

**BEYOND WINDMILLS, SILOS AND  
DISCIPLINES:**

**HIGHER EDUCATION AS A NATIONAL CRITICAL  
INFRASTRUCTURE**



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A Workshop on Critical Infrastructure:  
Needs in Interdisciplinary Research and Graduate Training  
Sponsors – National Science Foundation &  
White House Office of Science and Technology Policy

## INTRODUCTION

In Cervantes' Don Quixote, the primary character feels jubilant about the opportunity to engage his enemy.

"Look yonder, friend Sancho," he cries to his squire. "Fortune has provided me with thirty or forty giants to encounter. When they're dead, we may claim the lawful spoils of our conquest."

And even as his companion, Sancho, naively asks, "What giants?" Don Quixote drives his lance into the revolving sail of the first windmill. The motion of the sail breaks the lance and hurls the rider and horse a fair distance.

Sancho cries, "Did I not tell you they were windmills?" and rushes to his aid. Don Quixote laments his unlucky plight in which his enemy has deprived him of victory by changing these giants into simple windmills.

Don Quixote's conflict with the windmill is as rich in symbolism now as it was then. The ponderous machine may symbolically stand for entrenched, modern human institutions, ancient traditions, totalitarian governments, or even disciplines within a college or university. A lesson that could be derived from the strange conflict with the windmill is that a positive act of daring is capable of confronting any enemy or barrier and that success or failure is sometimes less important than the attempt itself.

The time has come for leaders in higher education to recognize and creatively respond to the opportunity and realities the national critical infrastructure challenge provides. In order to effectively do this, it is paramount that the academy embraces and implements a vision that balances basic and applied research, is truly interdisciplinary in program deployment, is engaged through strategic alliances yet retains institutional integrity, and deploys a reward structure that is real and reflects institutional mission and goals. If the challenge of the national critical infrastructure problem is taken seriously and appropriately and creatively responded to, higher education itself can be viewed as a national critical infrastructure. This important distinction would better serve the needs of society and strategically position the academy in the eyes of the public it seeks to serve and from which it receives its funding.

In keeping with the quixotic, if not agrarian theme, the successful destruction of these windmills or silos will take visionary action, perseverance, or even outright rebellion. Keeping

in mind that the quixotic reformer is often held up to ridicule or even destroyed; the visionary has been responsible for many great deeds, as well as many misdeeds. The difference may be in the eyes of the beholder.

Charles Perrow (2001) eloquently captures the interactive complexity and tight coupling of organizations and countries and how this relates to the national critical infrastructure challenge and the opportunity for higher education in his untitled paper for the White House Workshop on Critical Infrastructure. Building on his work in normal accident theory, Perrow points out that the interaction of systems is truly loosely coupled and difficult to predict and that the world may be less interactively complex and tightly coupled than many thought. To illustrate, he points to the Y2K challenge, which proved that a national and international program of remediation is possible if the sectors of society and nations cooperate, the problem is easily identified, the deadline is known and fixed, and the incentive to remediate high. However, Perrow offers that interactive complexity and tight coupling is rapidly increasing in the world, but “The new challenges will involve centralized, complex and coupled systems performing mundane, familiar, routine tasks in the area of financial data and transactions, telecommunications, energy generation, genetic agriculture, and pollution and global warming. To deal with these impending problems will take a sagacious mixture of natural and social sciences” (p. 2). He concludes that the centralization of society’s structures through mergers and acquisitions adds to the complexity. Higher education has the opportunity to lead here and in the process truly become a national critical infrastructure. Four simple but crucial recommendations are offered in this paper to make this fledgling opportunity a reality.

## **BALANCE APPLIED AND BASIC RESEARCH**

Perrow (2001) eloquently makes the case for a balanced university-wide approach to solving the infrastructure challenge where some researchers are left to man the foundation of systems through conducting basic research and others are linked to the private sector through applied research. Too much isolationism or too much commercialism will doom the efforts.

A vivid example lies in the skyrocketing use of the Internet and related activities, and in the failure of the nation's largest state economy to ensure a supply of energy to these burgeoning, power-hungry gadgets. Moreover, we have developed sophisticated, global positioning devices that can track or reroute vehicles, but there has been a failure to maintain and expand the highways on which these vehicles operate. The same can be said of the construction of bigger and faster aircraft, but not airports to accommodate them. Finally, the creation of a plethora of hand-held communication- and Internet-enabled devices has been created, but not enough space on the radio spectrum to carry them.

This is not to argue that the amazing results of recent research and development efforts are misguided, but it does underline Perrow's call for a balanced approach to the national critical infrastructure challenge from the academy: "Where some researchers are left to do basic research, but not all of them. Allow some researchers to link up with the private sector, but not all of them" (p. 3). The key is to involve both graduate and undergraduate students in challenge to bolster basic research and solve applied, interdisciplinary ones like critical infrastructure protection.

## **BREAK DOWN DISCIPLINARY SILOS TO ACHIEVE CURRICULAR CHANGE**

In addition to the dilemma of balancing basic and applied research, there is the question of academic programs and pedagogy in the academy. These choices of the academy have a direct effect on the national critical infrastructure question through the quality of the labor pool working on the problem and the related research activities of institutions.

However, higher education's role in the national critical infrastructure challenge may elicit more nervous laughter around the tables of Presidents and Chancellors than a meaningful exploration of the unique opportunity the challenge provides to reposition the academy with the society it seeks to serve. However, without leadership, there will be no reconceptualization of how academic curricula and programs are developed by their Provosts and Deans.

In recent years, higher education has been jolted by a variety of external factors. These challenges include globalization of the economy, changes in students' demographics and values, large-scale curricular change, decreasing state support, rapidly expanding information technology, changing age distribution of students, "privatization" efforts, competition from the public and private sector, and legislative demands for greater accountability. These and other factors co-mingle to produce a dramatic impact on the nature of emerging cross-disciplinary areas of study.

In order for the academy to make a difference in the national critical infrastructure arena, it must bring about systems level, over-the-top, paradigm-shifting curricular reforms. However, the organizational structure of higher education only encourages small-scale, programmatic innovation along the fringes such as changes in major programs.

Moreover, the university has been traditionally organized around silos or for the purpose of this argument—windmills. These structures can exist between divisions of universities such as academic and student affairs. Yet, the true challenge is within the academic units: the traditional academic department. Utilizing Lewin and Grabbe's (1945) "Nature of Change Concept", "desiloization" must occur. In this model, the system is frozen. In order for systems change to occur, it must be unfrozen and then re-frozen in the desired state. Knowledge does not conform to the traditional segregated units of the academy. Utilizing this concept knowledge is unencumbered by the need to fit into an academic unit and the institution is free to form in new ways. The key to this transformation is that the leadership of the institutions establishes a distinct vision and the reward system and resources are inextricably linked to the vision.

## **CREATE REWARD STRUCTURES THAT ARE REAL AND REFLECT INSTITUTIONAL MISSIONS AND PROGRAMMATIC GOALS**

Systems level change in higher education is inextricably linked to the internal reward structure of the tapestry of institutions comprising the academy. The key to this change process is the development of academic and administrative leaders that believe in the mission and direction of the institution and trust each other as they take the institution forward to the new frontiers of knowledge that are not the traditional domain of one college or another.

Incentive retirement plans should be effectively utilized when remediation is not possible. The promotion and tenure process must be carefully synchronized with institutional missions and goals. Departmental tyrannies that reward behavior inconsistent with the institutional mission and goals should be systematically dismantled. Pay for performance systems must be developed and implemented. Persons supporting institutional goals and missions should be financially rewarded for their performance. Deans and Department Heads should be evaluated on how well they collaborate with each other to advance the mission and goals of the university, and their merit pay should depend on it as well. The creative use of Task Forces and interdisciplinary teams designed to collaboratively examine threats and opportunities should be strategically employed. Any opportunity that facilitates interaction between people that do not traditionally communicate should be pursued. Carefully crafted and flexible employment contracts and faculty activity plans that focus energies on mission supporting activities can also be useful in achieving an effective systems level intervention.

## **UTILIZE STRATEGIC ALLIANCES TO ADVANCE REFORMS WHILE BALANCING THE INTEGRITY OF THE ACADEMY**

A new economy and external challenges and opportunities like the national critical infrastructure one are transforming the once staid academy. The impetus for change is the same: responding to a new economy in a world of changing boundaries, finite resources, globalization, changing demographics, legislative activism, privatization and competition.

In response to these trends, the higher education landscape must become increasingly entrepreneurial, agile and responsive to the changing needs of society. However, this process requires new tools for engaging external partners while balancing the integrity of the academy.

Godbey (1993) first examined the opportunity to make higher education more vital to society through strategic alliances. He comments on the power of these relationships: “Institutional autonomy will not disappear in the emerging context; rather, it will in psychological parlance, be sublimated—simultaneously canceled and preserved through transformation. Institutions that employ cooperative strategies will be stronger but more encumbered” (p. 38).

At the center of the emerging agile higher education institution resides a spirit of exploration, creative collaboration and strategic alliances. These relationships strengthen the capacity of partners to pursue their respective mission, as well as improve the ability to compete effectively. Although this process may seem counter-intuitive to some, the leaders who are engaging in these alliances embrace the opportunity to concentrate on organizational strengths, while teaming with partners that supplement that advantage. Simply put – competition through collaboration works.

According to Goldman (1994), organizational agility, or strategic alliances as it is sometimes called, has four basic elements. The first is enriching the customer (student or funding agency in the case of higher education) through a distinction between products and solutions. In a corporate model, the product or package is a solution, which is priced as a function of value to the individual through the uncoupling of production costs from lot sizes. The second component is that internal and external cooperation is the preferred operational strategy. The goal is to bring a product to market as quickly and cost-effectively as possible through utilizing the strengths of each of the partners. The third component relates to organizing in a manner that allows the rapid configuration of physical and human resources. Multiple concurrent organizations that meet different customers and needs are possible. The final component of strategic alliances is leveraging the impact of people and information. The skills and knowledge of people and information are the key differentiator for the strategic alliances mode.

## CONCLUSION

Higher education has an opportunity to play a vital role in the national critical infrastructure milieu and to establish itself as one of the nation's critical infrastructures because of its ability to positively or negatively affect the others. It is positioned to encourage information flow and facilitate the expanding functional interdependencies of society. However, achieving this reality will take not only a truly quixotic vision, but also endurance and the ability to implement it. The vision must be so strong that it can pierce the illusion of external experiences. Artifacts such as academic discipline boundaries and challenges such as backwards reward systems, academic isolation, extreme commercialism and balancing basic and applied research, are so ubiquitous and taken for granted that everyone thinks of them as harmless windmills – though they may be inexorably detrimental to the vitality of the academy and the ability to respond to national critical infrastructure opportunity.

Thus it does not matter if Don Quixote is a hero, madman, imposter, or actor. What does matter is that the character unleashes our imaginations so that we are free to explore the possibilities. The philosopher Unamo writes, “Thy triumph, my Don Quixote, was ever a triumph of daring, not of succeeding.”

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