makes such promises. In particular, there are differing perceptions of outcomes and their value – particularly between universities and commercial entities. For example, a university may perceive the testing of a hypothesis and the discovery that it is invalid as a useful piece of knowledge – a commercial partner may perceive this to be a failure, because it cannot lead to a business outcome. An industry partner may perceive a process or product, which is not well understood technically, but still yields commercial results as a success – a university may see this as a failure because it represents unsubstantiated science.

In a research collaboration, the partners need to be in synchronism when it comes to jointly defining research outcomes for a project. From the university perspective, and particularly in the case of research students, it is critical that a university understands its own limitations. Consider the examples 10.4 and 10.5.

### *Example 10.4*

*"The objective of the research program is to develop a device which can be used to automatically determine the temperature of a machine tool bed, and which can be commercialized by the partner organization."*

### *Example 10.5*

*"The objective of the research is to explore the development of a prototype device, and to determine if it can be used to automatically determine the temperature of a machine tool bed. If the prototype proves to be useful, the company will then need to undertake the development work required to generate a commercial product based upon the prototype."*

Example 10.4 highlights a typical mistake in the definition of project outcomes on the part of a university. It suggests that:

- The research has a predetermined outcome which will be achieved
- The research student can not only achieve the outcome but can build a product to a commercial standard.

This sort of mistake is also commonly made in projects where a postgraduate research project requires software development – and it is implied that a research student can deliver a piece of software to the sorts of standards required for commercial use – in general this is not the case.

In Example 10.5, on the other hand, the research is genuinely open-ended, and is not predisposed to achieving a particular outcome. Further, the research student is only required to develop a laboratory prototype model, and it is clear that the commercial partner has the responsibility of converting the prototype into commercial reality.

In trying to avoid the temptation of over-promising to an external partner organization, it may also be useful to divide the postgraduate research project into discrete elements, each with some tangible output that each partner can use to calibrate its oversight of the project. Table 10.1 provides an example set of milestone objectives.

<i><b>Project Week</b></i>	<i><b>Milestone/Deliverable</b></i>
5	Completed initial literature review with options for investigation
8	Project methodology defined and documented
16	Experimental design completed and ready for approval by project management committee
17	Experimentation commencement
25	Initial experimental results presented for evaluation by project management committee
32	Complete experimental results presented for evaluation by project management committee
39	Analysis of experimental results completed and documented
42	Documented recommendations for development of prototype presented to project management committee
:	:
156	Handover of prototype and evaluation data for development and commercialization to commence

*Table 10.1 – Sample Project Milestone/Deliverables Chart*

The same commonsense rules should apply to defining project outcomes/deliverables as those that apply to developing a project management chart – that is, don't waste time on defining outcomes/deliverables unless one is fully committed to achieving them. In the case of postgraduate research, it is the research student that is responsible for delivering outcomes and it is therefore important that he/she is genuinely confident of delivering them.

In most collaborative research projects, a management team will create a timeline of milestones/outcomes/deliverables as part of the project development – and before any significant research work has been completed. Unfortunately, this is often presented to a recruited research student *fait accompli* at the beginning of the candidature – and it is assumed that the student will be able to comply with the stated plan. There are problems with this.

Firstly, the student has to genuinely buy-in to the plan and the deliverables, rather than to merely have them handed to him/her. Secondly, students who are recruited to the project may agree to the plan merely in order to please the management committee and without a firm belief in being able to achieve the objectives. A better approach may be for the project management committee to present the initial plan to the research student as a draft – and to have the research student come up with a final plan for consideration by the committee. This provides a higher level of buy-in to the project on the part of the student.

As with all project management fundamentals, all parties need to genuinely commit in order to get outcomes. This means treating the milestone dates and outcomes as firm and immovable. Specifically, this will involve:

- The project management committee ensuring that resources required for the completion of the research are provided to the student as initially agreed and on time
- A research student increasing the number of hours devoted to the project each week in order to meet deadlines – and not just pushing back deadlines
- The project management committee providing additional resources if it becomes apparent that the research student is working at maximum capacity and due dates are at risk of not being met.

## 10.5 Utilization/Management of Resources and Funding

### 10.5.1 Fundamentals

A collaborative research project will generally involve people, funding and equipment which, ultimately, all come down to funding. A collaborative research project may be funded by:

- A government or benefactorial grant specifically directed towards a collaborative research project involving the partner organizations
- Joint contributions to a total funding pool by the partner organizations
- A university (in-house) grant to a research supervisor to facilitate a collaboration with external partners.

A written collaboration agreement needs to pre-date the commencement of the actual research project and define which expenditures of resources are to take place and when. Further, the agreement needs to define who will be the authorized signatory (or signatories) for expenditure of funds. This may be the university or one of the partners – or a joint management committee and/or its nominated representative (e.g., project director).

In any such project there will be regular, recurrent expenditures (e.g., for scholarships and salaries), as well as occasional expenditures on one-off items (e.g., purchase of equipment or services). Careful budgeting and book-keeping is particularly important, as is the monitoring of cash flow. In particular, it should not just be assumed that because a university is a large entity that it has the capacity to release any amount of funding at any time. A large collaboration may involve the expenditure of millions of dollars, for infrastructure or equipment, and it should not be assumed that the university automatically has the cash-flow to cover such expenditure at a moment's notice. Large expenditures within a university generally need to be scheduled into the organization's financial management systems in order to avoid cash-flow problems.

A government grant to a university may, in practice, be paid in installments (e.g., monthly, quarterly or annually). The project management committee (or its nominated representative) needs to ensure that recurrent expenditures do not exceed the account balance at any given time and, if there is a chance that they might, then the organization holding the funding needs to be notified to determine if accounts can go into the "red". Consider Example 10.6.

### Example 10.6

*A basic collaboration is funded by a government grant which is paid quarterly. However, the project involves the purchase of large equipment and the payment of a scholarship. An initial purchase of equipment may send the project account balance into the red, and leave insufficient funding account to pay for the scholarship until the next installment arrives. Managing cash flow issues is therefore important and, if it is to be the university that is the holder of the account, then the research supervisor needs to liaise with his/ her line manager to ensure that the institution can facilitate funding for a scholarship while an account is in the red.*

## 10.5.2 Accountability/Auditing

Universities tend to be large organizations that, by necessity, use sophisticated accounting and auditing systems to monitor income and expenditure. A large institution may have many thousands of accounts and cost-centers that need to be managed, and each has nominated signatories.

Within an institution the basic rules relating to expenditure of funding are relatively straightforward and based upon common sense:

- Funding from a project account is generally only expended according to a pre-determined budget
- Auditing is typically carried out against the budget
- Signatories to accounts can generally only expend within budget and, even within those constraints, are often limited to a ceiling amount on any one expenditure item – unless they have approval from a line manager or have undertaken a regulated purchasing program (e.g., competitive tendering)
- Signatories to an account cannot allocate/expend funding to themselves – either directly or indirectly – without the authorization of a line manager who is not accountable to the signatory (i.e., a signatory to a collaborative project account may not sign for a payment or reimbursement to himself/herself – this would need to be approved by a more senior person)
- Significant expenditures need to be justified in terms of supplier (e.g., has a competitive tender process been implemented or have multiple quotes been received prior to purchasing an



item?)

- Some expenditures can only be made through particular suppliers (e.g., computer hardware, stationery or airline travel may need to be purchased through a university-certified provider)
- Signatories to an account need to formally disclose any conflicts of interest or pecuniary interests that may impact upon expenditure (e.g., an account signatory cannot sign funds to an external company of which he/she is a major shareholder – or a spouse or relative is a major shareholder – unless this has been declared – and the expenditure approved by a line manager).

Modern accounting systems require payments from an account to be made via expenditure codes – the expenditure codes are generally defined by the organization setting up the system, and are peculiar to the types of expenditures that that organization would make. For example, a university might have expenditure codes for stationery, equipment repairs, etc. Further, it is often the case that an institution requires any suppliers that it deals with to have a formal, documented supplier relationship with the institution – in other words, the accounting system needs to recognize any organization to which payments are made.

These checks and balances are designed so that auditors can ensure that institutional funds are expended against items that make sense in relation to a budget, and that any external organizations to which payments are made are registered with the institution and can be investigated (e.g., shareholdings identified) to determine whether any conflict of interest irregularities are taking place.

All these checks and balances mean that if it is the research supervisor who is responsible for the project budget, then he/she needs to exercise particular care with what is expended, and which organizations receive payments. Irregularities and anomalies will be flagged, and the signatory may be required to explain them. Consider Example 10.7.

*Example 10.7*

*A supervisor has used research project funds to purchase a dishwasher from a department store – for cleaning project glassware. This might be flagged as an irregularity by a university audit, because it would not be something normally purchased for a research project. In order to ensure that such an unusual purchase was not acquired for the supervisor's personal benefit, an audit team may require the supervisor to substantiate why such a purchase was made with research project funds, and why a particular supplier was chosen.*

10.5.3 Resources

There is a common perception by academics that institutional resources are, by default, free of charge, merely by virtue of the fact that they exist within the institution and are available for use. This isn't the reality in many universities, and it is certainly not the case in commercial enterprise. Most organizations operate some form of cost-centered accounting, wherein capital equipment, consumables, technical support, etc. need to be formally considered in budgeting.

It can be the case that within an individual department/faculty or research group, some infrastructure is budgeted centrally, and those resources are made available to staff as part of their working environment. Effectively, this means that each member of staff has had part of their budget allocations diminished to fund this central activity. However, this sort of infrastructure socialization rarely applies across departments, faculties or operational units.

By way of example, consider that a university hospital may have a medical imaging device which is required for a postgraduate research program. Usage of such a device is likely be costed to each user (per image or per time unit) as would any complementary technical support.

It cannot be therefore be assumed in the context of a research collaboration that resources which are available within the university are resources which are free to include within a research collaboration. The same basic practice is all the more rigorously administered within a commercial environment, where resources and supporting services are considered as a cost or profit center within the organization.

Many universities around the world are government funded, and so it is altogether common for commercial partners to assume that – as taxpayers – their entity can make use of university resources and supporting services at no cost. It may be the case that, in order to facilitate a collaboration, the university contributes resources and supporting technical services *gratis* as its in-kind contribution to the project – in the expectation that it will receive returns at some later date, in the form of IP or royalties. The exact nature of what resources can and cannot be provided needs to be discussed with authorized university officeholders prior to making any commitments to partners.

It is also necessary to determine what resources a collaborating partner can contribute to a project as in-kind, and what resources and supporting services can only be supplied as costed items, which need to be included within the project budget.

From an auditing/budgeting perspective, extreme care needs to be taken with allocating project funds to a collaborating organization in exchange for resources or services provided back to the university. Consider examples 10.8, 10.9 and 10.10.

*Example 10.8*

*A government grant is awarded to a university to engage in a collaboration with a company. The company and the university both contribute cash and in-kind resources to the project. However, excluded from the in-kind contributions from the company are tooling and workshop labor for generation of a prototype – these are to be billed to the project budget by the company.*

*Example 10.9*

*A government grant is awarded to a university to engage in a collaboration with a company. The company and the university both contribute cash and in-kind resources to the project. One of the project requirements is to purchase a piece of software valued at \$500,000. There are several suppliers for the software but the company insists on the project using its own software which has been developed in-house for the project. \$500,000 would then be transferred from the project budget to the company.*

*Example 10.10*

*A government grant is awarded to a university to engage in a collaboration with a company. The company and the university both contribute cash and in-kind resources to the project. Part of the university's contribution to the project is three postgraduate research scholarships. The research supervisor wants to be paid a consulting fee by the company because he feels that his expertise, over and above his supervisory work, will be required to facilitate completion of the project.*

In Example 10.8, a small proportion of the project budget is deployed to providing fabrication work for the research. It may be that the tool-making department within the collaborating company is a separate cost center outside the control of the collaborating staff and therefore this could be a legitimate expense.

Example 10.9 is fraught with problems and may cause serious questions to be raised under audit. In this example, a piece of commercial software has been valued at \$500,000. This may be the legitimate value for the software when sold in the commercial marketplace. However, the incremental cost to the company providing it to the project is negligible (i.e., only the cost of the medium or network transfer time). In effect, the company is receiving a direct payment of \$500,000 from a project budget for something which has negligible incremental cost. In this example, the university should have negotiated the provision of the software at no cost to the project during the formulation of the agreement.

Example 10.10 would also cause serious problems under audit and constitutes a serious ethical problem for the supervisor. A university is contributing considerable cash to a project in the form of scholarships – from which the company directly benefits as a result of the research labor provided. The company has been asked to pay funds to the supervisor to support the inadequate knowledge base of the research students. In effect, in this scenario, it can appear that the supervisor is giving away university resources (i.e., research scholarships) in exchange for personal financial benefits (i.e., consulting fees) from the partner organization. This constitutes a serious conflict of interest, and is not something which an academic supervisor should even contemplate (much less agree to) without full disclosure of personal benefits to his/her line manager. Even then, such an arrangement could leave the academic open to charges of serious misconduct, in the sense that he/she has traded university resources to a commercial partner in exchange for personal financial profit from that partner.

The following points may be of assistance in managing resources related to collaborative postgraduate research programs:

- Do not assume that resources (infrastructure, laboratory equipment, technical support, etc.) either in the university or the partner organization are available for use free of charge – generally, even in-house resource usage incurs costs from other departments
- Determine all resource costs and availabilities in both the university and the partner organization before formulating a collaboration agreement
- Seek advice from authorized officeholders prior to committing any university resources to a project
- Exercise extreme caution in paying for resources/services from collaborative research project budgets – conflicts of interest and pecuniary interests need to be identified and disclosed, before project funds are approved for expenditure
- Residual resources from a collaborative project either need to be disbursed as per the collaboration agreement or, if no such consideration has been given in the agreement, advice from appropriate university officeholders needs to be sought on any distributions.

## 10.6 Preparation of Research Student for Collaborative Research

### 10.6.1 Overview

There are considerable benefits accruing to a postgraduate research student who elects to undertake his/her research as part of a collaborative research effort. A collaborative research project can provide:

- Broader exposure to the field in both an academic and commercial sense
- Possible commercialization opportunities
- Opportunities for the student to develop negotiation skills
- Opportunities for the research student to pursue a career outside the university – with the partner organization.

However, there are also considerable challenges for the student, and it is the supervisor's role to ensure that these do not become insurmountable.

It is neither sufficient nor responsible for a supervisor to simply place a student in an outside environment without consideration of the skill set that the student will need in order to function in that environment. It is also increasingly common for students from various international backgrounds to be placed in partner organization as part of collaborations, and these students can experience even higher levels of difficulty and anxiety than local students. Specifically then, a supervisor should consider the following points and determine how best to brief the research student accordingly:

- Basic induction into the company – health and safety
- Dress codes
- Dealing with company staff
- Organizing meetings with company staff
- Confidentiality
- IP
- Bullying and harassment.

It is a mistake to assume that because a research student has a high level of intellectual capacity in a scholastic sense that they have the business and commercial acumen (i.e., *street smarts*) to make their own way in a partner organization.

The time expended on ensuring that a student is suitably briefed for his/her role in a collaboration is more than recovered by the reduction in the number of potential problems that would otherwise arise without briefings.

#### 10.6.2 Basic Induction into the Company – Health and Safety

It should not be assumed that a student has had sufficient exposure to environments outside the learning environment such that they will automatically be able to fit in to a partner organization. Further, it may be the case that, as part of a collaborative agreement, the research student has no formal position or authority within the partner organization. This makes the research student an outsider to the partner organization and it makes his/her role all the more difficult.

There are many basic pieces of information which would be given automatically to a normal employee in an organization – often these are not supplied to the research student, so it is important that the research supervisor ensures that they are covered. Specifically:

- Basic access to the organization – keys; smart cards; car-parking arrangements
- Rudimentary resources – photocopying; access to IT/networking; telephony; stationery
- Tour of the organization – including location of relevant facilities and accessibility; location of emergency/fire exits
- Explanation of day to day processes – meals, refreshments, office activities, etc.

These may appear to be trivial issues but they are not trivial to a student who has never worked in a commercial environment, and they are particularly daunting for students from international backgrounds who are not used to local customs.

In addition to these basic requirements, however, there is also a need for the organization to formally induct the research student into any local health and safety practices that need to be followed. This is particularly important where the external partner organization is involved in activities such as:

- Laboratory work
- Manufacturing
- Chemical/biological processes
- Mining
- Building and construction.

It is also important that basic briefings are given where an organization is involved with particular types of clients, particularly in medical/social work situations (e.g., patients with Alzheimer's, frail elderly people, patients with contagious diseases, etc.).

The research supervisor has a responsibility to ensure that the partner organization formally undertakes health and safety training before a research student commences activities there. Further, a research supervisor should meet with the research student to ensure that any such training which has been received is adequate and, if not, determine how any shortcomings can be addressed.

### 10.6.3 Dress Codes

One of the most overlooked aspects of briefing research students in relation to deportment in a collaboration relates to dress codes. This may appear to be a trivial issue but it has significant consequences. A research student working in a collaborative project needs to be able to win over staff in the partner organization for ongoing support, and inappropriate dress may cause immediate alienation, which is difficult to overcome.

An organization may have an implicit or explicit dress code but, in either event, respect for the code is a sign of respect to the staff working in that organization.

During the formulation of the project, a research supervisor should acquire a good perspective on what sort of dress code will be required from the research student. It may also be useful to raise this with staff in the organization who will be collaborating with the university. Failing all the above, the student needs to be advised to develop an awareness for what is and is not appropriate in terms of attire.

Typically, a business, accounting, consulting or legal organization may have rigorous dress standards with formal business attire required. It would



therefore be inappropriate for a student to arrive at work in such an environment with casual clothing. Conversely, an information technology company may have an informal dress code, and it would be equally inappropriate for a student to work in such an organization with formal business attire.

#### 10.6.4 Dealing with Company Staff

Many research students may not have experienced the professional, commercial work environment prior to the commencement of their candidature. While a collaborative research project may give them the opportunity to gain this experience, it is also important that their inexperience does not become an unnecessary liability to a collaborative project. In particular, research students are in a difficult position because the staff with which they will liaise may have numerous other responsibilities, which are more pressing on a day-to-day basis than the research project. The research supervisor needs to advise a research student:

- *How to address staff in the partner organization* – some staff may object to being addressed by their first name, others may see this as acceptable
- *When to contact staff and when not to contact staff* – staff are busy and should not be bothered with trivial issues, or with issues that they do not have the capacity to resolve – in some organizations, office politics are in play, and students also need to determine which staff should not be contacted in relation to the project.

In addition, it is important that research students are not continually pestering staff in the collaborating organization with problems – they need to develop efficient communications skills wherein they can:

- Determine which staff member is best suited (and has the authority) to resolve an issue
- Present the issue to the staff member in a short, concise manner
- Present a potentially feasible solution to the issue, which the staff member may then be able to approve or facilitate.

It is important that the research students are seen as contributors, who

are moving things forward, rather than complainers and time-wasters that are constantly highlighting shortcomings without presenting a proposal for action.

#### 10.6.5 Organizing Meetings with Company Staff

Meetings can contribute to lost productivity in commercial organizations, so it is important that research students are not seen to be the cause of unnecessary meetings, or meetings which have no clear purpose.

Research supervisors need to ensure that students are fully briefed on how and when to call meetings that involve time from staff in a collaborating organization. Specifically, the meetings need to have:

- Clear objectives, to which those attending can contribute specifically
- Attendees who are able to facilitate actions, or need to be briefed on developments and potential actions – meetings should not be overloaded with staff who only have peripheral relevance to activities
- A concise agenda, from which actions can be derived and responsibilities for those actions allocated
- Progress reporting on the status of previously allocated actions.

In some instances, the supervisor will need to be present at the meetings and in other instances, where discussions are more focused on issues internal to the partner organization, the supervisor may not be present. It is therefore imperative that the student is able to manage himself/herself professionally in those meetings – and that staff in the collaborating organization see them as productive.

#### 10.6.6 Confidentiality

In collaborative research programs there are generally confidentiality provisions in place in regard to the project; its outcomes, and intellectual property. It is often the case that a research student electing to opt in to a collaborative project will need to sign some form of confidentiality agreement.

Any confidentiality agreement signed by a student will have consequences – some of these may impinge upon the student's ability to carry on a professional career in a specific area at the end of the research project. It is important that the research supervisor advises a research student to seek independent, professional advice before signing any such agreement. This is discussed further in Section 10.8.

#### 10.6.7 Intellectual Property (IP)

A formal research collaboration with two or more partners will generally lead to an agreement on how to distribute/allocate IP and/or royalty income. A research student, opting into such a project and being a key contributor to the IP, may need to be a formal party to such an agreement.

As with a confidentiality agreement, an IP agreement is a legal document which may have implications for the research student's future career or aspirations to start his/her own business enterprise. It is therefore important that the research supervisor advises the student to seek independent, professional advice before signing any IP agreements. This is discussed further in Section 10.10.

#### 10.6.8 Bullying and Harassment.

A research student, conducting his/her research in a partner organization, can be subject to the rules and regulations of that

organization, in addition to those within the university itself. Sometimes, there will be anomalies between processes and procedures within the university and the partner organization. However, when it comes to issues such as bullying and harassment, it is particularly important for the supervisor to advise the student that he/she is available at any time to discuss concerns that may arise within the partner organization.

From the supervisor's perspective, the logical position is to adopt the more rigorous of the processes and procedures of either the university or the partner organization as a reference point. This is particularly true if a student complains of bullying or harassment within the partner organization. It also needs to be considered that a research student may not technically be a staff member within the partner organization, and that some of its rules will not be applicable.

The supervisor should become the first port of call for the student when any issues arise in relation to bullying and harassment – or even if the student is accused of bullying and harassment.

## 10.7 Health and Safety

In any research supervision and in any research collaboration, the health and safety of the research student is clearly paramount, and supersedes any other considerations relating to the project.

In general, universities around the world tend to have rigorous health and safety programs for staff and students, but there are some necessary exceptions. It is often the case that universities have dispensations from national or regional laws, simply because it would otherwise be impossible to carry on laboratory or research work. For example, an electrical laboratory may be exempted from a requirement to have all electrical terminals insulated and for no bare wiring to be exposed – otherwise it would not be practical to wire up power circuits. In exchange for such allowances, universities often expend considerable effort to ensure that alternative safety measures are in place (e.g., earth leakage and additional current sensors in electrical laboratories).

The point here is that research students may have become accustomed to the unique health and safety considerations of the university environment, and subsequently need to work in a partner organization which is subject to more conventional regulations. The partner organization may have health and safety requirements which are more rigorous than those in the university but with fewer special-purpose safety fallback measures.

The research supervisor needs to ensure that the student is:

- Fully aware of the health and safety procedures in the collaborating partner organization
- Briefed on the differences between conducting work in the university environment and in the partner organization
- Provided with an appropriate health and safety induction program in the partner organization.

As with most aspects of the collaboration, ultimately the supervisor needs to bear responsibility for the student's welfare on the campus and on the premises of the partner organization. The supervisor therefore needs to ensure that he/she is satisfied that the partner organization is a sufficiently safe environment in which the student can work. Consequently, it may also be determined that the partner organization is *not* a sufficiently safe place for a student to conduct research. For example, the partner organization may be a small start-up company which does not yet have fully developed health and safety protocols.

It may also be the case that the partner organization is equipped for health and safety in its primary area of interest but is branching out into a new area through the collaborative research program – and that area is not serviced adequately by health and safety procedures. All these things need to be taken into consideration from the outset of the collaboration. If there is any doubt about the partner organization's capacity to provide a work environment that meets national/regional health and safety requirements, then the research student should not be permitted to work therein.

A research supervisor should also insist that the research student contact him/her if there are any concerns about any health and safety issues within the partner organization. The research supervisor has a moral (and often legal) obligation to act on these as a matter of urgency.

## 10.8 Adherence to Multiple (Potentially Conflicting) Instructions and Procedures

A research student in a collaborative research program can become the principal interface person between the university and the collaborating partner. Needless to say, this means that the research student will need to deal with two different work environments, often with contradictory or conflicting objectives. For example, a commercial organization may have:

- Short timelines
- Day-to-day imperatives
- A focus on confidentiality.

A university, on the other hand:

- Works on long-term timelines
- Has few day-to-day imperatives
- Has a focus on publishing knowledge which is uncovered.

Learning how to balance and satisfy seemingly contradictory objectives is an excellent learning vehicle for the research student, and provides invaluable training beyond the basic research skills which are acquired. However, from the supervisor's perspective, it is important that the student is not faced with insurmountable challenges and contradictions – or, perhaps, in attempting to satisfy contradictory requirements, ends up working two jobs.

Table 10.2 highlights some of the contradictions that can exist between the university environment and the commercial environment. Supervisors and research students both need to be aware of these, and consider how they can bridge gaps when they arise.

The research supervisor and the research student also both need to be acutely aware that, when working in a collaboration, it is not reasonable to always draw hard boundaries between academic requirements and the requirements of the partner – particularly if the partner is a commercial organization. A collaboration requires give and take on both sides and, without this, the likelihood of any successful outcome is diminished significantly.

A collaboration agreement, established between a university and a partner organization, only covers the basic elements of what will be required for the completion of the project. Beyond these basic elements, it will often be necessary to negotiate additional items, and this cannot be done effectively unless there is goodwill between the two partners.

	<i>Commercial Perspectives</i>	<i>Academic Perspectives</i>
(i)	Commercial/ financial success	Individual academic excellence
(ii)	Converting ideas into functional products or systems is paramount	Testing the limitations of ideas is paramount - the objective is to see whether or not ideas can work
(iii)	Ideas that cannot be converted into functional products or outcomes are a failure	Ideas that cannot be converted into functional products or outcomes are an integral part of the research process - the research is to assess boundaries not to achieve a perceived "correct" solution
(iv)	Relative competitive advantage - shades of grey	Absolute solutions - black and white
(v)	Corporate excellence - individuals collectively work towards achieving an outcome for the corporate entity	Individual Excellence - individuals work towards achieving an outcome for the individual
(vi)	Team-based projects with knowledge vested over a range of individuals	Individual project with knowledge vested in one individual
(vii)	Propensity to keep developments confidential	Propensity to publish any new developments as a hallmark of success
(viii)	Projects are multi-disciplinary in nature and may involve marketing, science, production, sales, etc.	Projects are highly specialized in nature and focus on one particular type of expertise
(ix)	Financial indicators are used to measure success	Academic rigor takes precedence over financial considerations
(x)	Projects are successful if they can be rapidly commercialized	Projects are successful if they contribute new knowledge
(xi)	Concepts have little value relative to the overall process of development and commercialization	Concepts are the end objective
(xii)	An academic solution is only a concept and a starting point	An academic solution is the end-point of a research process
(xiii)	Commercial outcomes take precedence over process rigor	Process rigor takes precedence over commercial issues
(xiv)	Time-frames are backward scheduled from perceived market demands for products	Time-frames are forward scheduled from an original concept
(xv)	Professional time-frames are measured in days or weeks	Professional time-frames are measured in months or years

*Table 10.2 – Differences Between Academic and Commercial Imperatives*



Establishing goodwill with a partner organization will require flexibility from the supervisor and the student. Consider Example 10.11, which poses a similar challenge to that highlighted earlier in Example 10.3.

*Example 10.11*

*A research collaboration takes place between a materials science department in a university and an automotive component manufacturer. Unforeseen during the formulation of the project, it becomes apparent that the research student will need to conduct additional experiments for her research – and these will require unbudgeted, additional expenditure from the manufacturer, for machine shop work and materials. The manufacturer has some materials testing which needs to be carried out on university equipment, and the university has agreed to allow usage of its machine, provided that the research student agrees to do the work. This testing, however, is not in any way related to the research student's research. What is the research student to do?*

One obvious solution is for the research student to simply conduct the unrelated experiments as part of a *quid pro quo* arrangement, provided that these are not too onerous. However, what is the supervisor to do if he/she acquiesces to this request and subsequently the collaboration makes another and another?

It takes skill and maturity to manage these sorts of issues carefully, and without offending the partner organization. A good approach might be to acquiesce to the first request and simultaneously advise the partner organization that this is only a one-off, goodwill gesture made by the university – in gratitude for the additional contributions of the partner, and to demonstrate commitment to the project.

There may be other challenges as well. For example, a research student may simply refuse to perform any work which does not form part of the postgraduate degree. This is the right of the student, but the supervisor's role is to then explain the consequences of that decision in the context of continuing the project. For example,

- What if the student subsequently requires additional support at a later time from the partner organization?
- What if the student is applying for a job after postgraduate completion and the organization to which he/she is applying asks for a reference from the collaborating partner?

These are all things which should be considered.

In a more general sense, there are also issues with the postgraduate research student receiving instructions from multiple sources, and having to interpret which ones to follow. A good approach is to have regular meetings of a management committee, composed of the supervisor and partner representatives, to ensure that there is consistency of message, and that any conflicting messages can be ironed out at the meeting. But what about day to day conflicts? Whose instructions should the research student follow?

One answer is to only follow those instructions of the supervisor, but this isn't always practical. Suppose that the supervisor requests for tests to be carried out at a partner organization but that organization advises the student that the relevant machinery is currently unsafe? There have to be basic guidelines that the research student follows independently of who issues instructions. For example:

- The research student will always adhere to health and safety instructions from either the partner organization or the university, and whichever of those entities precludes an activity because of health or safety concerns has effective veto power on the activity
- The research student will follow the instructions of the collaborative project management committee, as a first priority, and instructions from the university research supervisor as a second priority
- If a partner organization issues instructions and they are reasonable of themselves, and the student is able to follow them without impinging on the project, then he/she is at liberty to decide how to follow them – otherwise, the instructions are referred back to the university supervisor.

All these things may appear self-evident to a senior professional, or even one who has worked in the professional environment for some time, but they cannot be assumed to be skills possessed by a recent graduate. The supervisor needs to assess, based upon the student's professional experience, exactly how much advice needs to be given to enable that student to cope with multiple environments and multiple perceived bosses.

## 10.9 Confidentiality

Universities celebrate discoveries of knowledge and are quick to publish them for the benefit of the broader community, but this sort of freedom is generally curtailed as a result of a research collaboration – particularly if one of the research collaborators is a commercial organization. It can also be the case that, even when the partners are all universities or research organizations, collaborations take place so that the partners can derive a mutual benefit from any arising IP.

In addition to outcomes from the collaboration itself, there are other confidentiality issues that need to be addressed. For example, a commercial partner may allow academic staff and research students from a collaborating university access to processes, services, designs or software coding which that organization views as highly confidential – and which would otherwise not be made available to outside organizations. Release of such information could damage the financial position of the commercial partner.

Moreover, it isn't simply technical processes and designs that may be the subject of confidentiality. Consider Example 10.12.

### *Example 10.12*

*An automotive manufacturer is a collaborative research partner and is involved in litigation over the safety of one of its vehicle braking systems. As part of a collaborative project, on the design of a new braking system, the university and research student are given access to a range of information that impinges on the current litigation. This information is not only technical, but also includes correspondence that has taken place with customers – its release could be prejudicial to the automotive company in any litigation.*

Clearly, extreme care needs to be taken with any commercially sensitive material which is revealed to the university or student as part of a research project. A collaboration agreement should therefore enunciate any specific conditions relating to confidentiality in respect of:

- Emerging IP/discoveries/research outcomes
- Services, process, designs and software that are proprietary to any of the partners
- Confidential (privileged) information which will be disclosed to the collaborating partners

- Publication/publicity in relation to the research project and who can authorize its release.

In the case of Example 10.12 it would not be realistic for the university or research student to expect to publish work that contains information which impinges on a litigation process – and the university and the student need to understand that from the outset. More broadly, it may be agreed that all partners to a collaboration will desist from publication of any information which will have a negative impact on any one partner – without that partner's express approval.

The confidentiality issues are therefore serious ones, and they obviously impinge on the natural function of a university to conduct research for the purposes of knowledge discovery, and dissemination of findings for the benefit of society.

In the context of the moral dilemma of presenting a complete and accurate depiction of reality in collaborative research, part of this problem is resolved by making a statement of the environment in which the research was conducted. Consider Example 10.13.

*Example 10.13*

*The research documented herein was conducted as part of a research collaboration with the Xylon Pharmaceutical Company, which contributed resources and funds to this project.*

Example 10.13 provides a mechanism for disclosure of potential bias by virtue of environment. That is, it is a statement to the recipient/reader of any work produced that any outcomes need to be read in the context of the environment in which the work was conducted. In other words, that the research is necessarily constrained in its scope and outlook. Within that constrained environment, the work which is presented still must have complete integrity. Regardless of any constraints imposed by a partner, an academic or student should never publish material which he/she knows to be misleading to the reader, or an inaccurate depiction of the totality of the knowledge at hand. This includes misleading a reader by omission of critical information.

If restricted/confidential information is critical to an accurate picture of reality then clearly research cannot be published without it – and therefore, in all likelihood, the research should not be published at all.

In addition to constraints on making certain information public,

confidentiality agreements may also preclude academic staff (e.g., supervisors) and research students from using any of knowledge derived during the course of the collaboration for later research work

The bottom line is that those who are involved in negotiating a research collaboration need to be mindful of the consequences of the confidentiality provisions of a collaboration agreement. Specifically:

- The morality of keeping confidential research findings which have a negative impact on one of the partners but are otherwise of significant consequence to society (e.g., the discovery that a product or process produced by a partner organization has a deleterious effect on individuals or the environment – or perhaps that a pharmaceutical product has no beneficial effects)
- The impact of confidentiality on the current and future careers of those involved in the collaboration, including academic staff and research students – particularly as it relates to the use of knowledge they have created in future research or career choices
- The impact on academic performance metrics of not being able to publish research work which might otherwise be published.

The key point here is that these issues need to be contemplated *prior* to the signing of any agreement, and not the subject of a dispute after the agreement has been signed. If the university, as a stakeholder in a collaboration, feels that it is unable to live with the various permutations of confidentiality provisions, then it may be better that they do not enter into a collaboration in the first instance.

A research collaboration can bring about major benefits for the university, staff and research students but every benefit has a cost that needs to be considered, and confidentiality is a significant one of those costs.

## 10.10 Intellectual Property (IP)

The potential IP arising from a research collaboration needs to be identified prior to the commencement of the program, and arrangements made for its allocation at the end of the program.

A discussion on IP needs to be prefaced by noting that only a very small proportion of the intellectual property owned by a university generates significant income. Often, a university will have only a few major IP success stories – over decades of research – and these swamp much of the remaining holdings, which only create small income streams. It is important therefore not to become overly preoccupied with the retention or ownership of IP, given that the chances of achieving significant financial success with it are limited.

It has already been noted herein that a common *rule-of-thumb* is that for every dollar invested in research, ten dollars need to be invested in development and a hundred in commercialization in order to make a saleable/marketable end-product. At best then, the university is likely to receive less than one percent of a successful product revenues emanating from its research, and only a minute percentage of research will lead to a product – and, even then, only a minute percentage of the products will be successful products. These sorts of statistics need to be kept in mind before unnecessary efforts and funds are expended in negotiating IP agreements over what may amount to negligible monies. Consider examples 10.14 and 10.15.

### *Example 10.14*

*A university enters into a research collaboration with a high precision machine tool manufacturer. The objective of the exercise is to investigate the materials science associated with making the machine beds in order to make the beds more thermally stable, and thereby improve machine tool accuracy.*

### *Example 10.15*

*A university enters into a research collaboration with a pharmaceutical company to investigate variations to hypertensive drugs, in order to create a more efficacious product with fewer side-effects.*

In Example 10.14, the university is engaging in research that is potentially contributing to improvements to only one part of an end-product (i.e., the machine tool). The research is looking at modifications to materials science that is already in place – and the proprietary knowledge of the commercial partner. The machine tool is a specialist professional device and not a general-purpose consumer product, so volumes are low. The chances of receiving significant returns from the IP – as commercialized by the partner company – even if the research proves to be successful, are limited.

Conversely, it may be the case that the knowledge derived from the materials science investigation has widespread and lucrative commercial applications in other areas not serviced by the machine tool company. The decisions relating to distribution of IP in this example therefore require considerable thought. Signing away the IP, in exchange for royalties or a direct payment, may provide a short term income but may preclude the university from using its own knowledge for other, more lucrative research in the future. Being excessively protective of the IP may be costly in terms of legal arrangements, and the returns may be well below the cost of the legalities.

In Example 10.15, the university and the partner company are jointly working on what is essentially a new product. The product is aimed at a mass consumer market; the cost of the product is significant, and the production volumes are large – so too are the costs of commercialization and approval by national regulatory agencies. In this example, there is a larger impetus to consider hard bargaining on the IP or its exchange for royalties. If successful – and there may only be a minute chance of that – the potential returns could be significant. It may be possible in this instance to rationalize the costs of the legalities associated with protecting the IP – including litigation, if that IP is breached.

It also needs to be considered that there may be better alternatives for the university than simply owning IP or even collecting a royalty income stream. For example, it may be possible for an agreement to be put in place such that, instead of providing the university with royalties in exchange for IP, a partner organization agrees to fund additional research or scholarships instead at the end of the research program. In many instances, the value of scholarships (which are essentially money-in-the-hand for the university) may be a larger and more secure form of income than risky royalties down a long and convoluted track.

Another consideration in the area of IP is the issue of protecting it when breaches arise. In most countries, a breach of IP is a commercial, civil issue, not necessarily a criminal one, and therefore any patents or

agreements only have force if an organization is prepared to litigate to protect them. Without litigation there is no real protection. This leads to the need to consider the cost of litigation against the cost of potential revenue. Consider Example 10.16.

*Example 10.16*

*A university engages in a research collaboration with a small, external commercial organization. The resulting IP is patented by the university and the partner. The partner organization decides to use the IP for business purposes without paying royalties to the university, and in breach of the patent. What should the university do?*

This is where the concept of IP becomes very muddy. In addition to the costs of litigation on the part of the university, there are other costs to be considered. To begin with, there is the cost to the university's reputation of becoming involved in litigation. An internationally renowned university may have a *brand value* measured in tens or hundreds of millions of dollars. That *brand value* often attracts tens of thousands of fee paying students to study at that institution, and benefactors to donate money to it. An unseemly litigation, which plays out in the media, could cause damage to that brand – well in excess of any IP value.

The other follow-on effect of litigation is the public perception of the university in society. If, as in Example 10.16, the entity that has breached the patent is a small organization and a university, being a multi-billion dollar entity, is seen to be bullying that small organization, then there is further potential damage to the university brand. At the other extreme, if the partner is, say, a large multinational pharmaceutical company, then the university has to consider whether it even has the resources to challenge that organization in the event of a breach of the IP agreement.

So, in considering these possible scenarios, it is reasonable, in negotiating any IP arrangements with a commercial partner, to consider the following as a first step:

*"Is the university genuinely prepared to litigate to protect its IP interests?"*

If the answer to this question is no (and it often will be), then there is little value in spending inordinately large amounts of time and resources in negotiating a complex IP arrangement that will never be enforced.

Finally, in the context of IP, there is the need to look at the impact of any IP agreements upon the research student. In entering into a



collaborative postgraduate research project, a student may be required to become a signatory to the IP agreement. This may involve the student signing away his/her rights to ownership of the IP, in exchange for the scholarship which has been provided for the conduct of the research. In Section 10.6.7 it was noted that research students should be counseled to take their own, independent, legal advice prior to signing any IP agreement in order to participate in a project. To do less than this is to do an injustice to the student and potentially place unnecessary restrictions on their future career or money-earning capacity.

## 10.11 Student Welfare.

Health and safety are the two most basic aspects of research student welfare. However, there is far more to student welfare than simply health and safety.

In order to perform at maximum potential a research student needs to be:

- Comfortable with his/her surroundings/environment
- Working harmoniously with colleagues
- Stimulated and challenged by the research work
- Comfortable that the work being undertaken is worthwhile and may contribute to a long-term career
- Confident that he/she has the ability and the support to achieve good outcomes.

A good supervisor needs to track all of these factors, and they are especially important when a research student is working outside the normal university environment and in the premises of a partner organization. From the supervisor's perspective, it is in the process of examining these aspects of the research program that it becomes evident that supervision is not simply about providing technical advice on the research – it is about enabling/facilitating the capabilities of the research student.

It is often the case that managers naively see their role as telling people what to do, rather than making it possible for people to actually do things. Good managers and good supervisors understand that their role is to work behind the scenes, so that the *doers* always have the right working environment and the tools they need to be at their most motivated and productive levels.

Unfortunately, it is also the case that supervisors can feel that addressing these sorts of issues is time consuming, and that the student has to learn to *manage and work independently*. These thoughts are, however, rationalizations more than reasons and it should be apparent that, in general, a research student does not have sufficient control over his/her environment or resources to resolve many issues independently. This problem is all the more pronounced in a collaborative program where the research student is an outsider to the partner entity.

A supervisor needs to be aware that any preemptive, preventative measures may involve significantly less time wastage than a postgraduate research program which has gone awry – especially one which is part of a

collaboration between multiple partners.

Novice supervisors will not have had the experience of *mopping up* a postgraduate program that has gone wrong, and may therefore underestimate the scale of a clean-up task – particularly if there are multiple partners that need to be placated in relation to a poor collaborative outcome.

Logically then, a supervisor needs to put focus and resources into ensuring that the environment and resourcing for the research student is as good as it can be to facilitate a good academic outcome on the part of that student. Table 10.3 provides some useful suggestions on pro-active tasks that a supervisor can undertake in order to maintain the student's welfare during the course of a collaborative research program – especially where the student is located in the partner organization.

In addition to these rudimentary issues, there is always the need to keep a watchful eye on the mental health of the research student during a research collaboration. In particular, in such circumstances, it can be the case that a research student feels alone and isolated because he/she is neither part of the collaborating organization nor the normal university operating environment. A feeling of inclusiveness is unlikely to be achieved simply by holding formal meetings with the research student on a regular basis. Additional measures may also need to be taken – for example, organizing regular, informal events/functions at which the research student can interact and socialize with colleagues at the university – and asking the collaborating organization to do the same at its premises.

In summary, before entering into a research collaboration, a research supervisor needs to be aware that there will be significant, additional time implications for himself/herself as a result of the need to manage the research student's welfare during the collaboration. These are above and beyond those of the normal supervisory process and any technical inputs to the research collaboration itself.

<b><i>Welfare Issues for Research Student</i></b>	<b><i>Pro-active Tasks for Supervisor</i></b>
Comfortable with his/her surroundings/environment	<ul style="list-style-type: none"> <li>• Ensure that the collaborative partner has provided a suitable and safe environment for the research student – including basic support (IT, network access, etc.)</li> <li>• Personally check the environment on a regular basis to ensure that it is suitable and that immediate remedies are sought with the partner organization in the event of shortcomings</li> </ul>
Working harmoniously with colleagues	<ul style="list-style-type: none"> <li>• Make efforts to hold discussions with the research student's colleagues at the partner organization</li> <li>• Organize informal functions to facilitate better interaction</li> <li>• Speak regularly to the student about his/her relationship with other staff at the partner organization</li> </ul>
Stimulated and challenged by the research work	<ul style="list-style-type: none"> <li>• Ask the student directly if he/she finds the work stimulating/challenging (n.b., this may not elicit an honest answer)</li> <li>• Check the student's progress against milestones regularly – if the student is completing tasks well ahead of schedule, additional challenges should be given to maintain interest</li> </ul>
Comfortable that the work being undertaken is worthwhile and may contribute to a long-term career	<ul style="list-style-type: none"> <li>• Ask the student directly if he/she believes the work is worthwhile and contributing to a career (n.b., this may not elicit an honest answer)</li> <li>• Organize for senior staff at the partner organization to talk to the research student about future career opportunities and interests</li> </ul>
Confident that he/she has the ability and the support to achieve good outcomes	<ul style="list-style-type: none"> <li>• Endeavor to read body language and determine if the research student exudes confidence, reticence, timidity or fear – attempt to determine root causes where necessary</li> <li>• Ask if the student requires additional resources or personal support to achieve outcomes</li> </ul>

*Table 10.3 – Pro-Active Tasks for Supervisor to Ensure Student Welfare*