

Collaboration at the Departmental, School, National and International Levels at the International Medical University, Kuala Lumpur

Michael John Rathbone

Abstract: The nature, extent and definition of a collaboration varies between individuals, disciplines, departments and institutions. It depends upon such factors as the people involved, the nature of the research problem, the research environment, the institutional culture and demographic factors. This paper will examine the concept of collaborative research and discuss its place and position in an evolving university.

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Introduction

The International Medical University (IMU) actively promotes collaboration amongst its research-active staff. This is not unusual within academic institutions as the scientific arena supports the notion of research collaboration¹ and agrees that it should be encouraged. IMU has developed an extensive international network of universities through its undergraduate programmes and has introduced several initiatives that aim to develop collaboration amongst its researchers. These initiatives include: (i) the development of four Centres of Excellence based on identified thrust areas² including the Centre of Biomolecules and Drug Discovery, the Centre of Environmental and Population Health, the Centre of Cancer and Stem Cell Research and the Centre of Health Professional Education Research; (ii) IMU actively promotes and supports the concept of interdisciplinary research groups amongst its Schools; and (iii) the undergraduate programmes are designed to expose students to research through the BPharm, BSc Medical Science, Dental and Medical programmes. There are also initiatives aimed at developing links between academia and industry through the fostering of research collaboration between these sectors – in particular, between the university

and local industry. All these initiatives are dependent upon an increase in interdepartmental, interschool and international collaboration.

Implicit in this enthusiasm for fostering research collaboration at IMU are a number of assumptions:

1. That the definition of 'research collaboration' is understood by the staff that it is aimed at.
2. That 'research collaboration' is the most effective way to utilise resources
3. That the activities, goals and outcomes associated with a 'research collaboration' are essentially the same whether the collaboration is between individuals, groups, institutions, industry or international partners.
4. That 'research collaboration' encourages research activity of the individual, and enhances their capacity to conduct research.
5. That 'research collaboration' will foster learning between individuals on the theory and mechanisms for undertaking research (i.e., it is a mentoring tool where the experienced pass on their knowledge and know-how to the less experienced).
6. That an increase in 'research collaboration' results in increased research outputs such as increased numbers of secured grants, or increased numbers of publications, or improvement in the quality of those publications.
7. That the benefits of 'research collaboration' outweigh the downsides.

These assumptions may or may not be valid given that fundamentally we are dealing with individuals from a diverse background of scientific disciplines and international education and experiences whose professional, ethical and general approaches to research are different.

This paper will examine the concept of collaborative research and question its place in an evolving University.

Pharmaceutical Technology, School of Pharmacy, International Medical University, 126 Jalan Jalil Perkasa 19, 57000 Kuala Lumpur, MALAYSIA

Address for Correspondence:

Michael John Rathbone, Professor of Pharmaceutical Technology, Dean, School of Pharmacy
International Medical University, 126 Jalan Jalil Perkasa 19, 57000 Kuala Lumpur, MALAYSIA
Email: michael_rathbone@imu.edu.my

The Concept of Research Collaborations

Of course, the concept of research collaboration is not new. The topic was well described and discussed in the literature during the 1950's, 60's and 70's³⁻⁷. However, such discussion and support for the concept detracts from the fact that a productive research collaboration is a complex and challenging undertaking which can take several forms, and demands a range of skills, in order to successfully achieve its major objectives – an increase in grant income and publication outputs.

Over the past decades scientific research has become an increasingly collaborative endeavour. To be successful, today's researcher needs an ever increasing range of attributes and skills. This has resulted in the observation that it is rare that a single individual will possess all the knowledge, skills and technical know-how that is required to undertake and complete a comprehensive research programme that is acceptable in the eyes of their peers. Indeed, it is the belief at IMU that if multiple researchers collaborate, there is an increased probability that between them they will possess the synergy of knowledge, technical skills and enthusiasm required to be productive researchers. Indeed, early opinion on the subject agreed that there would be a high degree of correlation between collaboration and research productivity, and between collaboration and financial support for research⁸⁻¹⁰. However, in an evolving university whose staff are young and inexperienced, the real value of a research collaboration lies in the transfer of knowledge, technical skills and analytical techniques. Collaboration thus ensures a more effective use of an individual's talents and provides a mechanism for the sharing of knowledge or skills.

Benefits of Collaborative Research at IMU

There are several benefits to collaborative research. These include: (i) cost-savings or other financial benefits; (ii) increased equipment access/utilisation; (iii) an increase in the visibility scientists involved and; (iv) an increase in the productivity of the scientists

involved. Essentially, the opportunity to work in close physical and mental proximity to other researchers will increase the skills and knowledge of those involved in the research collaboration³⁻⁵.

Reasons for Promoting Research Collaborations at IMU

The promotion of research collaborations at IMU is underpinned by the same sound reasons it is promoted in other institutions worldwide. These include:

1. The reduction in available funding, and targeting of that funding to big groups comprising complementary disciplines each of which has an obvious contribution to the research.
2. The aspiration of the modern researcher to increase their reputation, visibility and recognition in the scientific arena³⁻⁵.
3. Increasing demands for the optimal use of manpower to maximise efficiency and productivity within an organisation³⁻⁵.
4. The challenges associated with ever more complex instrumentation that requires specialist operation and understanding.
5. The ever increasing expansion in scientific knowledge⁶ that is required to make significant advances which can only be met by multiple researchers pooling their knowledge.
6. The need to gain experience or to train apprentice researchers in the most effective way possible³⁻⁵.
7. The need for cross-fertilisation of ideas and projects across disciplines³⁻⁵.

Forms of Collaboration

Various forms of collaboration exist ranging from the writing of the grant that funded the work, to active participation in a specific part of a research programme. Within the collaborations the contributions of the researchers can vary from the "significant" to the "almost negligible". Whether the latter contribution would

be perceived by others outside of the collaboration as a sufficient contribution to warrant inclusion in the collaboration is debatable. Researchers' contributions can vary from offering theoretical or technical assistance in the research project to providing general advice, opinion or criticism on the progress of the work. Indeed, sometimes a researcher may be seen as a 'collaborator' and listed as a co-author on a publication simply by virtue of providing material or performing a routine assay.¹¹ Whether this is an acceptable practice is a subject for debate. Some researchers develop collaborations where one researcher uses the other's resources such as a piece of equipment, a biological strain, or a database. Nowadays, with the aid of electronic communication and the ease with which one can travel the world, researchers may not even collaborate through regular face-to-face interactions. For example, a collaboration between researchers from geographically distant organisations may occur through email correspondence, or Skype calls, or through discussions at conferences or by occasionally visiting each other, or by sending students between organisations. Using a combination of these various mediums the collaboration can be maintained by sharing ideas to expand the project or to solve problems, or sharing data that was generated in the different institutions and then integrating the results. Some examples of collaborations that can occur are listed in Table I.

Probably the most complicated form of collaboration is that between researchers working at a university and those in a company due to the different interests of the two parties. Universities aim to share the results of their research at conferences or in the form of publications. Indeed, a major determinant of a university researcher's progression through the ranks is based on the number and quality of their publications. Companies, on the other hand, because of their financial interests, aim to limit the dissemination of their data, considering it to be proprietary, and take active steps to protect their intellectual property through patents and by limiting the extent of public broadcast of their findings. Thus problems can arise between universities and

companies during research collaborations as to whether and when to publish and to the ownership of intellectual property.

When Does a Research Collaboration Exist (the spoken or unspoken laws of a collaboration)?

It can be argued that a research collaboration exists if one or more of the following characteristics are fulfilled:

1. When multiple researchers work together on a project for its duration or for a significant length of it.
2. If a researcher has made frequent or substantial contributions towards a research project.
3. If the name of the scientist appears in the original research proposal, even if subsequently their main contribution is to the management of the research (e.g. as team leader) rather than research *per se*.¹²
4. When a scientist has made substantial contribution to one or more aspects of the research experimentation or interpretation (e.g. the experimental design, construction of research equipment, execution of the experiment, analysis and interpretation of the data, writing up the results in a paper).
5. When more than one scientist has been responsible for a critical step of the research project (e.g. generation of the original idea or has been involved in the theoretical interpretation of the data).

Essentially, a significant intellectual contribution by each potential collaborator is necessary for the interaction to be considered a collaboration.

A researcher would generally not be considered to be part of a collaboration when:

1. That researcher only makes occasional or relatively minor contributions to the research.
2. The scientist involved plays the role of a technician (routinely performs an assay) or acts as a research assistant.
3. The scientist only provides a material.

Nevertheless, while the above spoken or unspoken laws of a collaboration are applicable to many research circumstances, there are many exceptions to them. The only definitive statement that can be made regarding a collaboration is that a research collaboration has an ill-defined border and exactly where that border is drawn is open to negotiation (or misinterpretation!).

How is Collaborative Research defined at IMU?

Collaborative research at IMU may be defined as any research project that: (i) is carried out by at least two people; (ii) occurs at the Departmental, School, National or International levels; (iii) may happen in any way agreeable to the parties involved; and (iv) is likely to be more common between some fields/departments/individuals than others. The definition may also include collaborative ventures with industry. The ultimate goal of collaborative research at IMU is to gain more grant money and/or increase in publication outputs. Nevertheless, the aspirations of the institution should be tempered by the fact that, at the most basic level, it is *people* who collaborate, and the institute must acknowledge that co-operation between two or more researchers is a voluntary activity. At the present time IMU talks about collaboration at the level of 'research groups within a department at IMU', 'between departments within IMU', 'between institutions', 'between sectors', and 'between geographical regions and countries'. It does this in order to promote the realisation of returns on its vast investment in its international networks and alliances. However, the limitation of this approach is that collaborative efforts will not be fostered if the vision of the institute is not embraced by the individuals that work for it.

Perceived Benefits of Research Collaboration

Benefits to IMU

Table 2 lists the benefits of collaboration to IMU.¹³

Benefits to the individual collaborators

Table 3 lists the benefits of collaboration to the individual.¹³

Expectations of Collaborations at IMU

When problems arise amongst those carrying out collaborative research, it is usually because the collaborators either have (i) different expectations or; (ii) have not communicated with each other sufficiently well and/or effectively enough to express, understand, and then resolve their differing expectations.

As pointed out earlier, normally a significant intellectual contribution by each potential collaborator is necessary for the interaction to be considered a collaboration. However, perceptions of what constitutes a "significant intellectual contribution" can vary between researchers. Sometimes, the term "research collaboration" may have a different meaning to different collaborators and to other scientists or company managers who may be directly or indirectly involved. If these differences are not resolved through clear communication early in the relationship, they can become contentious.

The term "collaboration" in academic research is usually believed to mean a partnership between two researchers who are pursuing research that is mutually interesting to both. However, in today's research environment (discussed above) many collaborations involve researchers of differing standing, funding status and from different organisations. Indeed, today's collaborations frequently involve several people ranging from the principle investigators, to post-doctoral fellows, research staff members, graduate students, and/or undergraduate students. The question arises "Are all of the research group members aware of their roles and standing within the research collaboration?" Of equal importance; in the case of an academic/industry collaboration, is the question "Do any agreements and/or understandings (formal or otherwise) of the principle

investigators conflict with the interests of graduate students involved in the project when it comes to them completing their dissertations and publishing their results?"

At the present time IMU does not require collaborators to sign written agreements formalising the research relationship. However, it is obvious and beneficial if clear communication concerning the terms of the research collaboration is identified, resolved and stated early in the relationship. Generally, however, many researchers operate on the basis of unwritten understandings, which can include the aspects listed in Table 4.

Collaborations Take Time, Money and Effort

The underlying premise of IMU's collaborative research initiative is that research can be carried out more effectively and staff will be more productive. Collaboration, however, also entails certain challenges which directly, or indirectly, impact on the institution.

Collaborative research may result in additional costs to a project which arise from, say, international travel, as researchers go from one location to another. Material/equipment costs may also increase due to equipment and materials being transported between institutions. Collaboration will demand additional time arising from the need to prepare a collaborative research proposal to secure grant funds. Additional time will also be spent on the process of communication to ensure that collaborators are fully informed of progress, as well as making decisions to define who is going to do what and when they will do it. Writing up results as a team may also take more time.

Concluding Remarks

Within an institution the concept of collaboration is promoted due to the escalating costs of conducting research at the frontiers of science. For an evolving university it is almost impossible to provide the necessary range of research facilities for all the research groups working within it. Collaborative research offers the

opportunity to pool resources. At IMU a major factor encouraging greater collaboration amongst its staff on the international level is IMU's enviable position of its impressive list of international network and alliances, which have been established and nurtured through its undergraduate programmes.

There is general agreement that the summation of the value and outputs of a collaboration is greater than its individual parts. However, any collaboration is dependent upon individuals and, in some cases, the difficulties in working productively together may be greater than the perceived benefits. Every scientist is an individual, therefore the pros and cons of a research collaboration for a particular individual must be evaluated. Only if the pros outweigh the cons should that individual pursue a collaborative research project, and not simply because it is an institutional requirement. At the end of the day, this approach benefits the institution, since an unsuccessful research collaboration can have an adverse effect on its reputation and standing.

A research collaboration is a complex endeavour. In any research collaboration there is a high potential for misunderstandings. Misunderstandings should be avoided through discussion and agreement between the parties involved early in the collaborative process.

The bottom line is that collaborations are beneficial but are challenging to establish and do take time, money, effort and experience.

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Table 1: Examples of possible collaborative ventures within IMU.

<i>Equal contribution:</i>	Researchers in the same department or different departments within IMU work together on a research project. Perhaps none or limited funding is involved (researchers contribute their time, effort and expertise). The work would likely be equally divided between the two researchers who would meet regularly in order to review progress and plan for the publication of their results for their mutual benefit.
<i>Unequal contribution:</i>	Researchers in the same department or in different departments within IMU collaborate together on a research project. It would be likely that one researcher would lead the project with the other researcher providing technical or knowledge expertise on a limited aspect of the project. This arrangement may involve researchers from within the same discipline, or it could be part of an interdisciplinary project.
<i>Interdisciplinary research collaboration:</i>	A dental clinician identifying the need for improved clinical effects of an existing dosage form collaborates with a pharmaceutical scientist in order to develop a new dosage form. Each has their individual expertise to contribute to the project. The collaboration allows them to combine their expertise to achieve the goal.
<i>National collaboration:</i>	Multiple researchers at different institutions throughout the nation work individually on the same project, researching different aspects of the project and exchanging data/discussing progress either via face-to-face meetings, Skype, or emails.
<i>International collaboration:</i>	In order to gain a more global perspective on a public health question, multiple researchers throughout the World form a collaboration. The research group would agree upon the research question and upon the research methodologies that should be used. The data collected is made available to the collaborative for a joint publication.
<i>Industry collaboration resulting in upskilling the industry partner:</i>	A researcher from a company collaborates with the research group of an academic researcher for a defined period. During the collaboration the industry partners upskill themselves on a particular analytical technique or research methodology.
<i>Upskilling of a graduate student:</i>	A postgraduate student works in a different institution to their own, on a single occasion or several times, in order to learn a new technique, or to conduct research that cannot be performed in their host institution.
<i>Access to equipment or other facilities:</i>	A researcher gains access to equipment or other facilities at a different department or institution. In this case, it is important to realise that this may or may not be considered a collaboration. This depends upon the nature of the situation. For example, the access to facilities may simply be an agreement allowing one researcher to use the equipment/facilities in another's laboratory. In this latter case the spoken or unspoken laws of collaboration do not apply (see below).

Table 2: List of benefits of collaboration to IMU.

Better utilisation of individual talents	Modern research is becoming increasingly complex. It requires an ever increasing range of skills. When multiple researchers collaborate, their synergy will result in the necessary range of skills.
Increased transfer of knowledge and/or skills	For many researchers tacit knowledge only becomes evident when it appears in the public domain. Considerable time usually elapses before a particular researcher's knowledge appears in written form. A research collaboration is one way of transferring new (especially tacit) knowledge.
Improved source of stimulation and creativity	A research collaboration will inevitably result in the individual experiencing increased stimulation, motivation and creativity.
Increased productivity and impact	A research collaboration can lead to increased publication outputs.

Table 3: List of benefits of collaboration to the individual.

Benefits	Comments
Provision of intellectual companionship	Intellectual isolation can be overcome through a research collaboration.
Extension of the individual researcher's networks and alliances	Research collaborations can extend the researchers' network around the world. Their extended network of scientists can be contacted for information or advice.
Enhancement of the dissemination of the research results	Research results can be disseminated more widely. If the collaborator is well known in the field there is the possibility of increased impact of the results due to the increased chance that the results of the research will be located and used by others.
Provision of the opportunity to use equipment	Different laboratories invest in different equipment, depending upon local expertise and demand. A collaborative researcher would therefore get access to more equipment through their collaborations
Collaboration can be a source of creativity	Cross-fertilisation of ideas is an inevitable outcome of a research collaboration. This in turn may generate new ideas that individuals working on their own would not have otherwise realised (or not realised as quickly).

Table 4: Aspects of a research collaboration.

Aspect	Typical Questions
Authorship and credit	“Where will the results be presented?” “Where will the results be published?” “Who will be included as authors in any publications or presentations?” “What will be the order of co-authors in any publications or presentations?”
Research accountability	“How frequently will the collaboration team members meet to discuss and evaluate progress and results?” “What access will the collaboration team members have to each other’s original data and/or notes?”
Intellectual property	“Who has the rights to patentable inventions discovered in the performance of the research?” “How do the collaboration team members determine who will have license rights?” “What are the guiding principles relating to the transfer ownership of the intellectual property?”
Use of data	“How do the collaboration team members ensure that researchers have access to their data?” “How do the collaboration team members limit the use of data for “proprietary reasons”?” “How do the collaboration team members assure the sharing of data?” “Who in the team has the right to the data for the submission of future grant applications and the publication of scholarly work?” “How do the collaboration team members recognise the contributions of the collaborators?”
Data retention and preservation	“How do the collaboration team members maintain the data after the project closes?”