

Building Research Collaborations with Partner Institutions

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The University Research Committee met during the fall and spring of the 2013-2014 academic year to consider the topic of "building research collaborations with partner institutes". The following represents a summary report of the discussion and conclusions of the committee.

1. Purpose of collaboration

In general, collaboration has significant benefits whether it is between individuals, between institutions, or between an individual and an institution. These include both intellectual and practical benefits. From an intellectual standpoint, collaboration may spark ideas that you might not otherwise have due to habits and standards within your own discipline. Exposure to other intellectual systems of thought and other intellectual "cultures" expands your ability to think from multiple points of view, and provides a different viewpoint for evaluation, critical thinking, and expansion of your own work. This is the central element of "out of the box" thinking, and collaboration can be seen as an important way to exit the "box" created by longstanding intellectual traditions and assumptions within a single field. Sometimes another field will be able to provide a solution to an intellectual problem due to the existence of specific technology, methods, or a body of relevant work. Sometimes those solutions will require the knowledge and effort of people in another field if you or others in your own field do not have the requisite techniques to solve the problem, or if it cannot be solved in as elegant a manner.

Collaboration is a two-way process, and an important element is the possibility that you have techniques, methods, or knowledge that may help to solve problems in another field. Collaboration therefore provides access to questions and problems that may be different from the canonical issues addressed within your own field, yet which may have profound impact in another field or on the outside world.

Fundamentally, collaboration is "something you cannot do by yourself;" by definition it requires and benefits from the efforts of two or more individuals. Systematization of the concept of "brainstorming" has demonstrated the strong benefits of doing so with people from multiple backgrounds who can expand on and vary each others' ideas rapidly in ways that would not have been predictable in advance by any single member of the brainstorming group. Creativity can emerge from groups as much as from individuals, and interdisciplinary collaborative groups

appear highly likely to generate creative thought that pushes the boundaries of all participating disciplines.

An important result of successful collaboration is that the impact of one's own work is extended into other fields. This can increase the overall impact of your work, increase the number of citations, and increase the likelihood that others will extend and benefit from your work. In some cases, the impact of your work may be greater outside your own field, in ways that would have been difficult to predict. In other cases, critical thinking by those outside your field may allow your work to become more focused in a way that increases its applicability (and impact) in other fields. It is often difficult to assess the importance of one's own work, and the additional "vetting" by those outside the field can be an important element in determining the most relevant areas.

An important element of collaboration is access to resources. Resources include physical resources such as equipment, supplies, and personnel, but also intellectual resources such as prior intellectual effort in a different field, or specific expertise. There may also be access to financial resources, since different fields may have access to different funding sources. A common example is the significantly increased funding in healthcare and defense compared with many other fields, so that collaboration with people in these fields may lead to the availability of increased funding for those not traditionally funded by such sources. In addition, collaboration may allow application for funding from private foundations that would not otherwise have funded your particular field.

The committee recognizes that collaboration in Science and Engineering may be very different from collaboration in the Arts and Humanities. Collaborations which try to go even further, for example to bring Science and Arts together, while encouraged are more difficult to do institutionally despite ostensible support for these initiatives. Although the basic principles and goals are the same, collaboration is most often between individuals for the purpose of aligning two or more different intellectual perspectives on the same problem.

The above discussion applies primarily to collaborations between individuals in different fields or across different institutions. When an individual collaborates with an institution, it is most often for the purpose of obtaining access to resources (such as design, prototyping, manufacturing, or testing) that address specific needs (such as a test population that could benefit from specific solutions, or a group of users who can identify problems in need of solution), or because the problem being addressed is more complex than what can be managed by a single discipline. Collaboration with other institutions can sometimes allow an individual to address and test large-scale problems, and in such cases, collaboration with multiple institutions is sometimes necessary.

Finally, we consider the purpose of collaboration between institutions. At the simplest level, collaboration between institutions means that two or more institutions facilitate collaborations between individuals within them. But collaboration between institutions can also include shared resources, joint intellectual activities (seminars, workshops, guest lectures, exhibitions), and joint funding sources (specific grants for collaboration or financial resources to facilitate transport, communication, or other elements necessary for collaboration). The benefit at the institutional level includes visibility of the institution with associated prestige. Individuals who collaborate will necessarily have a high opinion of their collaborators and the facilities available from the

other institution, and this will increase the assessment of the other institution's value and importance. This effect will hold between academic institutions, but also with industry partners, civil society organizations, and governments.

A strong inter-institutional collaboration provides obvious value to each of the institutions. From the point of view of USC, inter-institutional collaboration increases our visibility, impact, prestige, and outreach. It will help us to recruit the best future students and faculty. We expect a "snowball" effect in which each successful collaboration makes future collaborations more likely. In addition, collaborations allow an opportunity for direct engagement of our students with partner institutions. These can enrich the students' educational experiences, provide broader student access to a variety of internship opportunities and ultimately enhance USC's sphere of influence.

2. Characteristics of Successful Collaboration

Collaboration depends most importantly on the nature of the partners. It is often particularly successful when the partners are dissimilar but share an equal interest in the problem being studied, and when the resources or intellectual methods of one partner are significantly different from the other, so that new thought, processes, or technology can be brought to bear on a problem. Therefore identifying collaborators with related but complementary expertise is particularly important. Collaboration requires two-way effort and benefit, so each partner must identify a resource that the other can provide that contributes to a shared goal.

Other elements of good collaborators include the individual's history of collaboration (experience with interpersonal aspects, logistics, finance, communication, etc.), the institutional history of collaboration (encouragement and reward for collaboration, willingness of administration to facilitate and support), engagement with partners outside the United States, experience of successful collaborations when there are potential imbalances of power (such as with universities in poorer countries), and the history of global collaborations (experience with international agreements, international contacts, language and cultural communication programs).

From the point of view of USC, we seek to collaborate in order to build strengths where we are weak, to improve our local and global impact, to facilitate technology transfer to industry, and to create the best possible academic work products. The goal is that collaboration produces results that exceed the sum of the parts. Our educational mission emphasizes the importance of providing student opportunities through collaboration, as well as to teach students the art and logistics of successful collaboration. By strongly emphasizing the role of collaboration for our own faculty and students, we also become a model for emulation by other institutions, and we thus further increase the impact of our own innovations in the collaborative process.

3. What makes others want to collaborate with us?

Collaboration, interdisciplinary effort, and nontraditional combinations of fields are hallmarks of the USC brand. We have implemented this throughout our campus, at both the undergraduate and graduate student levels, between faculty, and between departments and schools. We have a strong global mission, and we value our ties to international organizations, governments, civil

society organizations, industry and the community. We are therefore extremely well-placed to be a very valuable collaboration partner for many outside individuals and institutions.

Collaboration within and between universities benefits from several important elements, including the originality of thought of the students, easy and direct access to thought-leading faculty, the ability to do research with considerably less regulation than required for industry, and broad diversity of knowledge and skills all under a single "roof". USC is particularly strong in these areas, including a student body selected for creativity and innovation, faculty selected and rewarded for interdisciplinary work, broad skill sets of faculty across multiple departments, and expertise in both academic and industrial regulatory issues. We have a history of flexibility as an institution that may make us particularly attractive to both industry and academic collaborators. We also have a well-respected name, a clear "brand", and an academic hospital.

The committee noted that all of these features make USC a highly desirable partner for collaboration, but these features are not always known to potential outside collaborators. As a result, we may be able to significantly increase our collaborations and impact through advertising and marketing, and by reaching out to existing collaborators about the unique abilities and opportunities that we provide.

3. Barriers to Collaboration

Collaboration must be learned. Most people at an academic institution will not be automatically good at collaboration, and schools are not necessarily set up to support collaborations. Collaboration requires communication skills, particularly communication between different fields. Successful communication requires respect for knowledge in other fields, even when that knowledge appears to contradict or be unjustified by work in your own field. Trust and respect extend to the relation between institutions; the leadership must believe in the value of the collaborating institution and there must be a true sense at all levels that both sides will gain from the interaction.

Another important barrier is that funding is often targeted to a single field. Even when funding for collaborative or interdisciplinary work is made explicitly available, it is often targeted at particular types of collaboration and does not allow the full flexibility that may be required for truly novel work.

This committee has previously addressed issues of expectations in collaborative work, assignment of credit, and assignment of intellectual property, but these issues need to be continuously addressed and managed through legal assistance, advice, and education.

4. Strategies to increase Collaboration with partner institutions

The considerations above lead to several potential strategies to increase the number and quality of collaborations with partner institutions and individuals from outside USC. (We note that much of the discussion applies equally well to collaborations within USC.):

- a) Create programs for teaching collaboration, including identifying good collaborators, logistics, communication, funding, credit assignment, and management.
- b) Create a program similar to the internal USC Collaboration Fund that provides seed support for inter-institutional collaborations. This could be coordinated through the existing Global Collaboration office.
- c) Create or expand existing databases or "experts directories" that identify the focus of faculty within USC who might be interested in collaborating both within and outside USC.
- d) Make faculty aware of existing databases and make sure that information is kept current. Individual schools may have separate databases that identify specific areas and needs relevant to their faculty.
- e) Databases should include current and potential funding sources so that collaborators can be aware of how collaboration might lead to new types of funding.
- f) Continue to provide and strengthen specific support for international/global collaborative efforts.
- g) Identify a clear message and "brand" that markets who we are and why USC is an ideal partner for collaboration.
- h) Provide guidance and assistance for students interested in collaborative work outside of USC.
- i) Establish and evaluate metrics of quantity and success in collaboration.