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# Key Factors for the Future Success of Scientific Research Institutes

By Emanuel Yi Pastreich (epastreich@gmail.com)

The future of the research institute is one of the most critical topics of our age. Across the world, research institutes are struggling to define their vision and their function in response to the rapid evolution of technology and a changing economic and demographic environment. Here are a few issues that are central to assuring that a future research institute fully realizes its potential.



Emanuel Pastreich,  
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## 1. The need for a vision of how the research institute contributes to society

In the long term, large research projects will be strong candidates for funding, and broad enthusiasm among workers, researchers and taxpayers if they feature an over-arching vision for explicit social contributions. In an age of limited budgets, the need to show social relevance will be decisive. We have many research institutes that describe their research in terms of biotechnology or nanotechnology. Such descriptions are fine from an intellectual point of view, but in the future justifications for funding must be made in terms of a direct response to serious medical, environmental, or energy challenges, locally and internationally. Creating an intellectual backdrop that highlights how the research institute is leading the way, not only in terms of new developments in medicine and biotechnology, but also in an ethical sense, will be the key to building international collaboration networks. Those networks, by extension, will determine the effectiveness of the institution.

## 2. The building of global consortia

Although the research center may feature a group of outstanding researchers dedicated to solid research within the domains recognized in today's scholarly discourse, it is critical for the research institute to build global coalitions for collaborative research on larger critical topics. The degree to which the research institute plays a leading role in the formation of consortia with other major institutions around the world will determine its own evolution.

Investment in the hiring and training of staff with the professional and analytic skills necessary to identify valuable partners internationally, create win-win coalitions, and put together win-win funding packages on a global scale needs to be emphasized. If research institutes build larger, but focused, coalitions, they can put together creative international programs for funding that go beyond what any one national research institute could achieve.

One of the biggest challenges going forward will be putting together international financing coalitions to fund complex research projects that continue over years. Such projects will require that research be split among major research institutes around the world

and they may be financed jointly by corporations, by local and central governments, by foundations, and by international organizations. The process of putting together such complex coalitions, whether to complete a research project or to get a possible product or application through the "valley of death" will be increasingly complex and will require investment in sophisticated teams to construct and maintain such coalitions. Although such efforts are already going on around the world, they could be carried out in a more sophisticated and specialized manner-and the advantage will be with the research institutes that first dedicate the resources to the building of global consortiums. It may eventually be necessary to have teams to negotiate agreements consisting of sophisticated speakers of foreign languages such as Chinese, Japanese, or Arabic-and who understand the institutional landscape of multiple countries.

## 3. The importance of an artists' colony to a research institute

The next generation of scientific research institute will require an artistic and musical soul that will bring depth to its institutional culture and make it the preferred place for innovation and intellectual stimulation. Let us remember the example of Soho in New York City and how it transformed a run-down neighborhood into a major intellectual and cultural center. The central role in the creation of Soho was played by artists who moved into this neighborhood of empty warehouses and created a thriving community. The power of artists to create an environment that will inspire scientists and help to generate the sort of innovative research that is most desired cannot be underestimated. Although few planners of research institutes think about making a space for artists within those institutions, such a decision would be the smartest one they could make.

Although the creation of art may seem quite at a remove from scientific research, an ecosystem of artistic creation can do much to inspire the entire institute and produce a vibrant culture of excellence. A group of artists who work within the research institute will attract top researchers-people for whom cultural attributes are important-and inspire creative approaches to research within the

laboratory and the board room.

## 4. The role of artists in improving the visual representation of information

Although few scientists recognize its importance, the visual representation of information has become one of the most important issues these days in the biomedical field (and many other technical fields). The analysis of materials, molecules, and atoms at the nano-level today produces complex information that is remarkably difficult to digest and visualize. The three-dimensional qualities of molecules have real implications, but scientists and laymen are having tremendous difficulty in comprehending them. The marriage of the visual arts and the sciences in the visual representation of information at the microscopic and molecular scale is a central topic for the research institute.

The last few years there have witnessed the release of several remarkable short films that provide compelling representations of the function of a cell. There is much room for the collaboration of artists and scientists to develop effective and convincing means to present the immense amount of data generated in research in a compelling manner. To the degree to which information is attractively represented, research is interesting and inspiring. The visual representation of information over next ten years will become absolutely critical to success. There is a vital role for those with a strong sense for the effective representation of information, especially artists, within the research institute.

## 5. Designing the laboratory with special attention to ergonomics and customized IT solutions

One simple step that can do much to improve our laboratories is to think carefully about how the laboratory itself is configured and equipped. Frequently, top research institutes are poorly designed with little concern for the actual needs of researchers. Laboratories that are designed to improve access to equipment, enhance collaboration between units, and make long periods of concentrated work pleasant and stress-free are far more effective. Innovations in the design of laboratory space can have profound impact on the functioning of research institutes. Often just taking the time to observe how researchers work and provide suggestions for improvement can make a huge difference. We can employ innovative ergonomic designs for laboratory equipment and cutting-edge IT displays to create a revolutionary research environment.

## 6. Use of prototypes for computers and lab equipment and adaptation of a system for the rapid replacement of hardware

As the rate of technological change increases, new paradigms for research institutes must be adapted that can change rapidly. There is a need for a far more flexible IT infrastructure. The next decade will see the emergence of custom-designed equipment for analysis. Rather than buying equipment off the shelf, we will find that IT infrastructure is increasingly part of the experiment, carefully structured to respond quickly to changing needs. The future laboratory will bring in technical equipment in response to specific needs and then remove it as soon as the work is complete. The degree to which the research integrates this new reality into its planning will

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Moreover, although there are new major SI projects coming up every year, which cost up to billions of won, the actual development environment often proves less than adequate, forcing developers to leave behind quality control. The institution's purpose is to prevent such big budgets from being wasted by enhancing the testing process for these SI projects.

The long-term goal of TTA Software Lab is globalizing GS certification, which has somewhat established itself in Korea but is not accepted in other countries yet. It is an essential step in order for GS-certified products to be able to assure their quality in global markets. It will certainly take some time, but I believe this can be achieved within the next 10 years, providing we continue to make rigorous efforts.

Another goal of the Lab is publicizing BMT results: The US, for over 20 years, already has been randomly collecting products from the market and conducting BMT each year before announcing the results in the media in order for the manufacturers to learn about the strengths and weaknesses of their product while enabling consumers to make an informed choice. To be sure, the market has accustomed to the system and learned to embrace the results. If Korea also adopts the same procedure, it will encourage the developers to pay more attention to improving the quality of their products.

Lastly, the TTA Software Lab will contribute to Korean software industries by strengthening its specialties as the first institution of its kind. We would like to help Korean software industries grow as a software test engineering organization that develops and distributes software quality evaluation models, standardizes software test process, and promotes testing specialist training and CSTS certificate programs. [\[1\]](#)

be critical.

## 7. Webinars, distance communications systems, and long-term institutional relations

The death of distance predicted by Frances Cairncross is at last starting to transform research. And yet, precious few research institutes are designed in a manner to facilitate virtual meetings and close collaboration over distances. Yet we can imagine a moment in the not-too-distant future when the networks that the research institute maintains internationally are as important as its infrastructure. The ability to link up databases, to set up convenient and effective webinars, and to develop effective means of sharing complex information over great distances will be critical to the success of research institutes. To the degree that research institutes invest in such innovations, they will be able to create alliances internationally and place themselves at the core of multiple international collaborative efforts. [\[1\]](#)