Defining Resilience

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Background

In 2019, I published a paper entitled "Defining Resilience"[1] that framed the critical questions engineers must ask when considering resilience among the performance requirements for infrastructure systems such as buildings, bridges, highways, ports and harbors, and so forth. This at a time when concepts of resilience were front and center in the minds of engineers, facilities owners and operators, bankers, and insurers, largely as a result of losses (primarily financial but also human life) and other challenges faced following recent natural, technological, and anthropogenic disasters. Resilience was a relatively new concept in structural engineering design, but one that was quickly gaining recognition as a critical design consideration if not requirement, particularly when considering networked or interconnected infrastructure systems built in regions subject to natural hazards. In that paper, I drew parallels to organizational resilience, drawing on my experience as a university senior leader, and recognizing the similarities between the features and workings of (and need to preserve functionality and connectivity of) interconnected and interdependent infrastructure systems and those of any large organization such as a university.

Building Institutional Resilience into Colleges and Universities

BY DAVID V. ROSOWSKY

IN EARLY 2020, the world was hit by the COVID-19 pandemic and virtually every aspect of our society was immediately impacted, if not by the virus itself then by our response to containing its spread. Higher education was hit especially hard by virtue of (1) the nature of large numbers of students living and learning on our residential campuses, (2) the timing of the outbreak, coming in the middle of an academic semester, and also a critical time in the new student recruitment process, and (3) the financial challenges already being faced by many institutions. The responses of colleges and universities have been remarkable—there will be lessons learned, best practices identified, and informed preparations made for future disruptive events. Scholars will study our responses and the outcomes for years if not generations. This pivot point (referred to as our "black swan event" by one university president and our "Dunkirk" by another) will surely be seen by history as a turning point for higher education. I hope this is the case. This is a singular opportunity.

TAKEAWAYS

- Higher education was hit especially hard by COVID-19 due to the number of students living on campuses, the timing of the pandemic during a semester and a recruiting period, and the financial challenges many institutions were already facing. This "pivot point" may be seen as a "pivot point" for higher education based on the responses and outcomes of institutions. These responses will include when to reopen, which mission elements to preserve, how to continue recruiting students, and how to use the crisis to make changes.

- Higher education institutions are analogous to infrastructure systems. One of these similarities is the need to continue critical services and functions after a major disruption. Institutions need alternate work-flow paths and response and recovery plans. With these plans, business-as-usual is not the goal, but instead business in the "new normal." This new normal will be shaped by the new conditions of living in a world with COVID-19 and understanding the response need and potential impact of pandemics.

- The higher education field has learned many things so far from COVID-19. These include that students and staff have quickly been able to adapt to new teaching and learning methods, that there are ripple effects on families and communities when students are sent home, not all students have the same access to learning materials and services in their homes, senior leaders play a large role in communicating and comforting, enrollment techniques must be adapted to the new reality, and that campus administrators have been challenged figuring out how and when to reopen their campuses.

- Resilience is the ability to bounce back and recover quickly. Here are some recommendations on how institutions can be resilient: Institutions must have contingency plans set up for all types of scenarios, they must have contingency funds set aside, all senior administrators must be able to assume the duties of another if needed, leadership during emergencies must be clear, a point person for internal communications may be necessary, keep a good data backup to ensure that critical digital information is accessible, IT infrastructure should be in place, and a plan should be in place for mental health needs of returning students and staff.

In my thinking and writing about change and opportunity in higher education, like everyone else I changed my focus immediately to the pandemic and how colleges and universities would come through this successfully, in a position of strength, and better able to fulfill their mission. Decisions will need to be made in short order about how and when to reopen, which mission elements to preserve and reinforce, how to find further efficiencies or other cost reductions, how to reengage current students and recruit future students, and how to use this crisis to make needed structural, organizational, or programming changes.[2] This is also an ideal time to turn my focus back to "defining resilience," this time focusing on our institutions themselves.

Drawing Parallels

First, we have to establish that such large institutions as universities are indeed analogous to infrastructure systems. Both are complex, made up of interconnected and interdependent elements and subsystems, and serve critical functions. They are both expensive to construct, operate, and maintain. Design and operation of these systems should implicitly or explicitly address security, health and safety, integrity, durability, redundancy, reliability, and other such characteristics (including resilience).

They both facilitate flow. In the case of infrastructure systems, this could be traffic, data, water, electricity, workforce, emergency vehicles, goods and services, commerce, etc. In the case of universities, flow could refer to our students or the generation/distribution of knowledge itself. Our "intellectual infrastructure" consists of the campus, buildings, research facilities, major equipment, physical plant (water, sewer, power, telecommunication) as well as IT infrastructure, and stored knowledge (whether physical or digital). But it also includes the people (faculty, staff, researchers, clinicians, and of course students).

Infrastructure systems at the urban scale typically sit between two scales. They comprise interconnected/interdependent elements and subsystems. But they also may be (and likely are) part of an even larger "system of systems" of interconnected infrastructure systems (e.g., the interstate highway system, the electric power grid). The same is true for universities, often connected through joint research, academic programs, athletics, and other partnerships.

Finally, there are similarities between infrastructure systems and institutions in terms of risk (e.g., balancing health/safety vs. economic risks) and associated decisions and decision-making strategies (e.g., risk tolerance, liability ownership, and intergenerational transfer of risk).

So, let's say the parallels have been drawn, the case made. We can consider a university to be (at least analogous to, if not actually) an infrastructure system.

System Resilience Expectations and Requirements

System resilience expectations/requirements are intended to ensure continuity of critical services and functions. Requirements for resilient infrastructure systems, such as power distribution, tele- communication, energy (oil and gas), emergency services, and transportation, are most often discussed in the aftermath of a major (disruptive) natural or technological disaster. This is also when colleges and universities tend to assess resilience needs and develop/implement policies procedures, and processes to respond to any future events.

Infrastructure and institutional systems have much in common, including needs for robustness, reliability, sustainability, adaptability, and resiliency.

Robustness and redundancy are terms used to describe an engineered system's ability to respond to different loading types, directions, scenarios, or conditions of localized or partial failure not explicitly considered in the (typically member-level) design. This relates to load-sharing properties of a system, alternate load paths, fuse-type elements, and so on. Like resilience, these are *system characteristics.*

Response and recovery (of function, whether element, system, or network) are terms most often associated with disasters, specifically post-disaster efforts. Repair, most often, is a term that refers to structural restoration or rehabilitation of a damaged element or system. These are all ***actions***, rather than characteristics.

The analogies to institutional (university) resilience are clear. Alternate load paths are alternate work-flow paths. Fuse elements are procedures that contain any organizational impact or limit that impact on other parts of the organizations. Response and recovery, of course, take on exactly the same meaning.

Prioritization, triage, and sequencing considerations in response and recovery must be considerations in developing and implementing any institutional resilience plan. We are witnessing, at the time this is being written, extensive discussions around sequencing considerations as universities begin to think about partial or phased reopenings, who will be invited back to campus when, and how operations (teaching, advising, academic support, student services) can continue to support both on-campus and off-campus students. We are *not* simply seeking to restore normal (pre-crisis) operations of our higher educational institutions, as the external conditions will have changed dramatically. Business-as-usual is not the goal, but rather business in the "new normal," with conditions dictated by the realities of (a) living in a world with COVID-19 until such time that antibody testing and a vaccine are found and able to be manufactured and distributed in sufficient quantities to immunize and protect the world's population, and (b) living in a world in which we understand the potential response needs and the potential impacts of the next pandemic.

Learning from the Pandemic

What have we learned from our response to the COVID-19 pandemic? Admittedly this story is unfolding and there will be many lessons learned in the coming months, years, and beyond. There will be case studies, reports of best practices, and even scholarly work around every aspect of this pandemic, its impact, and this period in our collective history. Higher education is just one piece. Admittedly, it is a very big piece and, besides the potential interruptions or delays to students working toward degrees and faculty performing critical research and clinical work, the impacts on higher education and on our institutions have profound and far-reaching impacts on other parts of society as well. Colleges are not only economic engines or drivers, but they are economic contributors. Nowhere is this more true than in small rural college towns that are largely dependent on the student population for business.[3,4] University medical centers and hospital systems provide critical care to their regional populations. Media, arts, sciences, social services, education—virtually every sector is impacted directly or indirectly by (even temporary) closures of colleges and universities.

***What have we learned* so far?**

1. Faculty, students, and staff have been able to quickly pivot and adapt to a new way of working, teaching, and learning.
2. There are myriad ripple effects on students, families, and communities when students are sent home to live.
3. Not all students have the same access to conditions, equipment, or services to make the move to online learning. Family settings and conditions vary. Access to computers and high-speed internet vary. Demands beyond schoolwork vary.
4. Academic and student services are critical to maintain and must adapt to the new conditions alongside the faculty and students. Some student services become more critical. There may be higher demand for some services and lower demand for others deemed less critical at this time.
5. There is anxiety, uncertainty, and fear among all constituents. Some fear for their job, some fear for the future, some fear for their health and the health of their loved ones, some fear there will never be a return to "normal."
6. Senior leaders across the university play a critical role in communicating, comforting, and calming. The best senior leaders exhibit both confidence in the institution's ability to persist and compassion.
7. Colleges and universities appeared to have different levels of planning and sophistication in responding to the crisis, but we quickly learned from each other and common best practices emerged across institutions.
8. Traditional enrollment management practices and strategies are not likely to be effective or even relevant during and immedi-

ately following the crisis. We are rethinking these on the fly, cognizant of the financial impact of failing to meet enrollment goals. While everyone is in the same boat, some schools are more tuition-dependent and/or have fewer reserves to buffer a shortfall.

9. Communities continue to look to colleges and universities for assistance, information, and guidance during the crisis. (And they have delivered.)
10. Faculty and instructional staff have had to quickly experiment with and come to understand the opportunities afforded by online teaching. This includes faculty who have been resistant to such models for pedagogical/philosophical reasons, workload reasons, or both. The "shock to the system" that was the response to this pandemic forced an entire generation of faculty to become skilled in online teaching, a goal many schools have had for years. Going forward, there is likely to be a new receptivity to online and hybrid classes and programs among faculty as they come to appreciate the flexibility it provides and the new features of teaching and content it enables.
11. Administrations are challenged thinking about when, how, and to whom to reopen their campuses.

This list will continue to grow as we navigate the crisis and response, as well as the return to more normal operations. But this list can serve as a guide as we think about building resilience in universities to weather the next crisis, be it a pandemic, natural disaster, or something else.

How Do We Build Resilience in Universities?

We first need to establish a definition of *resilience.* Dictionaries define resilience as the capacity to recover quickly from difficulties, the ability to bounce back, or a toughness. Generally, resilience is associated with an ability to withstand hardship and return back to an original state. While the goal of returning to the original state may be appropriate for some systems, it is not necessarily an appropriate or strategic goal for others. For example, it might be more appropriate to rebuild damaged homes in a hurricane-prone region to a higher standard, an *improved* state relative to its original condition. Universities, as complex infrastructure systems, may seek to return to normal operations under some circumstances (e.g., following a fire, flood, or other natural hazard event), but may seek to return to an entirely different set of operating conditions and capabilities under others (e.g., following a global pandemic). Adaptation (of institutions and behaviors) to climate change also fall into this category. Indeed, we may well see many universities "return" to something quite different from what we had before the pandemic. There are certainly reasons this may be advantageous, timely, and strategic beyond the pandemic. In fact, there have been growing pressures on colleges and universities to change in recent decades, more often met with resistance than support from within, resulting in a growing rift between institutions and their missions, and society's expectations and needs for higher education. Higher education is stagnant and history-bound relative to nearly every other aspect of modern society, which is far more fluid, nimble, agile, and evolutionary. We have been accused of failing to adapt or evolve (despite recent evidence to the contrary with the rapid, universal move to remote teaching), of being out of touch with the needs of today's learners, and failing to prepare graduates for employability. This crisis has given us both challenges and opportunities, to make needed change and reconsider our roles and responsibilities in society.

Given the discussion above, and drawing on my experience as a university senior leader and perpetual student of higher education and its institutions and systems, here are 14 specific recommendations for building institutional resilience:

1. Scenario-plan and contingency-plan. The coronavirus epidemic was not unforeseen.[5] Consider the full range of possible (however unlikely) interruptions to normal campus operations, at all different times during the academic year. Have a standing committee led by a member of the senior administration that reports regularly on readiness to the president and board.
2. Build an emergency/contingency reserves fund. Set a goal based on (a) your annual expenditures, and (b) your current capacity to absorb losses. For some institutions, building such a dedicated reserves fund will take time. What's important is that you start now and make it a priority to add funds each year until you make your goal.
3. Establish an expectation for all senior administrators to be able to assume the duties of another administrator if needed. This can be done in a number of different ways, either by regularly briefing the entire senior leadership team on critical functions, initiatives, and challenges of each administrative division, or by assigning specific backup roles (each

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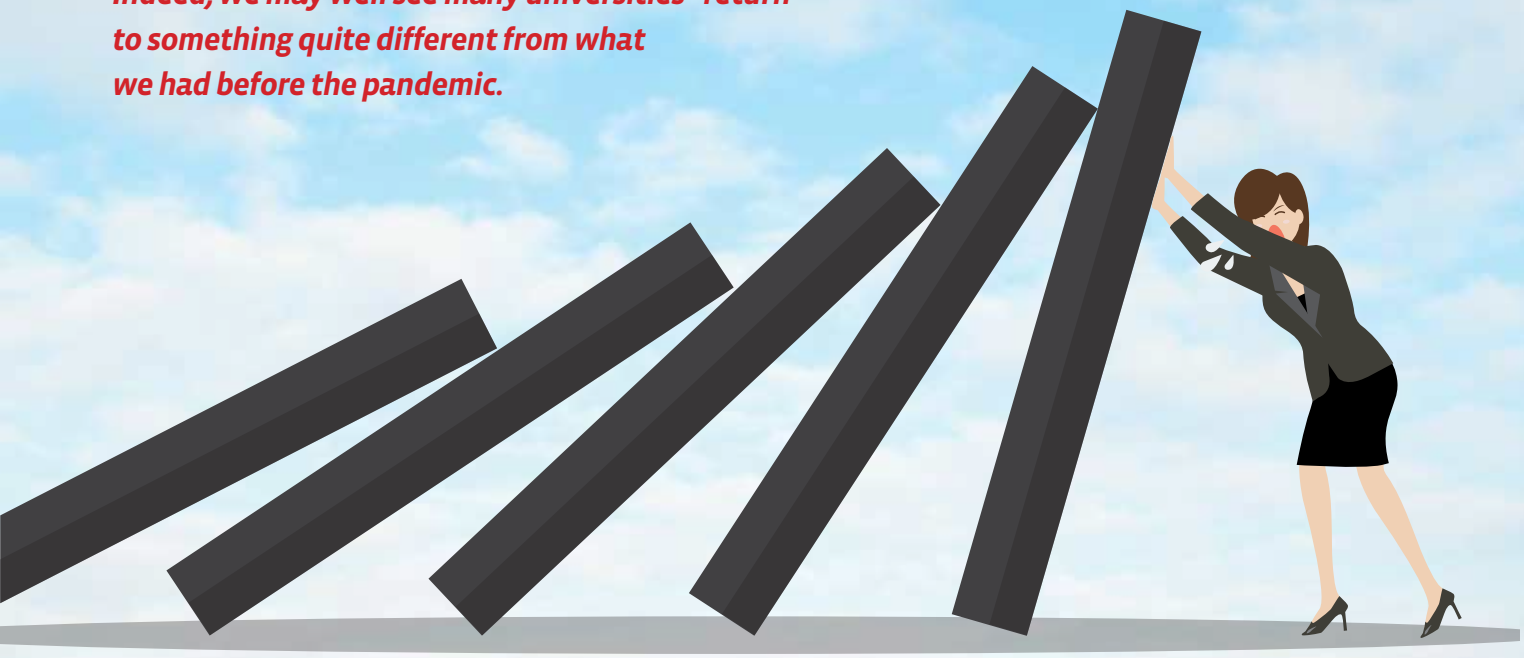

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senior leader responsible for a division of the university is assigned as the backup for another senior leader, thereby only needing to stay abreast of one other division's activities).

4. Develop emergency/continency plans throughout the organization, down to the department, lab, employee group, or office level as appropriate. These should be (a) reviewed and updated annually, and (b) collected and posted (for internal use) by each college, school, or division. The standing committee (see recommendation 1) should review these annually for completeness, consistency, continuity assurance, and mutual compatibility, making recommendations for any needed changes.
5. Establish both chain of command during emergencies and an emergency operations institutional leadership structure for prolonged periods of time during which the university must operate under crisis conditions. This leadership structure may be the institution's regular leadership structure, it may be a streamlined version, or it may be quite different. Set clear conditions under which any change in university operations and leadership structure may change. It's critical that everyone know who is making decisions, who is the responsible authority, and how trustworthy and timely information will be disseminated.
6. Scenario-plan (including explicit considerations of risks) reopening/return-to-normal procedures including possible partial or incremental reopenings or returns to normal operations. Establish clarity around who makes these decisions and who informs the decision-maker(s). For each scenario considered, also consider different timings during the academic year.
7. Establish a point person for internal communications from the start of the crisis until the crisis is over and the campus has returned to normal operations. This person also should coordinate all internal communications, working closely with and setting policy or providing best practices to departments, student life and student affairs offices, advisers, student services offices, as well as campus leaders.
8. Establish a point-person for external communications/coordination from the start of the crisis until the crisis is over and the campus has returned to normal operations. This person (who may or may not be the same person in recommendation number 7) has responsibility for coordinating communications with external constituents (community, alumni, city or state government offices and officials, hospitals) and for coordinating efforts with other organizations, institutions, municipalities, or the state.

9. Create and regularly review/refresh data management and security plans to ensure critical digital information is preserved and accessible. Most colleges and universities already have procedures in place (e.g., data backup, off-site data centers).
10. Create and regularly review/refresh a research emergency operations plan that addresses lab shutdowns, storage or disposal of volatile or hazardous substances, securing of facilities, decisions about laboratory animals, interruptions to clinical trials, and establishing a critical personnel list for operations that must be continued during a shutdown.
11. Ensure IT infrastructure is in place (including appropriate redundancies) to allow senior leaders to continue to meet and function as a team, and for the president and board to continue to meet. Create a physical and a virtual "war room" for command-and-control meetings and operations.
12. Create a campus-housing emergency plan responsive to multiple different emergency scenarios, including (1) students remaining on campus, (2) students returning home, (3) some students remaining and some leaving, (4) one or more residence halls coming offline, (5) use of vacant rooms to house other individuals/groups, (6) use of other campus (or community) facilities for temporary housing. The same should be done for campus dining operations.
13. Identify one or more professionals (*external* to the university) who can be brought in to assist senior leaders if needed, e.g., crisis management, public relations, legal, security.
14. Recognize and plan for mental health needs of returning personnel (students as well as faculty and staff). Ensure an onboarding plan is established and available for when people return to campus. Scenario-plan the different needs of these groups and have a plan robust enough to handle all eventualities. Mental health issues may range from anxiety to stress over job security to post-traumatic stress syndrome to grief over loss of loved ones.

These recommendations are intended for campus-based institutions. Other types of institutions may have additional or different considerations. But this list can serve as a good starting point for nearly all types of universities when thinking about and building (physical, distributed, or virtual) institutional resiliency.

Issues of Access and Equity

I believe America's colleges and universities have always been socially conscious and socially engaged, but our journey toward being socially just, equitable, and truly accessible continues. Being on this journey gives me hope that higher education will, once again, lead the nation to a better place. There are many dimensions of access and equity, both individual and institutional, that should be considered when building institutional resilience.

Universities must commit to accessibility by their students regardless of operating conditions or circumstances. Just as we have made great strides in everything from note-takers and readers, to accessible websites, to incorporating principles of universal design into our pedagogy, we must also consider our students' needs when operating outside normal conditions, whether they are on-campus or off-campus. This may mean extra steps, extra services, or extra time spent with students having special learning needs.

Students come from different backgrounds and can have very different family circumstances. For some students, working remotely from their home can be a relatively easy and even welcome transition to make. They are close to parents, their pets, a well-stocked kitchen, and have ready access to a computer, printer, and reliable high-speed internet. For others students, it could be an entirely different story. Strained relationships (or worse) with a parent, very crowded space not conducive to online learning, food insecurity, lack of access to a computer and (more often) high-speed internet. Environments, support systems, and access to necessary technology can all be completely different for different students. If they are all expected to engage in online learning from home while the university is closed, a number of new equity issues become relevant.

We must also be sensitive and responsive to the needs of our faculty and staff when asked to work under nonstandard conditions, especially if that includes working remotely. As with students and their settings for learning, settings often are not ideal for the work expected of faculty and staff. Many have family responsibilities that include children. Some are caring for aging parents. We have asked people to continue in their roles, to the extent possible, under certainly less-than-ideal conditions that blur the separation between work and family. Any concept of work-life balance may entirely disappear for some.

Many of the lowest salaried employees may be especially challenged during a campus closure, particularly if their hours are reduced or if they are furloughed for any period of time. Again, this presents a new set of equity issues—not all of which are faced under normal operating conditions.

While our focus naturally turns to individuals when considering access and equity, there are also issues of *institutional* equity. As is often the case, where there are challenges there are also opportunities. Wealthier institutions (those having larger reserves, endowments having at least some flexibility or the ability to be used at the president's discretion, or other means to weather a crisis) are better positioned to withstand a crisis that affects them alone (i.e., event forcing a campus closure). They are also likely better positioned to withstand a crisis that impacts broad sectors of society and/or all of higher education (as is the case with the coronavirus epidemic). They also enroll more students from higher socioeconomic backgrounds that have the means to (a) travel home when needed, (b) purchase books and technology for learning as needed, and (c) focus full time on studies without having to also work. By contrast, less wealthy schools (often already financially challenged, even before a crisis), particularly regional public institutions, enroll disproportionately larger numbers of first-generation and students from lower socioeconomic backgrounds. Institutional equity, if we take a very long view, may seek to close these gaps. But for a variety of reasons, that is unlikely to happen anytime soon. It is still possible to achieve institutional equity under a shared crisis condition (such as we are experiencing with the pandemic) by having institutions *work together to both serve their students and address community needs*. In this sense, we are speaking of a ***shared resilience***, one that addresses multiple higher education institutions in a community or region, and that community itself. We already are beginning to see evidence of this type of cooperative response, outreach, and service. There may be new opportunities for (and new receptivity to) cross-listed courses, shared administrative services, cross-institution degree plans, student housing, health services, and even athletics programs in the months and years ahead.

Final Thoughts: Can We Afford It?

Building resilience is not cheap. Neither is maintaining it. Resilience requires real and ongoing financial commitments by the institution, this coming at time of increased financial pressure on all institutions, decreased state support for public institutions, concerns over meeting net tuition revenue goals in areas where demographic trends are not favorable and/or discount rates are rising, and public perception of the value of higher education being at an all-time low. Think of building resilience as a necessary complement to investing in deferred maintenance. Opportunity costs and trade-offs will have to be considered, as will triage/sequencing strategies, and risks of delayed investments. The explicit goal of building a resilient institution should be part of any case made for investing in deferred maintenance (reducing the backlog), or building new facilities to minimize deferred maintenance costs in the future. Investment decisions (whether in campus facilities, utilities and related infrastructure, technology infrastructure, physical or data security, or deferred maintenance on any of these) should be evaluated, triaged, and made taking a system-level view of the institution. How does investing or failing to invest in one impact the others? Which strategy has the greatest positive impact on institutional resilience? How is this being assessed, measured, and reported to the board? This is not unlike an enterprise risk management (ERM) exercise, and perhaps could be incorporated into an institution and board's existing ERM.

Colleges and universities have to be willing to invest in ensuring resilience, just as they have been willing to invest in programs, personnel, facilities, and even deferred maintenance. But it may not take significant new resources or resource commitments that the institution wasn't likely to make anyhow. Rather, it may be more of shifting the leadership's mind-set and decision-making processes to *explicitly* include consideration of institutional resilience. These would be coupled, of course, with organizational strategies (e.g., for scenario planning, contingency planning, response coordination) such as those described above.

The question is not whether we can afford to build resiliency into our colleges and universities. Given all that we have experienced and are learning from the pandemic (still playing out), *can we afford not to?* T

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