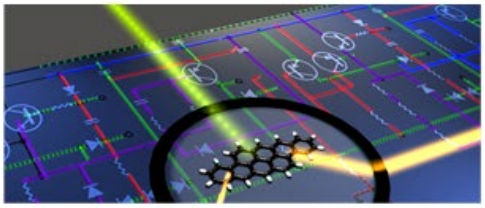
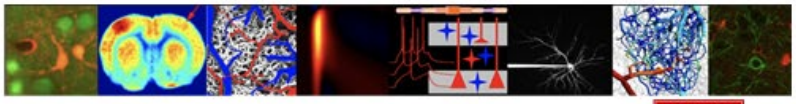
July 1, 2021

BOSTON UNIVERSITY



The 2021 College of Engineering Strategy Plan:



BOSTON UNIVERSITY

1

INTRODUCTION:

The College of Engineering at Boston University will embark on an ambitious, unique strategic plan based on a transformational concept for empowering engineering students at all levels to solve complex societal problems and faculty to drive high impact research associated with one or more convergent research themes. The plan builds on a decade of progress that created a college structure allowing for nimble, flexible thinking across disciplines and a college philosophy for "Creating the Societal Engineer". The 2021 Strategic Plan intends to create College that is "*Engineered for Impact*" across all dimensions of our mission. Our position is that in the future solving complex societal challenges and opportunities will require synthesizing methods from traditional disciplines to accelerate the most creative and implemental solutions. This process is called "convergence" We will create a new kind of engineer and create a new kind of faculty community all "*Wired for a New World"*. Our future engineers and faculty will be driven by and are aware of what is needed to advance quality of life for all members of society especially by embracing the power of intersecting and abstracting approaches from multiple disciplines and from the rich diversity of people that make up society. To this end we propose a unique structure that retains core disciplines and engineering departments in which faculty lines reside and oversee the educational curricular for their discipline, while embracing the need to work as a team in order to recruit faculty and students most likely to amplify excellence across a set of six strategic convergent themes. We propose new operating processes in faculty hiring and mentoring that enhances the power of collaboration at all stages of their career. We also propose new processes for enhancing our curriculum especially in ways that educates students to the importance of diversity for inclusive design and easily allowing student exposure to convergent thinking, for recruiting a new kind of diverse PhD students, for seeding high impact ideas in convergent themes, and for partnering with society in general outside the academy. In short, our aim is to embrace the concept that "*Great minds do not all think alike*" and intentionally insure we create a community not of like-minded world experts, but open-minded diverse world experts each continuously empowering each other. Our Goals are:

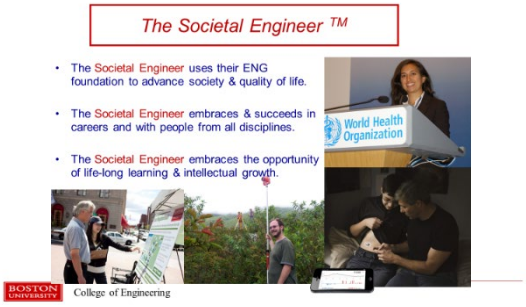
1. To create a culture and processes capable of leveraging the power or convergence and collaboration at scale across all aspects of our mission from education to research to societal partnerships via corporate and community engagement
2. To expand our goal of creating holistic societal engineers across all levels of education that are empowered with extraordinary problem-solving skills and life-long learning confidence.
3. To continuously identify a manageable set of convergent research themes of strength in the college that leverage related strengths throughout the College and Boston University and which strive to address the most important scientific and technical challenge in society.
4. To build strategic and sustainable partnerships with society that stimulate corporate research collaborations and our preparing a highly valued workforce with experiences that prepares them for immediate impact in today's world.
5. To create a community and educational experience that reinforces the extraordinary power of diversity and inclusion for impacting excellence in education, research and community.

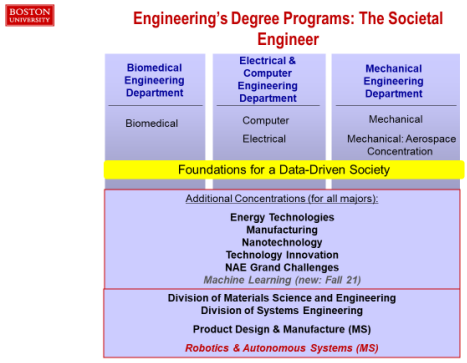
This document is complemented by an extensive slide deck that builds the motivation for, concept of, and process of how we will implement our new Strategic Plan, along with an estimate of resources needed for both a "business as usual" budget approach or an aspirational plan that would require substantive new funds to greatly accelerate the plan's success. Only some slides are also embedded in the prose of this document. The complete deck is attached with slides referred to by number.

BACKGROUND:

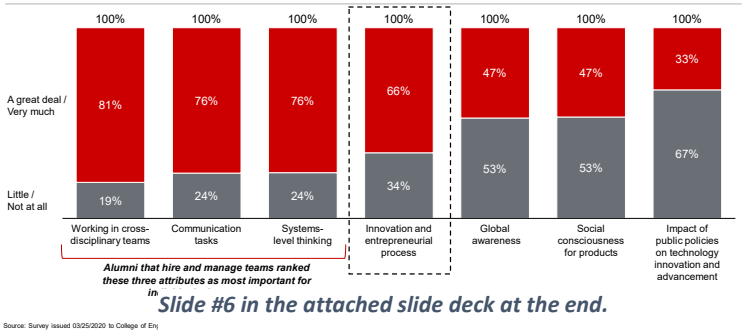
The Unique Structure: A little over a decade ago, the College made a conscious choice to no longer retain accredited undergraduate BS programs that were not aligned with the preponderance of the faculty's research strength. The result was to terminate our BS programs in Aerospace and in Manufacturing Engineering. We restructured to create 3 strong and relatively large departments in which all tenure-track faculty lines reside and which supported large and high quality undergraduate and graduate degrees. These were Biomedical Engineering, Electrical and Computer Engineering, and Mechanical Engineering. We stood up 2 Interdisciplinary Divisions in which faculty from all three departments and cognate ones outside engineering (eg., Chemistry, Physics, Computer Science, etc.) held secondary appointments and contributed to their graduate programs. These were in Materials Science and Engineering and in Systems Engineering. The result was a capacity to recruit future research-oriented tenure-track faculty primarily for research goals and needs at the department and College levels. Also, this structure was seen as attractive to potential faculty recruits because of the growing need and desire of these faculty to interact with faculty outside their core discipline and to attract Ph.D. students from multiple disciplines.

The Societal Engineer (slides 4-6): About a decade ago the College unveiled a strategic plan in which a guiding philosophy for our educational programs, particularly undergraduates, was "Creating the Societal Engineer" . We recognized that our mission was not simply to ensure each student competes course requirements for a degree and gets an initial placement as an engineer. Indeed, this is necessary of any program in any university, but insufficient. We also recognize that >40% of people getting a BS in Engineering in the country are no longer practicing engineers 10-15 years after graduating. We felt our mission was to a) provide an excellent engineering foundation in a chosen discipline with commensurate creative and quantitative problem solving skills; and b) provide additional attributes that complement the degree that maximizes the potential for the graduate to have a passion for and a capability for life-long learning and life-long impact on society regardless of what career they eventually pursue. The Societal Engineer has all the attributes listed in Slide 6. This concept was and remains a powerful one in the eyes of virtually all relevant stakeholders. When polled, Alumni resonate with it and feel our program prepared them well for most attributes, particularly the ones that polled potential employers felt were most valuable





Alumni feel as though their BU engineering education prepared them for the Societal Engineer attributes, particularly those that managers find attractive



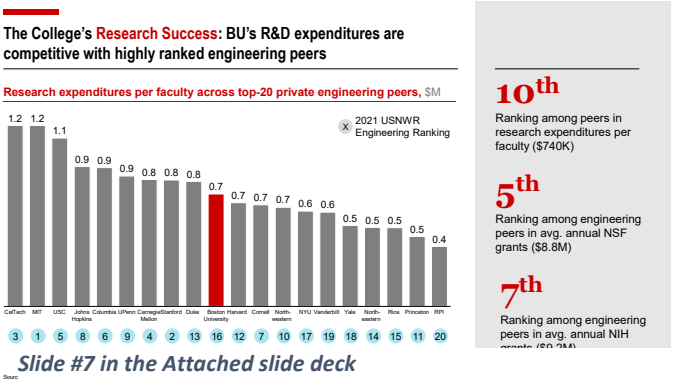
Slide #6 in the attached slide deck at the end.

Source: Survey issued 03/25/2020 to College of Eng

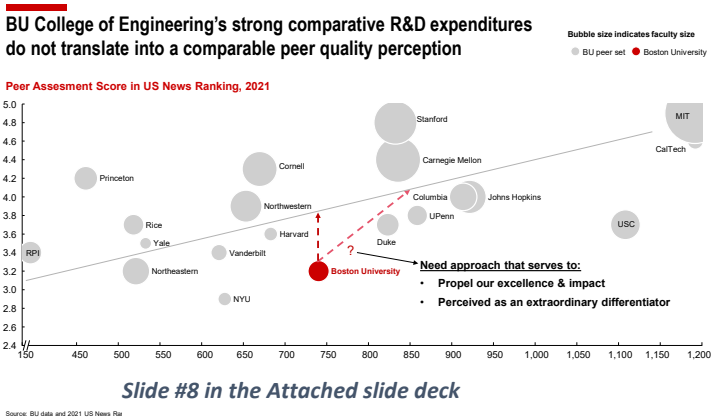
(Slide 6, and bar chart to right). To support a capacity to Create the Societal Engineer we stood up unique educational programs and greatly enhance student experiential opportunities. We created a series of Concentrations accessible from all BS programs that connect to areas most relevant to society's future ranging from Energy Technologies to our unique Technology Innovation Concentration in partnership with the Questrom School of Business. Finally, just 3 years ago we introduced the nations first approach to insure and require that every engineering student, regardless of their major, be introduced to statistical methods with large data (data science) and to machine learning. In short, to prepare them for the digital and big-data driven world that has emerged and impacts virtually all approaches to technological systems.

Rankings (slides 7,8): In 2005 the College was ranked 54th in US News& World report among all Engineering schools. A decade later we were ranked 36th. Most impressive we are now 16th among engineering schools at private institutions. We are now ranked ahead of many superb engineering schools such as Case Western, Vanderbilt, RPI, Univ. Rochester, Washington Univ. in St. Louis, Yale, and Lehigh all of whom we were ranked below back in 2005. However, given the mathematical way in which US News uses metrics to perform the rankings, it will be very difficult for Engineering to move up much more. The US News method already is biased to large schools in faculty and student size because it uses for example total research dollars, total PhD's graduated, and total enrollments of the master's programs and PhD programs combined. We are already over performing on metrics normalized by faculty size and it will be a challenge to change these dramatically. Two "metrics" that we have no direct control over are the reputational survey score from all other Deans and similar from a set of Industries that hire our graduates. Survey participants rank other programs between 1-5 with 5 the best.

Research Success (Slides 7,8): The College's research success has been extraordinary over the past decade. Among the top 20 ranked Engineering schools at private institutions we rank 10th in extramural research dollars per faculty member. Boston University's College of Engineering has about 128 tenure-track faculty and 150 total faculty which places us at the median of the top-20 for private institutions. In 2019, compared to these programs our faculty brought in the 5th most total dollars (not normalized by size) from the NSF and 7th most for funding from the NIH. When one plots the peer survey reputational score from Deans versus research dollars per faculty (slide 8), it becomes apparent that BU's reputational score is incommensurate with our research success. Our Dean reputation score has moved from 3.0 to 3.2 over the decade but this rise is not sufficient to place us near an



Slide #7 in the Attached slide deck



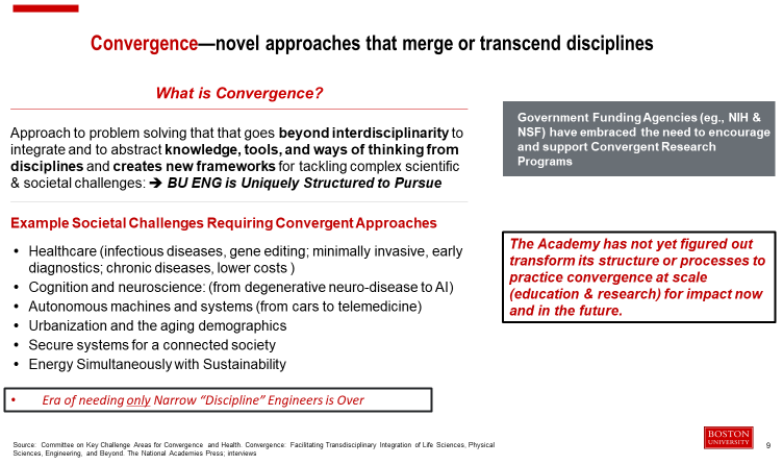
Slide #8 in the Attached slide deck

eye-balled regression line. In fact, if our score had risen to around 3.4 our rankings could improve approximately another 10-fold.

The Challenge: Our college is one of the youngest of all in the top 50 in terms of research-driven graduate programs. Our first PhD was offered in 1992. Also, unlike most other private institutions, we have the same faculty size but fewer distinct departments. It is our hypothesis that in order to propel our excellence and impact and in turn our rankings we need to target a process that can rapidly and noticeably achieve a substantive increase in well-accepted measures of excellence and to become a destination of choice for the most talented and ambitious faculty and students, even if we rank below other places for them to choose from at that time. The key metrics include ones related to research funding and PhD's produced per year, event-like ones such as landing highly competitive major center grants (eg., an NSF ERC) or attracting a major philanthropic gift capable of transforming excellence, and finally actions that are perceived as visionary and important to the future of society in ways other engineering schools would be envious of and that they perceive as likely to attract more than our fair share of excellent junior and senior faculty and top PhD students as well as graduate highly desirable students at all levels to top-ranked institutions.

A UNIQUE and EMPOWERING VISION (Slides 9-13):

Society's Needs (Slide 9):



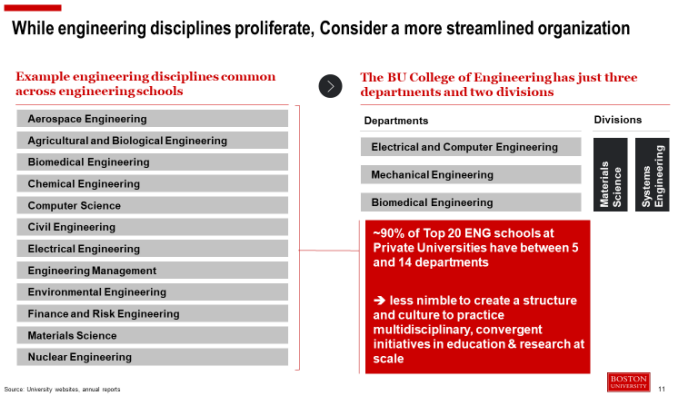
Slide #9 in the Attached slide deck

Solutions to society's grand challenges will be dependent on breakthroughs in technology in concert with all other dimensions of how society functions, from public policy to economic and social viability for large scale implementation and many others. Slide 9 list just a few of the extraordinary critical challenges we face. Healthcare technological breakthroughs have enormous potential in areas ranging from cancer, to gene editing, to chronic disease, to degenerative brain disorders, and of course to emergent infectious disease. Moreover, the solutions must be deployable at scale and have potential to lower healthcare costs while improving quality of life. Neurodegenerative diseases impact a wide spectrum of our healthcare and community systems. Also, breakthroughs in understanding and mimicking cognition should revolutionize the design of next generation of artificial intelligent systems. Connected and autonomous systems will impact every dimension of our life, from urban function to product development, to personalized, predictive and digital medicine. Population growth around cities along with aging demographics will require multi-dimensional innovation for urban efficiency and resilience while improving connectivity and productivity from all citizens. The exponential growth in the connectivity of all dimensions of society including IoT and social media will need breakthroughs in cybersecurity, cloud computing, and data science. And of course how will we meet the ever increasing energy needs in a fashion that does not radically damage earth's climate causing societal calamity?

<u>Convergence (Slides 10 - 12)</u>: These grand societal challenges cannot be met using the tools of a single engineering discipline alone nor the discrete application of tools from different disciplines. Indeed, **the era of needing to train *<u>only</u>* single discipline engineers is over**. For certain, we still need many engineers trained deeply in a specific disciplines, but we also need a continuous supply of new kinds of engineers and scientists. We need engineers that bring some expertise to a problem they face, but openly embrace problem solving with people trained in other specific disciplines in order to abstract knowledge, tools and ways of thinking to synthesize new convergent solutions, frameworks and methods that may likely do not readily emerge from one discipline. This process, called ***"Convergence***" is critical for solving complex challenges in society. Solutions from convergent processes will be more creative and robust and that likely lead to accelerated success for impacting society broadly and flexibly. They may even lead to brand new (sub)disciplines. Consider the recent field of Synthetic Biology. The original challenge was how to control intracellular processes to achieve a desired application. Classical molecular biologists knew general principals about genetics and the biological molecules that act like signals to turn genes on or off for eventual protein formation and function These biologist also had tools that allowed them to measure if a gene was turned on or a protein was being made. However, they knew nothing about engineering control and network theory or quantitative modeling of engineered systems. Convergence of these fields allowed one to ask if one could literally program a cell to achieve a specific goal and in a controllable fashion. Thus, was born the field of Synthetic Biology with commensurate engineered cells. Similarly, the field of biomechanics and mechanical engineering had already figured out how to measure mechanical properties of biomolecules, cells, tissues etc. But, with the discovery that mechanical forces can actually alter the eventual intra and extracellular functions of a cell and modulate tissue remodeling, the convergent field of "Mechanobiology" emerged. Similarly, "Intelligent & Autonomous Systems" requires synthesizing approaches from control theory, to AI and Machine Learning, to robotics, to sensors and big data. The list can go on.

Government funding agencies have already recognized the potential power of convergent research with the NSF calling it out as one of its 10 Big Ideas. But the Academy has not yet figured out how to transform its structure and processes to practice convergence at scale. In almost every engineering school the organization and resource allocation and strategy are driven at the departmental levels where faculty lines reside. This structure inhibits innovation and nimbleness. Interdisciplinary research is practiced in research centers, but these entities typically do not own faculty lines nor the right to stand up degree programs. Also, their directors answer to Deans and Provosts and not the Chairs.

If one examined the top 20 engineering schools at private institutions, 18 of them have between 5 to 14 departments with 6-14 ABET engineering degree programs (Slide 11). While our faculty size is at the median of these 20 institutions (~150 total faculty) we restructured 10 years ago to retain only 3 large departments covering four of the top six bachelor's disciplines (Mechanical, Electrical, Computer, and Biomedical) and each having large and vibrant BS, MS and PhD programs plus two cross-



Slide #11 in the Attached slide deck

cutting divisions that oversee MS and PhD programs only (Materials and Systems Engineering).

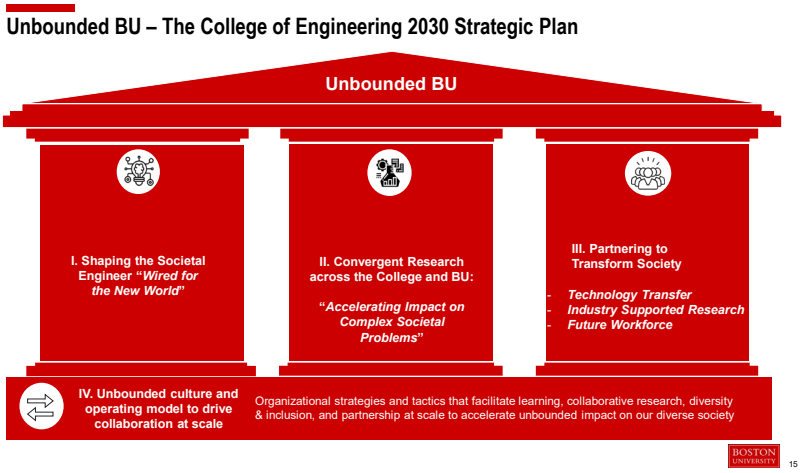
THE CONCEPT

We believe that a new operating model can be applied to the College's nimble structure and BU's unbounded culture of collaboration resulting in a ***College Engineered for Impact*** regarding every dimension of our mission, from relevant cutting edge undergraduate and graduate educational programs, pedagogy and experiences based on the most pressing corporate workforce needs, to research that matters to society, to partnerships to address society's challenges and opportunities. Our graduates and faculty will

- ***Accelerated Creative and Robust Solutions for Complex Societal Needs***
- Be ***Wired for a New World*** requiring engineers that embrace the power of synthesizing across disciplines to generate new powerful methods
- Embrace the need and advantage of operating in environments ***Where Great Minds Do Not Think Alike***. Rather it is their diversity of expertise and awareness of the power of engaging other experts from disparate fields that maximizes their impact on society.

Based on a survey with nearly full participation, nearly 80% of our faculty believe that a strategy driven by the power and investment in strong existing convergent themes that cut across several departments rather one that invests in departments as independent entities is desirable. Moreover nearly 80% feel collaborating across departments is already strong.

THE PLAN

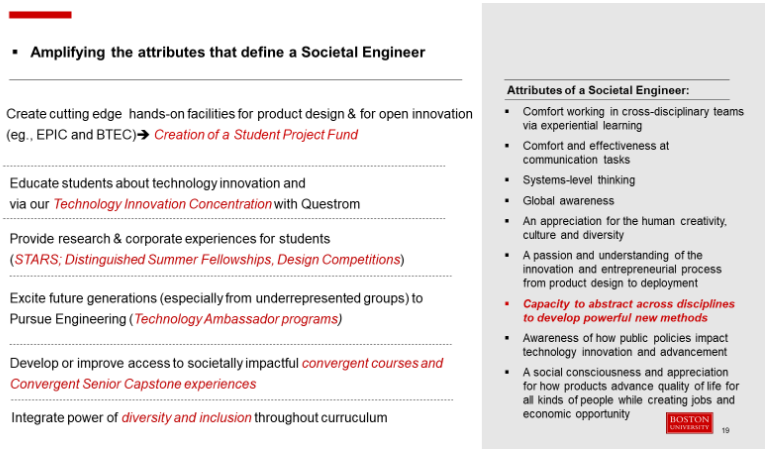


Slide #15 in the Attached slide deck

The plan (slide 15) parses into three fundamental pillars. Pillar 1 will enhance the Societal Engineer at all levels from undergraduate to graduate creating graduates that are ***"Wired for a New World"***. Pillar 2 will prioritize investing along convergent research themes that cuts across engineering departments and in which the College already has strength. This is in contrast to the more traditional approach in academia of investing in individual departments or disciplines in a decoupled fashion. Pillar 3 will derive a multi-dimensional approach to build sustainable and impactful partnerships with society along three related axes. These include 1) new partnerships to insure our curricular are modern and experiential thus creating the most valuable workforce for a wide range of industries, 2) creating strategic partners for corporate sponsored research, and 3) translating our research to benefit society. All three pillars will be supported by a Foundation consisting of unique and bold new organizational operating processes and tactics designed to facilitate learning, collaborative research, the power of diversity and inclusion, and partnership at scale and hence accelerate our impact on society.

Pillar 1: Shaping the Societal Engineer (Slide 16-19) Initiatives

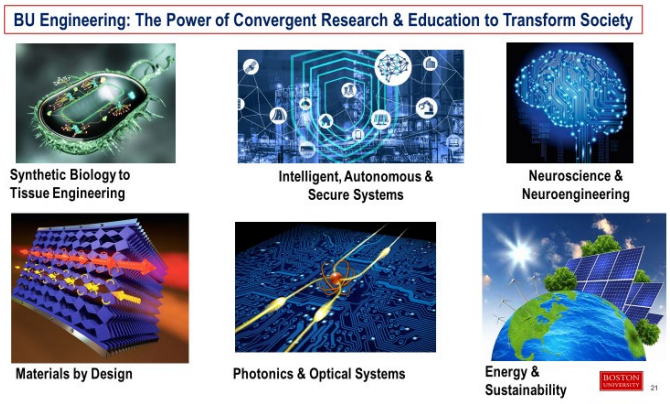
- Reaffirm the key attributes of a Societal Engineer and add the "*capacity to abstract across disciplines to develop more creative, robust and impactful problem-solving approaches*"
- Create and sustain cutting edge hands-on facilities for formal educational initiatives and experiences and for open-innovation by students and insure sustainable resources for supplies for the large growth in student projects each year.
- Educate our undergraduate and graduate students on how technology innovation works from a business perspective
- Provide research and corporate experiences for most of our students including internship programs at the MS and PhD levels
- Develop programs to help technology ambassadors to increase and broaden participation in engineering especially among underrepresented groups
- Inventory/develop a suite of impactful "convergent" technical electives at all levels and develop ways for students to perform cross-departmental senior capstone projects
- Integrate concepts of diversity and inclusion throughout our curriculum, including the power of inclusion to enhance product design and success and the negative impact of exclusion.



Slide #19 in the Attached slide deck

Pillar 2: Advancing Excellence and Impact Along Convergent Themes

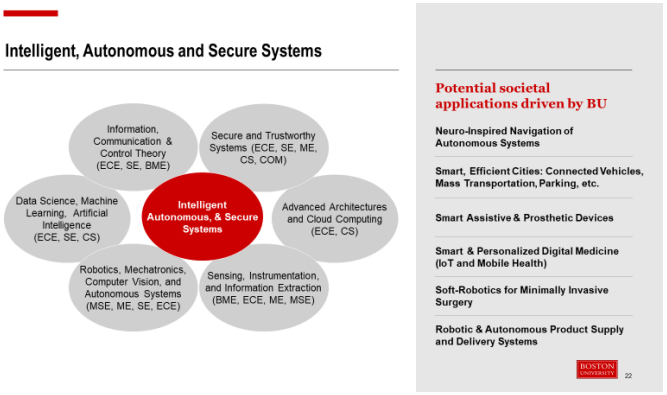
The College of Engineering has developed consensus that identifies six major convergent research themes for which either we are already considered best in class or can rapidly become such and stay as such so long as we derive strategic investment and tactics to enhance these themes. Each theme consists of a critical mass of collaborative faculty from not only all of our engineering programs, but throughout all of Boston University. The themes in alphabetical order are:



Slide #21 in the Attached slide deck

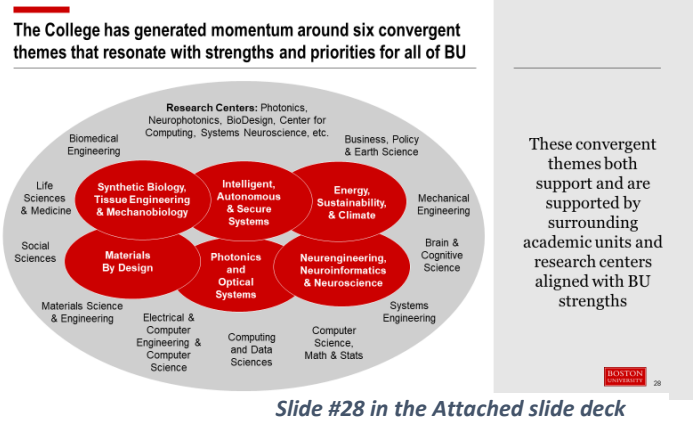
1) Energy, Sustainability, & Climate
2) Intelligent, Autonomous and Secure Systems
3) Materials by Design
4) Neuroengineering and Neuroscience
5) Photonics and Optical Systems
6) Synthetic Biology, Tissue Engineering, & Mechanobiology

Each theme results from the combined interests of individual faculty with expertise from a variety of related traditional disciplines and who strive to collaborate to advance powerful new basic and applied research in the convergent theme. For example, consider the theme of Intelligent, Autonomous, and Secure Systems (Slide 22). Faculty in this theme might be driven to advance transformative new connected and autonomous systems to make urban centers more efficient in function and in energy consumption (e.g., smart traffic and smart parking) or to develop robust, secure digital and predictive medical systems (e.g., wearables combined with electronic health records) that result in earlier intervention, better quality of life and lower medical costs. Sustained and expanded impact of this theme requires that we recruit faculty whose base expertise spans traditional areas of ECE, Systems Engineering, & Computer Science (e.g., Control Theory, Information Science, Machine Learning and AI, Cybersecurtiy, Cloud Computing, Computer Vision, etc.), of Mechanical Engineering (e.g., Robotics, Dynamic Systems), and Biomedical Engineering (e.g., Biosensing, Bioinformatics). The goal is to create a community of faculty with appointments distributed throughout all these cognate departments but who come to BU not simply to further enhance their own existing and more narrow expertise, but to collaborate with all these faculty to pursue the convergent research needed to advance the next societally impactful intelligent, autonomous and secure systems. Such systems cannot evolve from any one of these faculty working alone nor from discrete applications of their existing expertise. Instead they must all synthesize their expertise to develop robust new systems that best can translate to impact society in a robust way.



Slide #22 in the Attached slide deck

Slides 22-27 convey the concepts for each of the convergent themes. They also show that success in these themes will require coordination and collaboration with many departments and schools outside of engineering from the life and physical sciences in the Collage of Arts and Sciences (e.g., Physics, Biology, Chemistry, Brain and Cognitive Science, Psychology, Earth & Environmental Science), to the Medical School, to the Business School (re sustainability and digital medicine), to the new Faculty of Computer and Data Sciences, and with many of the university's research centers and institutes. **Most important is that these same themes resonate with the strategic priority areas for all of Boston University (eg, Life Science and Engineering, Neuroscience, Infectious Disease, Photonics, Computing and Data Sciences, Sustainability) (Slide 28).**



Slide #28 in the Attached slide deck

Convergent Themes vs Individual Departments & Divisions: The above model depends on each department and division advancing excellence at their levels. Each program will need to identify their own strategic research themes and priorities hopefully in coordination with the College's six themes. The program level themes are represented by many of the outer bubble areas in Slides 22-27 and tend

to capture the areas of excellence and focus at the level of one or more departments. For example a world-class ECE department could identify optical electronics and photonics, solid state devices, cybersecurity, cloud computing, machine learning and artificial intelligence, sensor networks, communication systems, and computer architecture all as important research foci and strive to hire excellent faculty among these areas. They would periodically assess new areas or pulling back on older areas. For example, quantum engineering and computational imaging are rapidly emerging areas. **The key, however, is that the departments/division continuously convey exciting opportunities to connect these more discipline specific areas to the College-wide convergent themes.** Such faculty would be looking to join an institution that embraces and supports a collaborative culture and enables these faculty to not only advance their existing area of expertise but invites them to engage one or more College-wide convergent themes in exciting ways to expand their research impact and aspirations. Similar analogies could be made for all our departments and division. In short, we will necessarily strive for a co-dependence between the strength and foci of each department and division and the strength, excellence, and foci of the College as a whole.

Pillar 3: Partnering with Society

Ultimately research universities impact society via their educational and their research mission. In our case we will partner along three main axes 1) Technology Transfer from research performed by our faculty, 2) Industry Sponsored Research with companies whose goals align with ours and who can establish a relationship that accelerates applications of our creative research applied to products for society, and 3) Future of Workforce in which the relationships we develop with companies along these convergent themes explicitly and consistently leads us to innovate and on current design of curricular so that skill sets of our graduates are most valuable and impactful immediately and in the long term to societal organizations ranging from industry to community to hospitals and so on.

Slide #30 in the Attached slide deck

Slide #31 in the Attached slide deck

Regarding the Future of Workforce, it is known that academic curricular tend to ossify and the academy is not perceived as nimble and/or flexible with updating curricular. In short, an engineering BS degree in a specific discipline may not necessarily be creating the kind of engineers with skills needed most by industry. More than ever, powerful, impactful and foundational methods are evolving that broad sectors of industry need but remain difficult to find in traditional engineering curricular (consider machine learning or additive manufacturing or data science). We believe that combining our nimbler program structure with deep relations with corporation clusters aligned with our convergent themes will result in a more adaptive

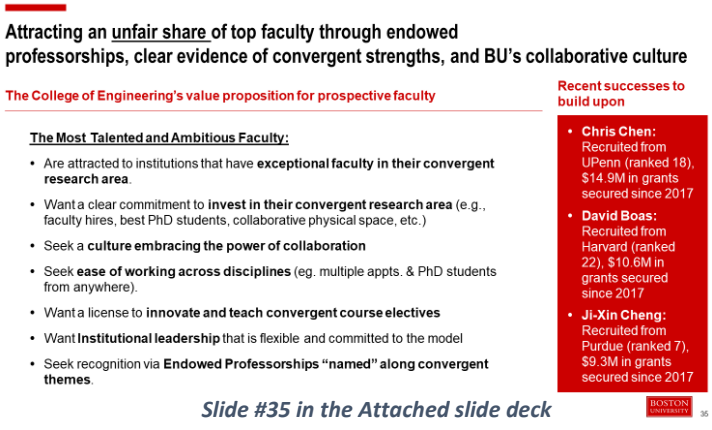
approach for curricular needs for the future. Examples of this is our standing up of Corporate Advisory Board for EPIC and for BTEC (Slides 30,31). The mission of these boards is to provide consensus guidance on what skill sets our graduates most need to be valuable to them as a group and how to use EPIC and BTEC and other curricular modification and/or innovation to insure that our graduates can get these skills. In short to work with companies so that the student experiences in EPIC and BTEC will minimize skill gaps in their new engineering hires from BU.

Foundations: Designing A New Operating Model:

To achieve the goals of all three Pillars requires a new set of operating principals driven by a bold sense of new tactics not normally found in most engineering schools organized more rigidly along a large set of semi-independent departments. Slide 33 list what these bold new tactics must accomplish.

- They must result in the College being successful at recruiting more than our fair share of excellent faculty at the junior and senior levels.
- Develop programs, processes, and resources to support collaborative, convergent research from the junior faculty up to full professors.
- Periodically assess our themes for strengths and needed investments
- Design and resource internal seed funds to catalyze high risk high impact initiatives from convergent faculty.
- Advance innovation in curricula and experiential programs so that our students experience the power of convergent approaches for problem solving.
- Design and implement sustainable processes to attract a cohort of industry to want to partner with us.
- Create and take advantage of the power of diversity and a culture of inclusion in education and in research.
- Stand up an aggressive and creative marketing plan and set of narratives to ensure key stakeholders are aware of the extraordinary approach we are taking.

Regarding the first tactic of recruiting more than our typical share of exceptional faculty (Slide 34). We contend that the most creative, ambitious, and talented faculty are not simply drawn to the highest-ranking institution they can get an offer from. These people do not have such a shallow perspective. What most of them would prioritize more is to join an institution that has exceptional faculty col leagues working in the convergent research themes they most identify with. Moreover, they want the community of such faculty to derive tenure lines spanning an array of disciplines. They want a clear sense that the institution leadership broadly will prioritize their research theme area via investments in other faculty hires, in recruitment of PhD students who explicitly want to work in their area, and at a place that has low boundaries for collaborating across disciplines, for joint



Slide #35 in the Attached slide deck

appointments, and for recruiting students from many related disciplines. In short, an institution that embraces the power and need to resource convergent research in their theme is more important than the specific ranking of the department they join. Of course, senior leaders in these themes will desire what has become the coin of the realm for star faculty, namely an endowed professorship.

Taken together Slides 35 and 37 identify a series of bold moves that will drive impact aligned with our three main strategic plan pillars. These moves are as follows:

1) Hiring world-class convergent theme faculty: About 1/3 of our annual faculty searches will be so called "Convergent-Theme" searches. Here a search committee of leading faculty at all levels from throughout the College and University will run a search that targets a faculty collaborator to further enhance our excellence and impact in research along a specific convergent theme. The committee will be representing the strength and needs of the theme, and not any specific department. The final hire will have a faculty appointment in one or more of our departments, and almost surely have secondary appointments as well. The committee will report to a new position called the Associate Dean for Research and Faculty Development rather than to a specific department chair or division head. **Important to note is that here we are exploiting our uniquely nimble structure and culture of collaboration in ways that most other top engineering schools could not accomplish**. This approach would continuously need to balance the department and division level programmatic needs in research and education with the power of a pursuing and leveraging the strength along college-wide and BU-wide convergent themes. Hence an approach that supports department driven searches simultaneously.

2) Support, Mentoring & Assessment of Convergent Research: Most other academic institutions caution their junior faculty about not "over-collaborating" before getting tenure. Our culture will be distinct in that we will recruit junior faculty who prioritize the value of a culture of collaboration and have mentorship programs to help then succeed in it. We will stand up a new position called the ***Associate Dean for Research and Faculty Development (ADRFD).*** The ADRFD will provide leadership-level advice and mentoring to help junior faculty use collaborative opportunities to amplify the impact and success of their research while avoiding "collaborations" for which they primarily provide technical support of traditional methods rather than help develop creative new approaches for solving complex problems. The ADRFD will formally meet annually with junior faculty for this purpose, including facilitating new connections throughout the college and university. The ADRFD will also annually hold an internal assessment of our Convergent Themes and organize and external reviews of each theme every 3-4 years. These reviews will solicit broad input as to the strength, direction, resources and relevance of our themes and/or if new themes are emerging to consider.

3) Seeding High Risk/High Impact Research Along Convergent Themes: We believe a community of convergent themed faculty will naturally and spontaneously engage in brainstorming of potentially transformative new approaches to solve important problems with high potential impact on society. Many of these will be high-risk, high-impact concepts that need an initial two years of seed funding to flesh out before they can competitively attract major external grant funding. We will design new approaches to the College's former "Deans Catalyst Award" seed grant program to align them along convergent themes.

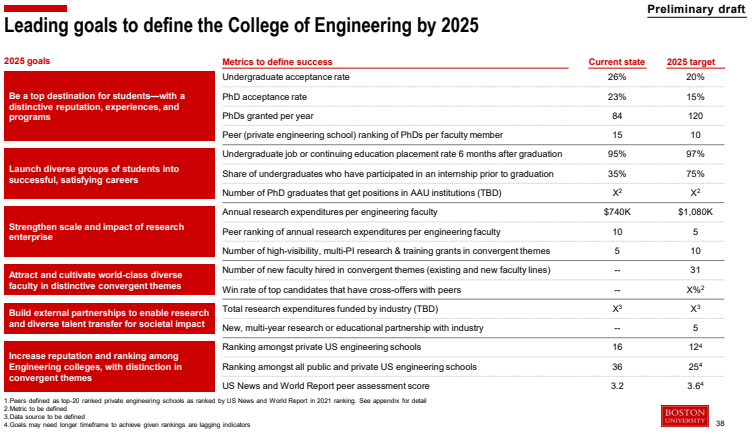
4) Societal Engineers with Convergent Educational Experiences: Consider first our Undergraduate Programs. At almost all even top engineering schools the degree requirements for a BS in a traditional engineering discipline are rigid and at best engage incremental curricular change relative to societal needs. They are also insular, tending to push their students to take as many advanced courses in that discipline as can fit in the upper division (junior and senior years). The faculty in each department rarely are tasked with partnering with faculty from other departments to conjure exciting new and technically substantive new courses that address understanding and practice of new techniques that in industry are rapidly becoming ubiquitous. Examples are domain applications of data science and machine learning, or autonomous systems, or additive manufacturing, all of which would enhance the preparation of engineers from all disciplines and better prepare them for immediate impact in technical companies. We will inventory our current junior and senior year convergent theme electives and resource the development of new such upper division electives. Thes courses would necessarily have to introduce students to apply methods from more than one BS degree program and would naturally attract students from multiple departments. Examples of such existing courses are "Medical Robotics"; "Smart and Connected Systems", and "Engineering Synthetic Biology". Ideas for future courses might be "Materials for Climate Friendly Energy" , "Medical Applications of Cellular Metamaterials" or "Data Science and Artificial Intelligence Applied to Medicine and Biology". We will encourage all undergraduate students to take at least one of these as a upper class technical elective and insure that all of our ABET approved BS programs will permit such to count toward their BS degree. Experientially we will stand up a course called "Interdisciplinary Senior Capstone" in which each project requires students from 2 or more disciplines and the course design and deliverables still satisfy Senior Capstone requirements for the ABET BS degrees. Turning to the PhD degree programs we believe the best and most creative PhD applicants already have identified areas they want to do research in and very often (but not always) they will align with one or more of our convergent themes. Such students will be applying to and admitted to a specific department or division in which they will get a PhD, but look forward to experiencing collaborations with students and faculty in other disciplines. To amplify the success of recruiting such students we will create and resource a "College of Engineering Distinguished PhD Fellowship in XXXXXX (fill in the convergent theme)" with resources that exceed a traditional fellowship such as professional development discretionary funds for the holders. We will also assess if there is value in designing a way to further brand PhD degrees with convergent theme titles. For example, if a PhD student from any department completes 3-4 of their 8 courses along a theme and a dissertation along the theme, their degree could be further branded as such. Imagine getting then a PhD in Electrical Engineering or Mechanical Engineering or Biomedical Engineering or Systems Engineering with "a Concentration in Intelligent, Autonomous and Secure Systems". The only cost to the College for allowing this would be the administrative overhead to keep track of such as no new courses would need to be developed first.

5) Proactive Industry Relations: We need to develop a more strategic approach to building up corporate partners aligned with our strategic plan. Working with the Office of Industry

Engagement at Boston University we will identify and build clusters of industries for each convergent theme, with priorities to find corporations that see value in both our research alignment with their goals and their future workforce needs. We will need to cultivate and steward these corporate partners to provide them real-time insights as to our faculty expertise and programs with high probability of periodically stimulating joint research efforts or technology transfer opportunities. We will explore programs to imbed corporate research and development employees with our faculty. This might include our faculty becoming visiting scientists within appropriate companies including engaging industry sabbaticals, or perhaps design ways for joint appointments with BU and companies. It also could invite R&D employees to have a visiting scientist experience in our labs.

6) Culture of Impactful Inclusion: The College needs a holistic strategic plan for engaging the power of diversity, equity, and inclusion to create excellence in education, research and societal impact. To this end we will stand-up a system of new DEI Committees including a College-wide committee to coordinate all efforts connected to separate committees within each department. These committees will be comprised of one faculty from each department, some key Staff leaders, and undergraduate and graduate students. These committees will be charged with identifying and implementing ways for our curriculum to convey the power of inclusion in product design and success, as well as learning the negative impact of exclusion. Examples of such will be embedded from Freshman year through graduate studies. They will also be charged with deriving specific new programs to amplify not just diversity among students and faculty but the power of inclusion and an inclusive, equitable culture for amplifying individual and institutional success and excellence. Success must include undergraduate and graduate DEI and must impact faculty recruitment, faculty success, mentoring, sponsorship and leadership, and an overall continuing inclusive culture. At the graduate level we will prioritize fund raising for PhD Fellowships and Endowed faculty positions dedicated to broaden our representation among underrepresented groups.

Measuring Success: Slide 38 lists a series of metrics and goals we want to achieve. We believe that with a major bolus of funds (see next section and slide 53), many to most are achievable in 5 years or so Without such, many are still achievable, but success will require at least a decade. Perhaps the most critical metrics that can translate to improving our reputation and success are ones related to growth in our PhD production rate from the current 84 to 120 per year, growth in extramural funding expenditures from $0.74M to $1.1M per faculty per year, a doubling of industry sponsored research funds per year (to about $6M/year), landing two to three more high impact and cache center-like grants and training grants, and most important, hiring 30 or so new faculty (replacement or growth) of which 5-10 would be high profile



Preliminary draft

Leading goals to define the College of Engineering by 2025

2025 goals	Metrics to define success	Current state	2025 target
Be a top destination for students—with a distinctive reputation, experiences, and programs	Undergraduate acceptance rate	26%	20%
	PhD acceptance rate	23%	15%
	PhDs granted per year	84	120
	Peer (private engineering school) ranking of PhDs per faculty member	15	10
Launch diverse groups of students into successful, satisfying careers	Undergraduate job or continuing education placement rate 6 months after graduation	95%	97%
	Share of undergraduates who have participated in an internship prior to graduation	35%	75%
	Number of PhD graduates that get positions in AAU institutions (TBD)	X[2]	X[2]
Strengthen scale and impact of research enterprise	Annual research expenditures per engineering faculty	$740K	$1,080K
	Peer ranking of annual research expenditures per engineering faculty	10	5
	Number of high-visibility, multi-PI research & training grants in convergent themes	5	10
Attract and cultivate world-class diverse faculty in distinctive convergent themes	Number of new faculty hired in convergent themes (existing and new faculty lines)	--	31
	Win rate of top candidates that have cross-offers with peers	--	X%[2]
Build external partnerships to enable research and diverse talent transfer for societal impact	Total research expenditures funded by industry (TBD)	X[3]	X[3]
	New, multi-year research or educational partnership with industry	--	5
Increase reputation and ranking among Engineering colleges, with distinction in convergent themes	Ranking amongst private US engineering schools	16	12[4]
	Ranking amongst all public and private US engineering schools	36	25[4]
	US News and World Report peer assessment score	3.2	3.6[4]

1.Peers defined as top-20 ranked private engineering schools as ranked by US News and World Report in 2021 ranking. See appendix for detail
2.Metric to be defined
3.Data source to be defined
4.Goals may need longer timeframe to achieve given rankings are lagging indicators

BOSTON UNIVERSITY 38

Slide #38 in the Attached slide deck

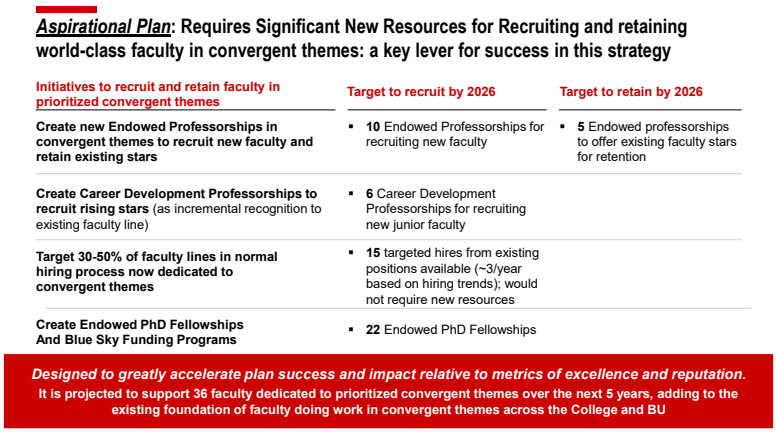
convergent research embracing senior hires, all aligned with and attracted to our collaborative, convergence philosophy. Once here their success in our culture and strategic approach will raise our reputation too at the college and program levels.

Implementation & Resource Requirements

The overall plan will be monitored by a Strategic Plan Oversight Committee (Slide 41) comprised of the Deans of CAS, the Senior Associate Dean for Life and Physical Sciences in CAS, the Dean of the Medical School, the Vice President for Research for Boston University, a member of the Board of Trustees, and a few select members of the external Engineering Deans Leadership Advisory Board. This committee will meet 2-3 times per year and provide feedback on progress, advice and help for implementation particularly of initiatives that impact BU broadly which, because of the nature of Convergence, so many of our initiatives will.

Initiatives for Pillars and Foundations: Separate Subcommittees will be established to identify and oversee implementation of a series of short and long term initiatives for success in each Pillar and the Foundation (depicted in Slide 15). The full set of proposed initiatives and Preliminary charges to these committees are shown in Slides 42 to 50.

Resources Needed: We considered implementation of the plan with business as usual regarding our budget and financial resources as compared to an aspirational plan designed to accelerate success by as much as 5 years or so. With business as usual resourcing, the College would likely hire about 20 new people over a 5 year time-period, most either filling existing open slots or slots that will open upon existing faculty leaving. Maximizing speed and scope of success will require approximately $125 Million of new funds beyond our existing business as usual budget. In the "aspirational-plan" we would aspire to hire 30-35 new people over five years. Slide 52 summarizes the Aspirational Plan which aspires to



***Aspirational Plan*: Requires Significant New Resources for Recruiting and retaining world-class faculty in convergent themes: a key lever for success in this strategy**

Initiatives to recruit and retain faculty in prioritized convergent themes	Target to recruit by 2026	Target to retain by 2026
Create new Endowed Professorships in convergent themes to recruit new faculty and retain existing stars	▪ **10** Endowed Professorships for recruiting new faculty	▪ **5** Endowed professorships to offer existing faculty stars for retention
Create Career Development Professorships to recruit rising stars (as incremental recognition to existing faculty line)	▪ **6** Career Development Professorships for recruiting new junior faculty	
Target 30-50% of faculty lines in normal hiring process now dedicated to convergent themes	▪ **15** targeted hires from existing positions available (~3/year based on hiring trends); would not require new resources	
Create Endowed PhD Fellowships And Blue Sky Funding Programs	▪ **22** Endowed PhD Fellowships	

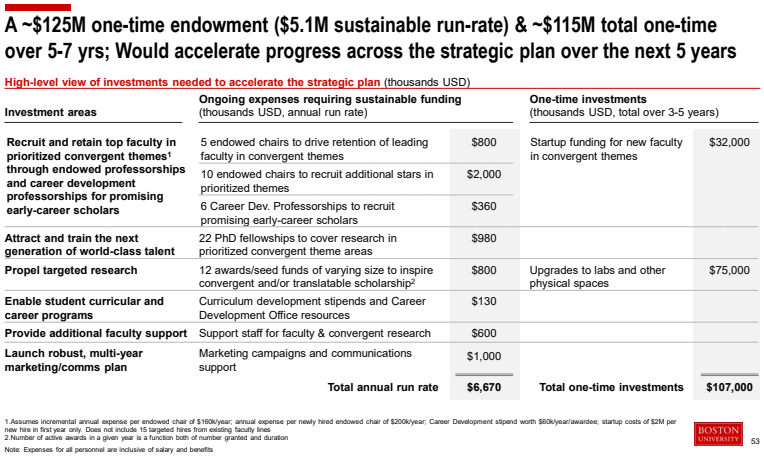
Designed to greatly accelerate plan success and impact relative to metrics of excellence and reputation.
It is projected to support 36 faculty dedicated to prioritized convergent themes over the next 5 years, adding to the existing foundation of faculty doing work in convergent themes across the College and BU

Slide #52 in the Attached slide deck

- Recruit 10 new senior star faculty from peer and peer + institutions each with a new Endowed Professorship.
- Retain 5 current star faculty by standing up 5 Endowed Professorships
- Create 6 new Career Development Professorships to help recruit top junior faculty aligned with convergent themes
- Hire about 3 new faculty/year via convergent searches into existing slots (15 total)
- Stand up 22 New Endowed Distinguished PhD Fellowships named after and distributed across all six convergent themes.
- Elevate Seed Grant Programs to support two $200-400K seed grants per year each for two years.

- Endow a Student Engineering Educational fund to sustain operations in our extraordinary hands-on teaching facilities such as EPIC and BTEC and other experiential programs

This plan financially is summarized in Slide 53. The total annual spending to support all new endowed professorships, PhD fellowships, Seed Grant programs, and an aggressive marketing campaign would require $6.67M per year decreasing to $5.5M/yr after five years. This would require approximately a $125M of new and primarily endowed funding from philanthropy. Also, the one-time costs for start-up funds and renovations for all these hires will be another approximately $110M dollars spread over 5-10 years.



A ~$125M one-time endowment ($5.1M sustainable run-rate) & ~$115M total one-time over 5-7 yrs; Would accelerate progress across the strategic plan over the next 5 years

High-level view of investments needed to accelerate the strategic plan (thousands USD)

Investment areas	Ongoing expenses requiring sustainable funding (thousands USD, annual run rate)		One-time investments (thousands USD, total over 3-5 years)	
Recruit and retain top faculty in prioritized convergent themes[1] through endowed professorships and career development professorships for promising early-career scholars	5 endowed chairs to drive retention of leading faculty in convergent themes	$800	Startup funding for new faculty in convergent themes	$32,000
	10 endowed chairs to recruit additional stars in prioritized themes	$2,000		
	6 Career Dev. Professorships to recruit promising early-career scholars	$360		
Attract and train the next generation of world-class talent	22 PhD fellowships to cover research in prioritized convergent theme areas	$980		
Propel targeted research	12 awards/seed funds of varying size to inspire convergent and/or translatable scholarship[2]	$800	Upgrades to labs and other physical spaces	$75,000
Enable student curricular and career programs	Curriculum development stipends and Career Development Office resources	$130		
Provide additional faculty support	Support staff for faculty & convergent research	$600		
Launch robust, multi-year marketing/comms plan	Marketing campaigns and communications support	$1,000		
	Total annual run rate	**$6,670**	**Total one-time investments**	**$107,000**

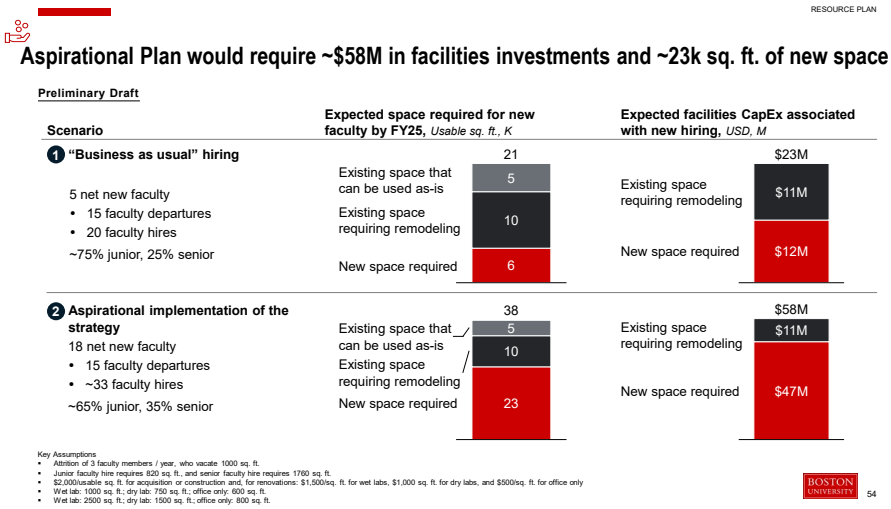
1.Assumes incremental annual expense per endowed chair of $160k/year; annual expense per newly hired endowed chair of $200k/year; Career Development stipend worth $60k/year/awardee; startup costs of $2M per new hire in first year only. Does not include 15 targeted hires from existing faculty lines
2.Number of active awards in a given year is a function both of number granted and duration
Note: Expenses for all personnel are inclusive of salary and benefits

BOSTON UNIVERSITY 53

Slide #53 in the Attached slide deck

Space Needs and Costs:

Slide 54 summarizes space and costs for business-as-usual hiring compared to the hiring for the Aspirational Plan. For the business as usual, we anticipate about 21 hires over 5 years. Examining our existing allocated space and anticipated retirements, Slide 54 estimates that these hires will require 6,000 square ft of new space and renovations to 10,000 sq feet of exist space requiring renovation for a total projected renovation costs of $12M (new space) and $11 M (existing space). The Aspirational Plan is projected as requiting 23,000 sq. ft. of New Space and 10,000 sq. ft of renovations to existing space for a cost f $47 M (new space) and $11M (existing space) respectively



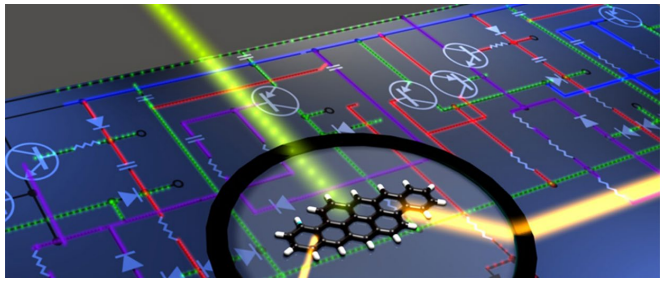
Slide #54 in the Attached slide deck

SUMMARY

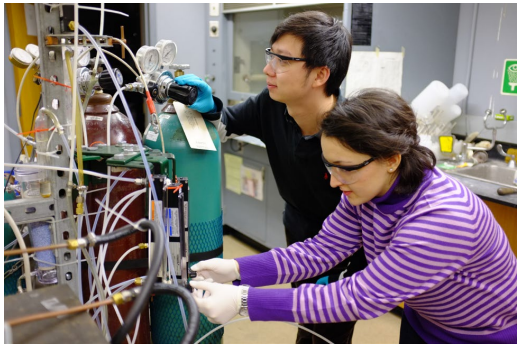
We propose to create a new kind of engineering school, one "***Engineered for Impac***t". The structure and processes and strategic tactics for this school for achieving excellence and impact for all facets of our mission will be distinctive from that achievable by the preponderance of peer institutions. Our unique simplified and nimble structure will allow us to prioritize research thematic excellence that requires the convergence of superb faculty, methods, and ideas across many disciplines. Corresponding impact on complex societal challenges and opportunities will be accelerated via the creation of more robust solutions. Students at all levels will acquire the capacity for solving problems by learning and experiencing the art and power of synthesizing methods from their discipline with techniques, ideas, and mindsets from many other fields. Such individuals will transform the corporate world via a sustained pipeline of robust problem solvers with deep engineering foundations but flexible problem-solving skills. While other instructions continue to be stuck in the jaws of traditional disciplinary silos for education and research, we believe the best faculty and students will come to see Boston University as unique destination of choice if they aspire to become leading contributors to solving complex societal problems. Our College will be engineered as a place with degree granting in traditional disciplines exist, but with educational and research programs ***wired for the new world*** and which grasp and exploit the power of connecting to other disciplines. We will create a can-do culture of ***great minds that do not think alike*** that embraces the power of diversity of thought and expertise and aspires to a continuous modernizing of our curricular for future workforce and research that matters.

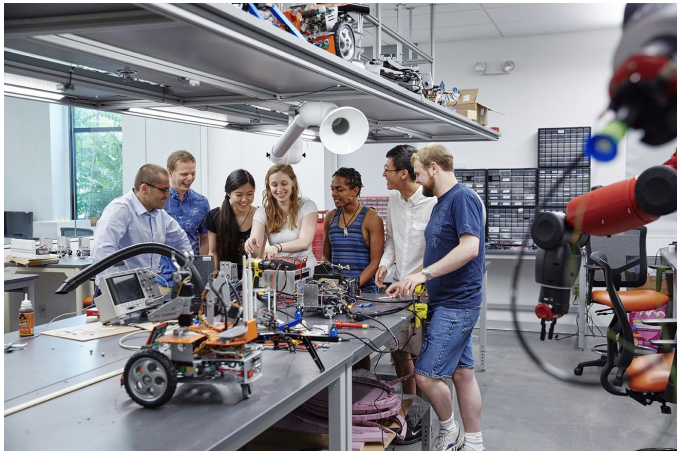
Complementary Attached File: College of Engineering 2021 Strategic Plan Full Slide Deck

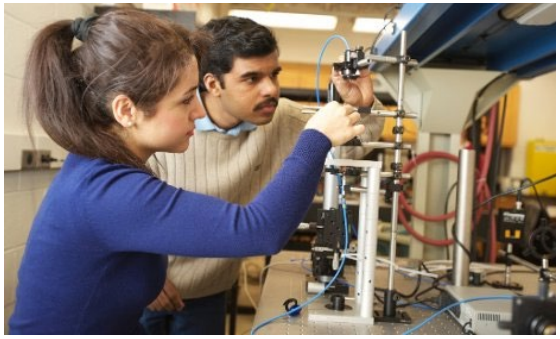
BOSTON UNIVERSITY

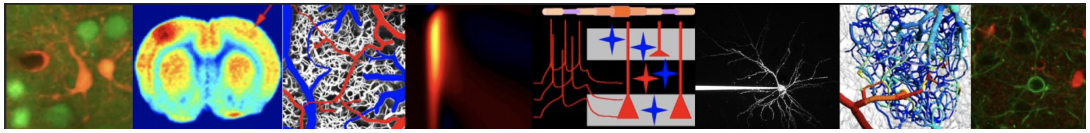


The 2021
College of Engineering Strategy Plan:









Executive Summary

Strengths, opportunities, and the trend toward convergence

- The College has achieved **healthy enrollment growth and strong career outcomes** for graduates, who express strong support for the Societal Engineer
- Faculty have built a **highly productive research enterprise** – but the College's **reputation and ranking lag** its research strengths and national measures.
- BU can **leverage its streamlined departmental structure and research strengths in convergent themes** to pursue a strategy differentiated from peers
- The College has **built the underlying capabilities necessary to engage industry partners proactively**, but has substantial room to grow research and educational partnerships

Emerging Strategic Plan

- A vision for an **"Unbounded BU"** is constituted by three pillars to propel success for the College of Engineering embracing convergence as a guiding principle:
  - Education programs and experiences to shape a diverse pipeline of Societal Engineers appreciative of the ***power of convergence*** across disciplines for problem solving.
  - Leading research along **convergent themes** across the College and BU that can address society's grand challenges
  - External partnerships to transform society via research and future diverse workforce needs
- To enable change, the College will **increase faculty hiring in priority research areas**, invest to **market its strengths**, and deploy a **unique new operating model supporting collaboration at scale**

Implementation considerations

- Implementation will require **clear accountability** for each initiative and **engagement of internal and external leaders** for support
- The College must also plan to mitigate risks, maintaining **faculty engagement and buy-in** as well as **clearly telling the story of its distinctive convergent approach**
- Two versions of the plan are proposed, one we call business as usual and an ***aspirational plan in which new philanthropic resources could propel the College to top ranks quickly***.

We have engaged 100+ faculty, staff, students, and external experts to solicit feedback and ideas, and an additional 80+ faculty and 100+ alumni sharing input through a survey

AS OF MAY 20, 2020

Steering Committee

- Dean Karen Antman
- President Robert A. Brown
- Dean Kenneth Lutchen
- Provost Jean Morrison
- Dean Stan Sclaroff

Board of Trustees Ad Hoc Committee

- Malek Sukkar, Chair
- Nate Dalton
- Maurice Ferré
- Sandra Frazier
- Alicia Mullen
- Peter Wexler

Boston University Faculty: ENG & Outside ENG

- Sean Anderson
- Michael Albro
- Soumendra Basu
- Tom Bifano
- James Bird
- David Bishop
- David Boas
- Will Boley
- John Byers
- Keith Brown
- Christos Cassandras
- David Castanon
- Chris Chen
- Ayse Coskun
- Doug Densmore
- Wynter Duncanson
- Mary Dunlop
- Sol Eisenberg
- Gerry Fine
- Peter Fox-Penner
- Vivek Goyal
- Doug Holmes
- Mo Khalil
- Catherine Klapperich
- Laura Lewis
- Elise Morgan
- Harold Park
- Yannis Paschalidis
- Siddharth Ramachandran
- Darren Roblyer
- Mike Sorenson
- Roberto Tron
- Gloria Waters
- Alice White
- John White
- Rabia Yazicigil
- Muhammad Zaman
- Faculty survey
- (80+ respondents)

Outside ENG Center Directors

BU Staff

- Josh Aiello
- Dave Apostol
- Tristan Barakao
- Steve Burgay
- Doug Edwards
- Jennifer Grodsky
- John Hartnett
- Stacey Herman
- Diane Joseph-McCarthy
- Jen Marron
- Kat Mor
- Ziba Parissa
- Mike Pratt
- Judith Sandonato
- Marc Scatamaccia

Students and alumni

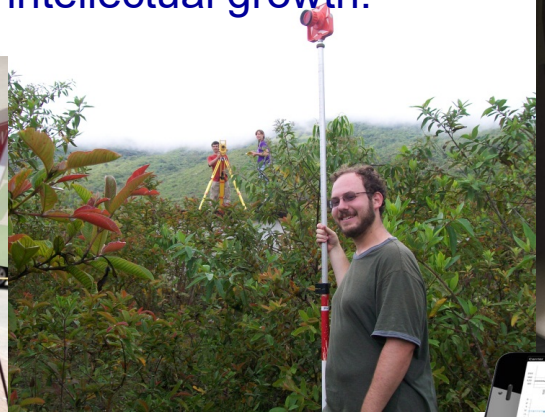
- Undergraduate focus group
- PhD focus group
- Post Doc focus group
- Alumni survey (115+ respondents)

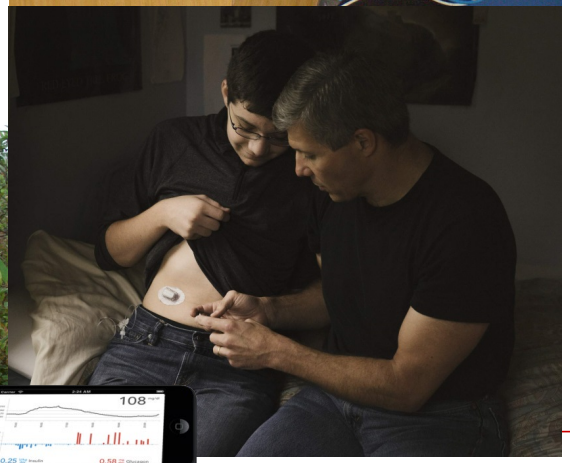
Other external interviews

- Industry and private sector leaders (e.g., Philips, iRobot, Amazon, Mathworks, Pfizer, Roche, GE, Toyota, Saint Gobain, PTC, etc.)
- NSF program directors
- PhD students from other leading engineering institutions

The Societal Engineer ™

- The Societal Engineer uses their ENG foundation to advance society & quality of life.
- The Societal Engineer embraces & succeeds in careers and with people from all disciplines.
- The Societal Engineer embraces the opportunity of life-long learning & intellectual growth.





BOSTON UNIVERSITY

Engineering's Degree Programs: The Societal Engineer

Biomedical Engineering Department	Electrical & Computer Engineering Department	Mechanical Engineering Department
Biomedical	Computer Electrical	Mechanical Mechanical: Aerospace Concentration

Foundations for a Data-Driven Society

Additional Concentrations (for all majors):

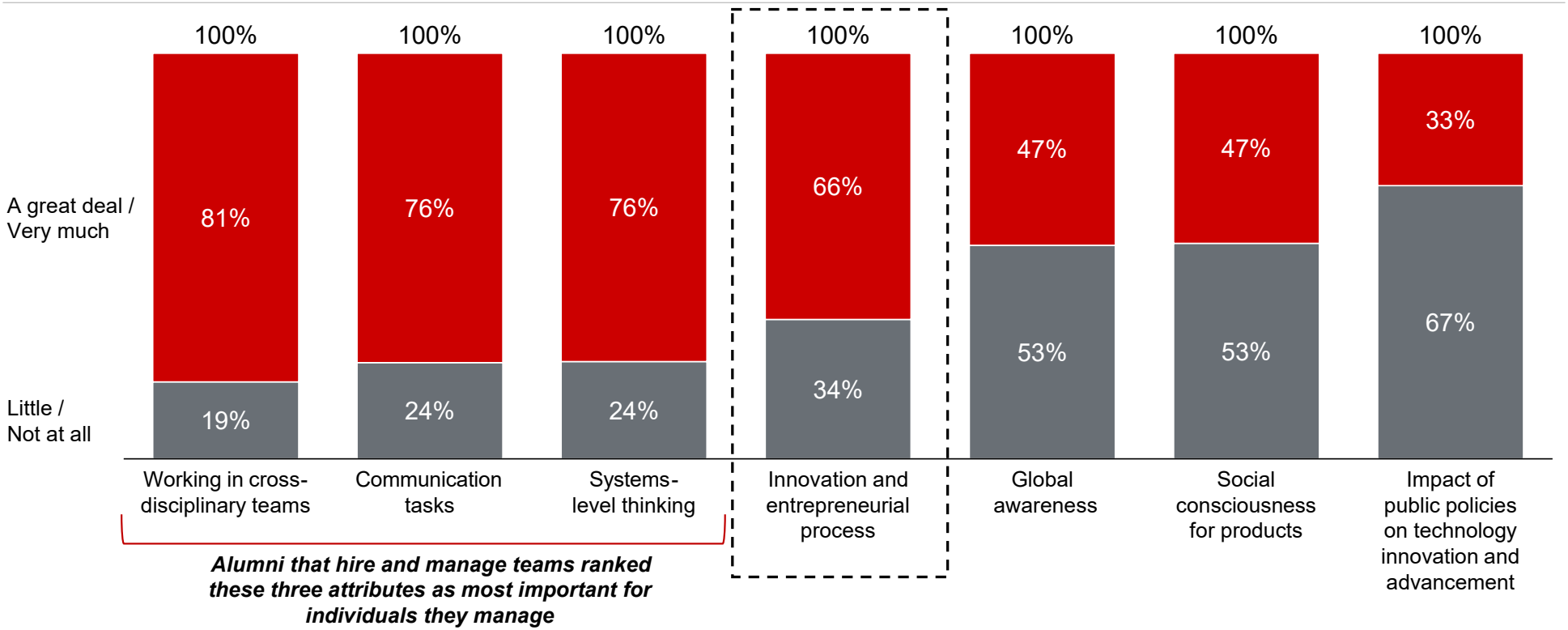
Energy Technologies
Manufacturing
Nanotechnology
Technology Innovation
NAE Grand Challenges
Machine Learning (new: Fall 21)

Division of Materials Science and Engineering
Division of Systems Engineering

Product Design & Manufacture (MS)

Robotics & Autonomous Systems (MS)

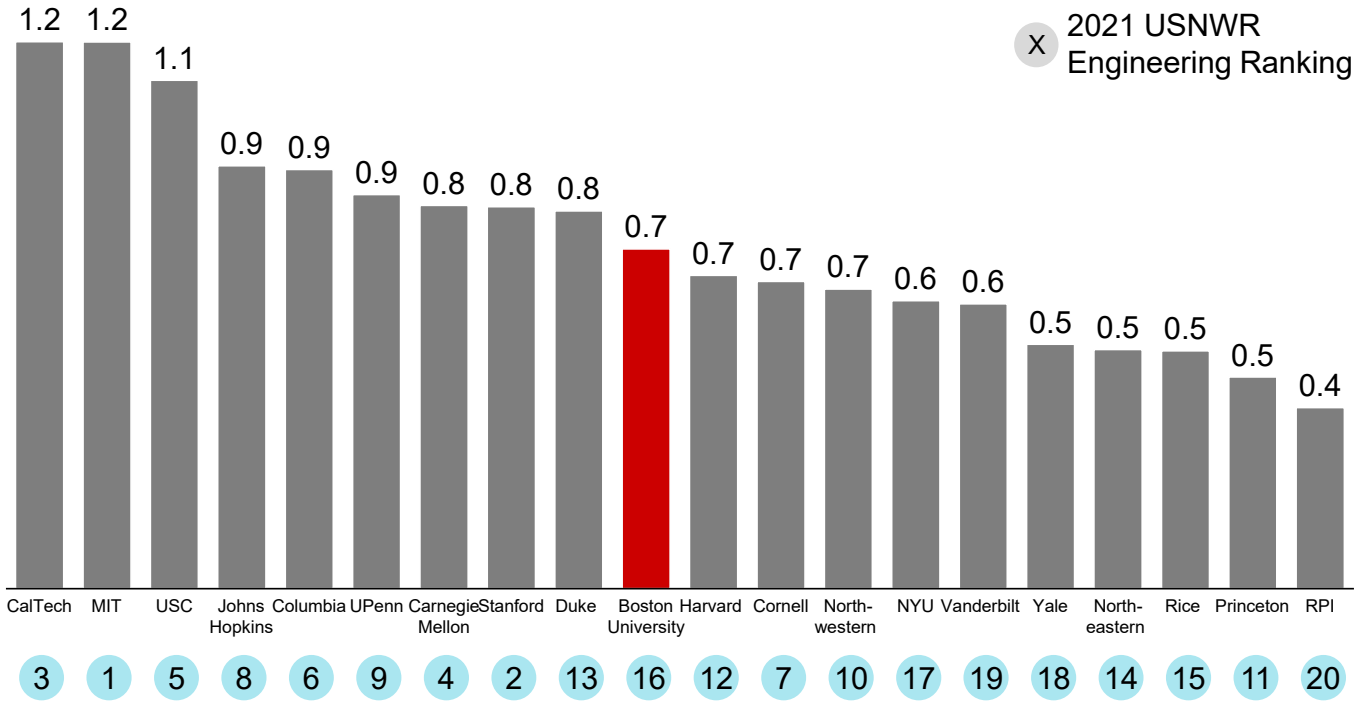
Alumni feel as though their BU engineering education prepared them for the Societal Engineer attributes, particularly those that managers find attractive



Source: Survey issued 03/25/2020 to College of Engineering alumni who graduated between 2000 and 2019; n=118

The College's Research Success: BU's R&D expenditures are competitive with highly ranked engineering peers

Research expenditures per faculty across top-20 private engineering peers, $M



Source: 2021 USNWR Best Engineering School Rankings

10th

Ranking among peers in research expenditures per faculty ($740K)

5th

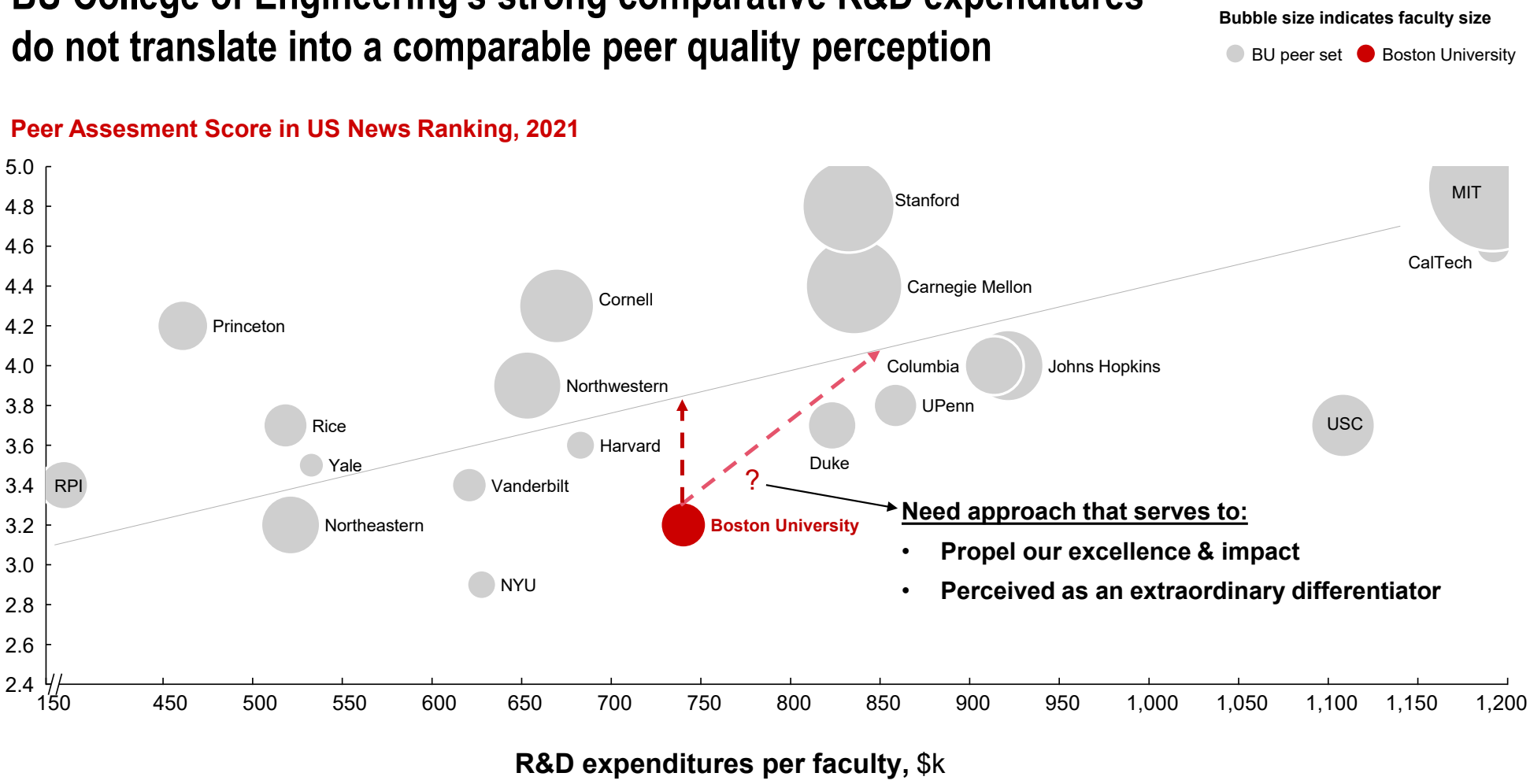
Ranking among engineering peers in avg. annual NSF grants ($8.8M)

7th

Ranking among engineering peers in avg. annual NIH grants ($9.2M)

BOSTON UNIVERSITY

BU College of Engineering's strong comparative R&D expenditures do not translate into a comparable peer quality perception



Source: BU data and 2021 US News Rankings

Convergence—novel approaches that merge or transcend disciplines

What is Convergence?

Approach to problem solving that that goes **beyond interdisciplinarity** to integrate and to abstract **knowledge, tools, and ways of thinking from disciplines** and **creates new frameworks** for tackling complex scientific & societal challenges: ➔ ***BU ENG is Uniquely Structured to Pursue***

Government Funding Agencies (eg., NIH & NSF) have embraced the need to encourage and support Convergent Research Programs

Example Societal Challenges Requiring Convergent Approaches

- Healthcare (infectious diseases, gene editing; minimally invasive, early diagnostics; chronic diseases, lower costs)
- Cognition and neuroscience: (from degenerative neuro-disease to AI)
- Autonomous machines and systems (from cars to telemedicine)
- Urbanization and the aging demographics
- Secure systems for a connected society
- Energy Simultaneously with Sustainability

The Academy has not yet figured out transform its structure or processes to practice convergence at scale (education & research) for impact now and in the future.

- *Era of needing only Narrow "Discipline" Engineers is Over*

Source: Committee on Key Challenge Areas for Convergence and Health. Convergence: Facilitating Transdisciplinary Integration of Life Sciences, Physical Sciences, Engineering, and Beyond. The National Academies Press; interviews

Existing Structure of Engineering Schools in Academia

- Organization remains deeply driven by (many) traditional departments that independently design degree requirements.

- Research agendas & strategy become driven at level of departments with faculty hiring controlled by departments.

- Interdisciplinary research is usually "housed" in Research Centers;
  - ➔ But, centers generally do not run or design degree programs or own faculty lines; and Directors report to Dean's or Provost (i.e., they do not answer to department leaders).

- *Claim ➔ The above inhibits innovation needed in building research and education at scale to impact society's grand challenges.*

While engineering disciplines proliferate, Consider a more streamlined organization

Example engineering disciplines common across engineering schools

- Aerospace Engineering
- Agricultural and Biological Engineering
- Biomedical Engineering
- Chemical Engineering
- Computer Science
- Civil Engineering
- Electrical Engineering
- Engineering Management
- Environmental Engineering
- Finance and Risk Engineering
- Materials Science
- Nuclear Engineering

The BU College of Engineering has just three departments and two divisions

Departments

- Electrical and Computer Engineering
- Mechanical Engineering
- Biomedical Engineering

Divisions

- Materials Science
- Systems Engineering

~90% of Top 20 ENG schools at Private Universities have between 5 and 14 departments

➔ less nimble to create a structure and culture to practice multidisciplinary, convergent initiatives in education & research at scale

Source: University websites, annual reports

Convergence:
A strategic approach to differentiate BU's College of Engineering for Achieving Excellence and Impact

Convergence goes **beyond interdisciplinarity** by integrating and abstracting **knowledge, tools, and ways of thinking from disciplines** and **creates new frameworks** for tackling complex scientific & societal challenges:

Convergence is a process/culture of **synthesizing powerful new approaches** to solve complex problems not easily or efficiently solved by methods of any existing discipline nor discrete applications of existing methods from several discipline.

Convergence can **accelerate success** at developing **implementable and robust solutions** to complex problems

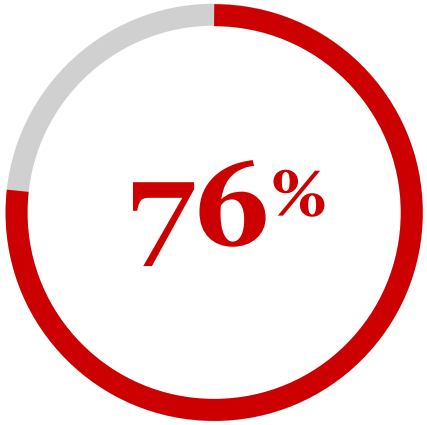
➔ ***Most Grand Societal Challenges/Opportunities Will Require Convergent Approaches***

➔ ***BU ENG is Uniquely Structured to Pursue***

➔ ***BU Institutionally has a Unique Culture to Engage***

A strategy to differentiate the College of Engineering through convergent research is building from existing strengths

of faculty agree with a strategy that **prioritizes investments in convergent themes** as a source of distinctiveness



of faculty rate **collaboration across departmental lines** as strong or very strong

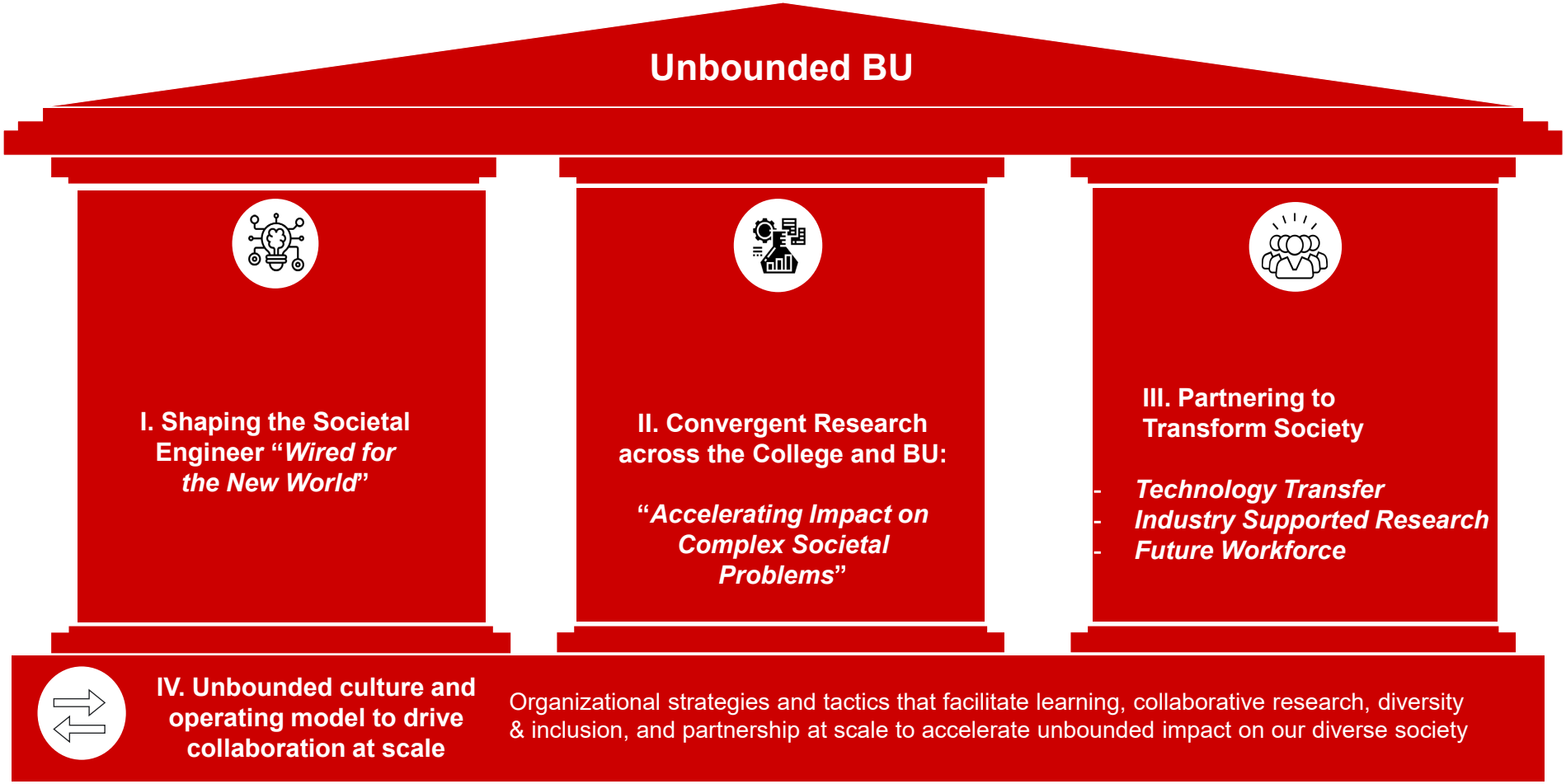
Source: Faculty Survey 2020 (data from 83 faculty respondents to survey), BU internal data

Unbounded BU

VISION

BU's unbounded culture and operating model will enable high-impact convergent research, education, and partnership at scale to propel world-class excellence in engineering and societal impact

Unbounded BU – The College of Engineering 2030 Strategic Plan



- **Amplifying the attributes that define a Societal Engineer**

Create cutting edge hands-on facilities for product design & for open innovation (eg., EPIC and BTEC)

Attributes of a Societal Engineer:

- Comfort working in cross-disciplinary teams via experiential learning
- Comfort and effectiveness at communication tasks
- Systems-level thinking
- Global awareness
- An appreciation for the human creativity, culture and diversity
- A passion and understanding of the innovation and entrepreneurial process from product design to deployment
- ***Capacity to abstract across disciplines to develop powerful new methods***
- Awareness of how public policies impact technology innovation and advancement
- A social consciousness and appreciation for how products advance quality of life for all kinds of people while creating jobs and economic opportunity

Engineering Product Innovation Center: EPIC

Facility Includes:

- Computer Aided Design
- 3-D Printing
- Robotics
- Laser Processing
- Materials Characterization
- Supply chain management
- CNC, etc

A Unique 15,000 sq. ft. Hands-On Maker-Space Facility To ***Educate All*** Engineers On Product Design-to-Deployment-to-Sustainability

BU College of Engineering

BIOENGINEERING TECHNOLOGY & ENTREPRENEURSHIP CENTER

AT BOSTON UNIVERSITY'S COLLEGE OF ENGINEERING

Molecular, Cellular, and Tissue Engineering Suite

Biosensors and Instrumentation Suite

Digital and Predictive Medicine Design Suite

*

- **Amplifying the attributes that define a Societal Engineer**

Create cutting edge hands-on facilities for product design & for open innovation (eg., EPIC and BTEC)➔ *Creation of a Student Project Fund*

Educate students about technology innovation and via our *Technology Innovation Concentration* with Questrom

Provide research & corporate experiences for students (*STARS; Distinguished Summer Fellowships, Design Competitions*)

Excite future generations (especially from underrepresented groups) to Pursue Engineering (*Technology Ambassador programs*)

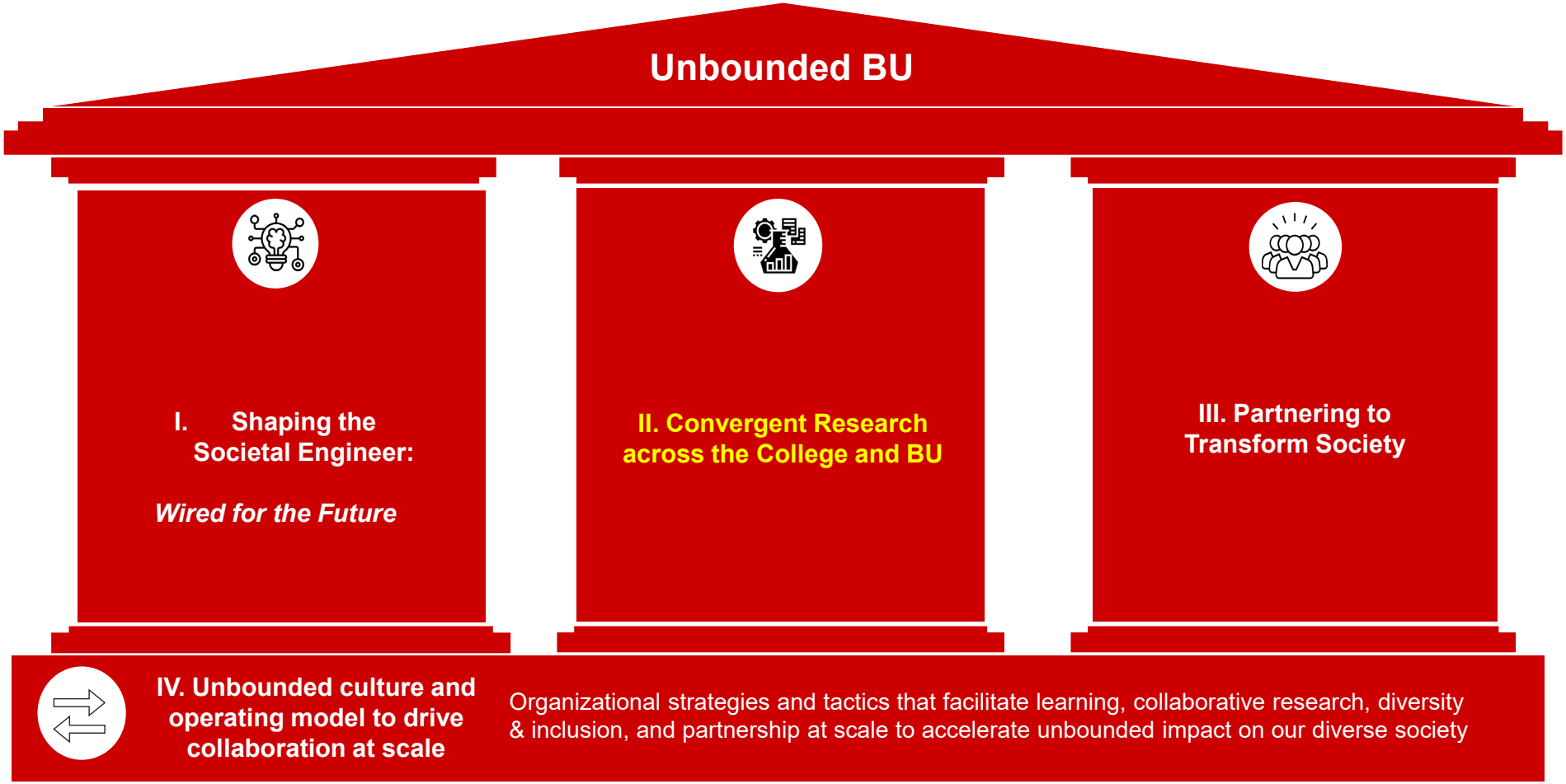
Develop or improve access to societally impactful *convergent courses and Convergent Senior Capstone experiences*

Integrate power of *diversity and inclusion* throughout curriculum

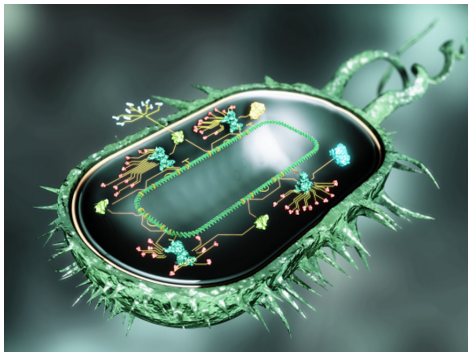
Attributes of a Societal Engineer:

- Comfort working in cross-disciplinary teams via experiential learning
- Comfort and effectiveness at communication tasks
- Systems-level thinking
- Global awareness
- An appreciation for the human creativity, culture and diversity
- A passion and understanding of the innovation and entrepreneurial process from product design to deployment
- ***Capacity to abstract across disciplines to develop powerful new methods***
- Awareness of how public policies impact technology innovation and advancement
- A social consciousness and appreciation for how products advance quality of life for all kinds of people while creating jobs and economic opportunity

Unbounded BU – The College of Engineering 2030 Strategic Plan



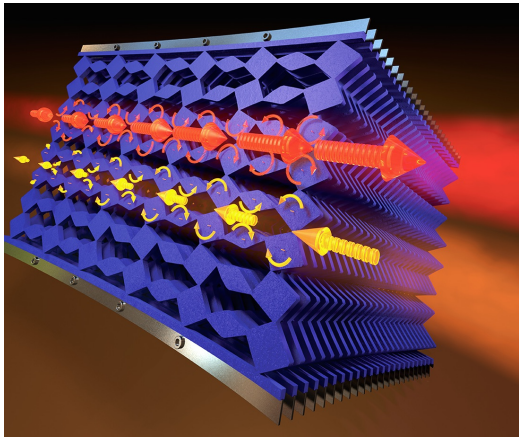
BU Engineering: The Power of Convergent Research & Education to Transform Society



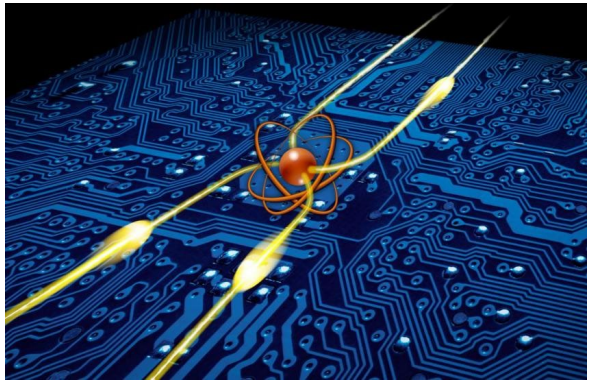
Synthetic Biology to Tissue Engineering

Intelligent, Autonomous & Secure Systems

Neuroscience & Neuroengineering



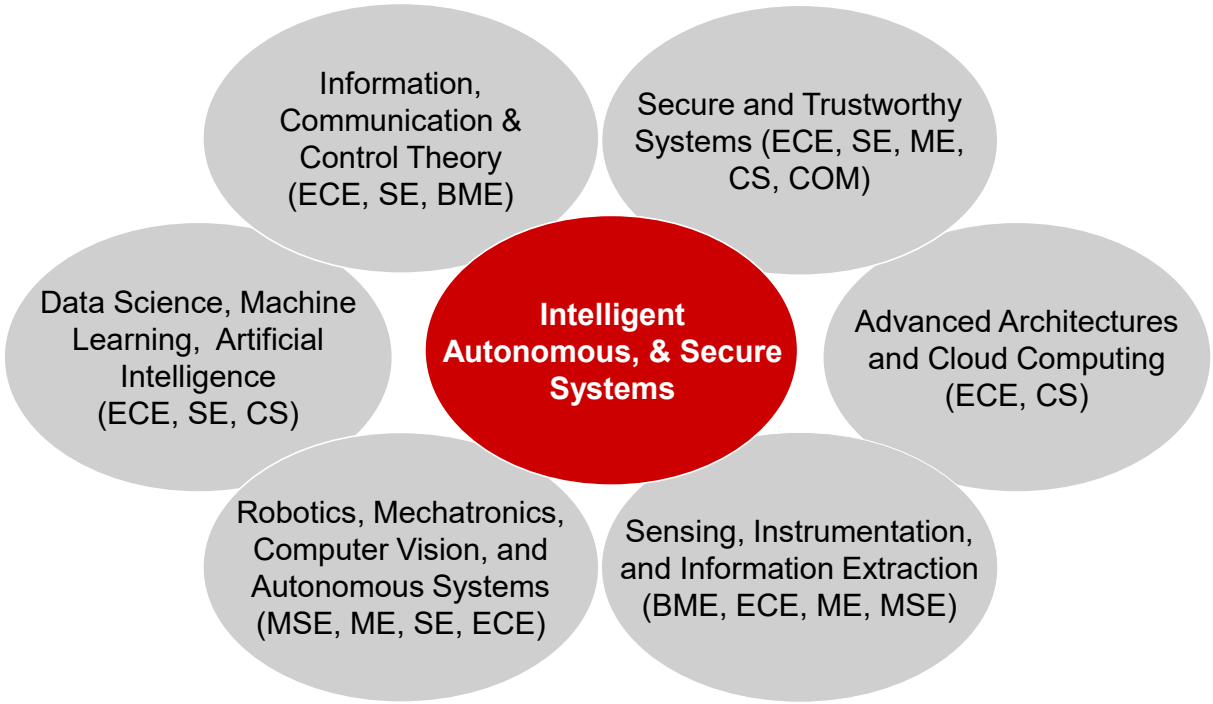
Materials by Design



Photonics & Optical Systems

Energy & Sustainability

Intelligent, Autonomous and Secure Systems



Potential societal applications driven by BU

Neuro-Inspired Navigation of Autonomous Systems

Smart, Efficient Cities: Connected Vehicles, Mass Transportation, Parking, etc.

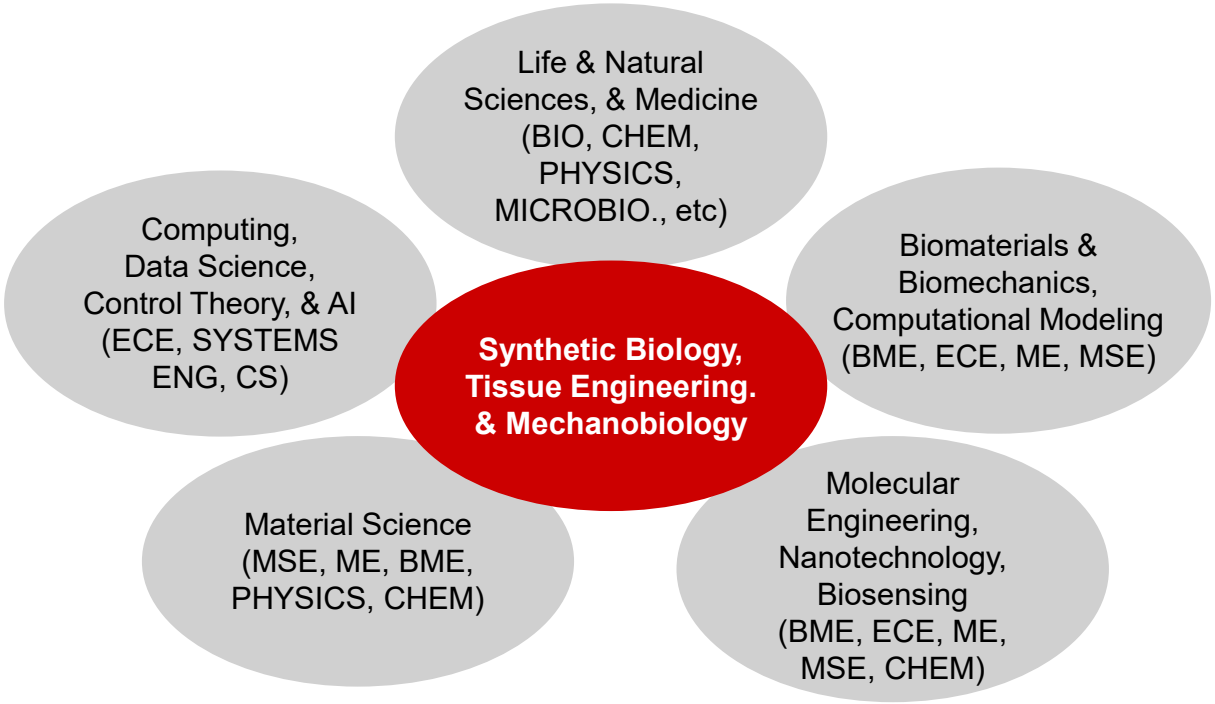
Smart Assistive & Prosthetic Devices

Smart & Personalized Digital Medicine (IoT and Mobile Health)

Soft-Robotics for Minimally Invasive Surgery

Robotic & Autonomous Product Supply and Delivery Systems

Synthetic Biology, Tissue Engineering & Mechanobiology



Potential Societal Applications Driven by BU Engineering

Cells Designed To Detect or Treat Antibiotic Resistance

Design, & Control Personalized Immune Cells to Cure Cancer & Other Diseases

Design Engineering & 3D Printing of Functional Heart Tissue Strips

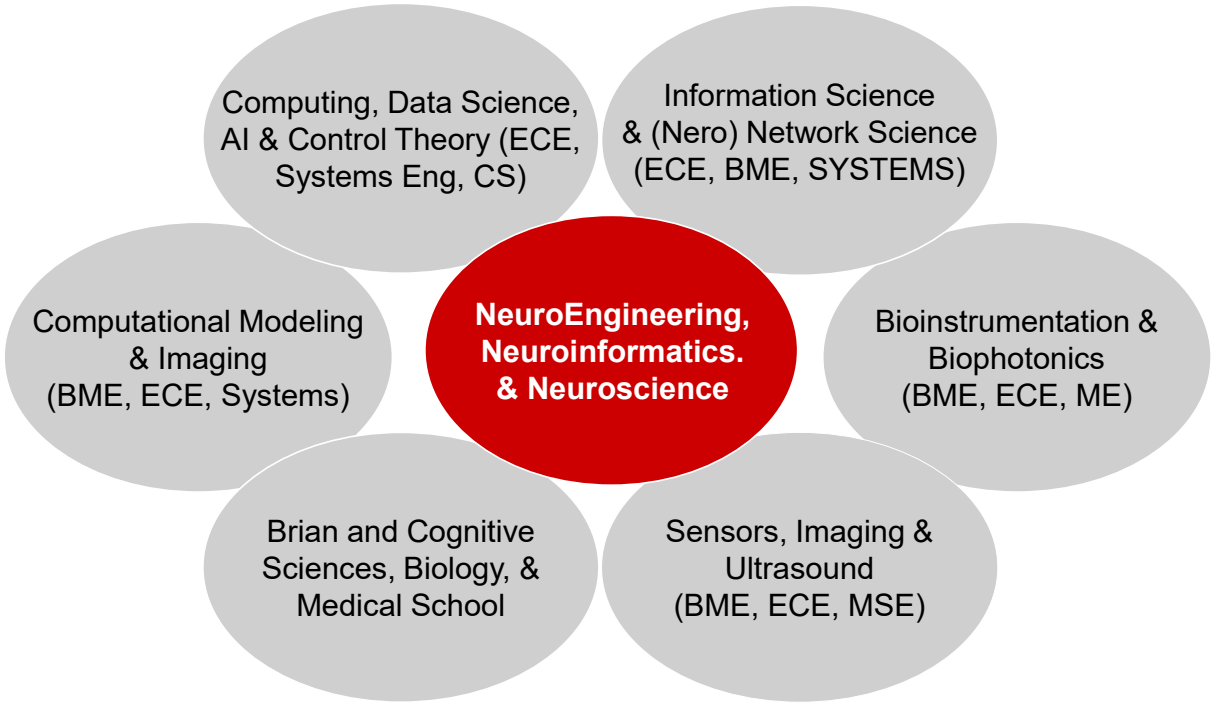
Design, Control & Regeneration Of Organ Replacements

Implantable Biological Sensors

Design Plants for Carbon Mitigation

Environmentally Friendly Synthesis of Products Via Renewable Sources

NeuroEngineering, Neuroinformatics & Neuroscience



Potential Societal Applications Driven by BU Engineering

Brain-Machine Interfaces via fNIRS

Brain Stimulation for Chronic Pain, Neurodegenerative Disorders & Mental Health

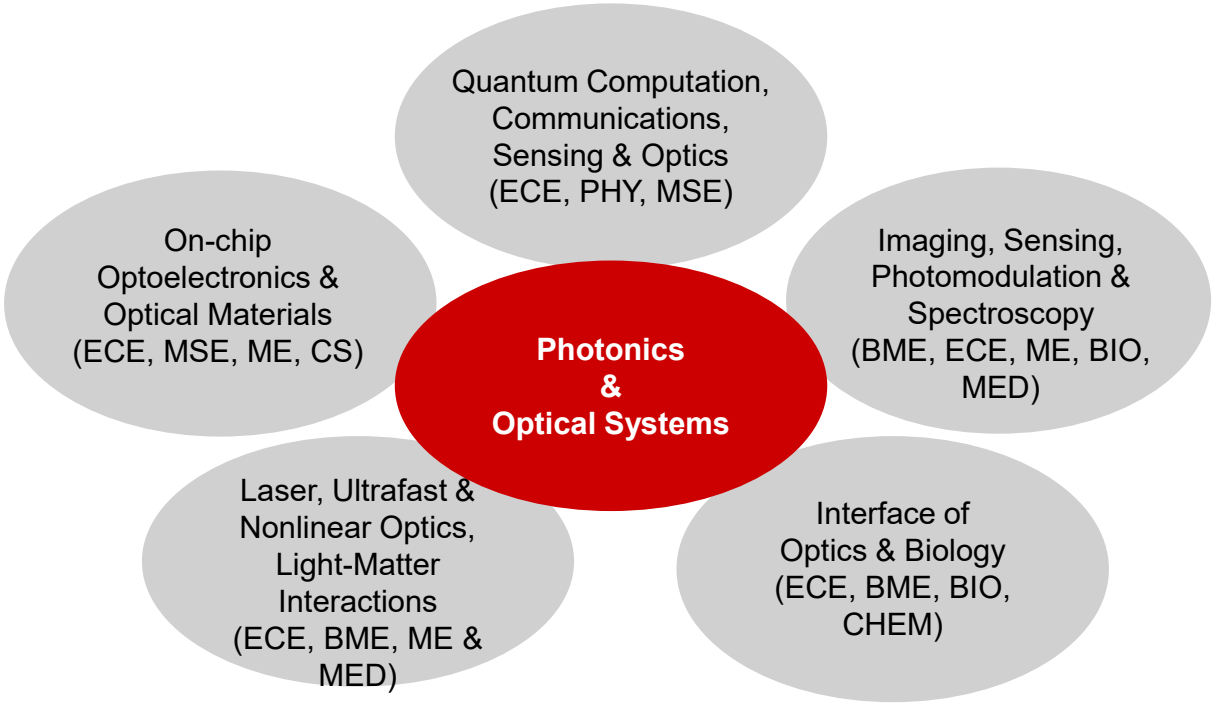
Early Detection of Biomarkers for Alzheimer's & Traumatic Brain Injury

Brain Mapping: The Neuro-Connectome To Understand Brain Structure-to-function

Closed-Loop Neuromodulation to modulate/enhance cognition

Neuro-Inspired Autonomous Systems & Neuromorphic Computing

Photonics & Optical Systems



Potential Societal Applications Driven by BU Engineering

NeuroPhotonics & Optogenetics for understanding memory & behavior

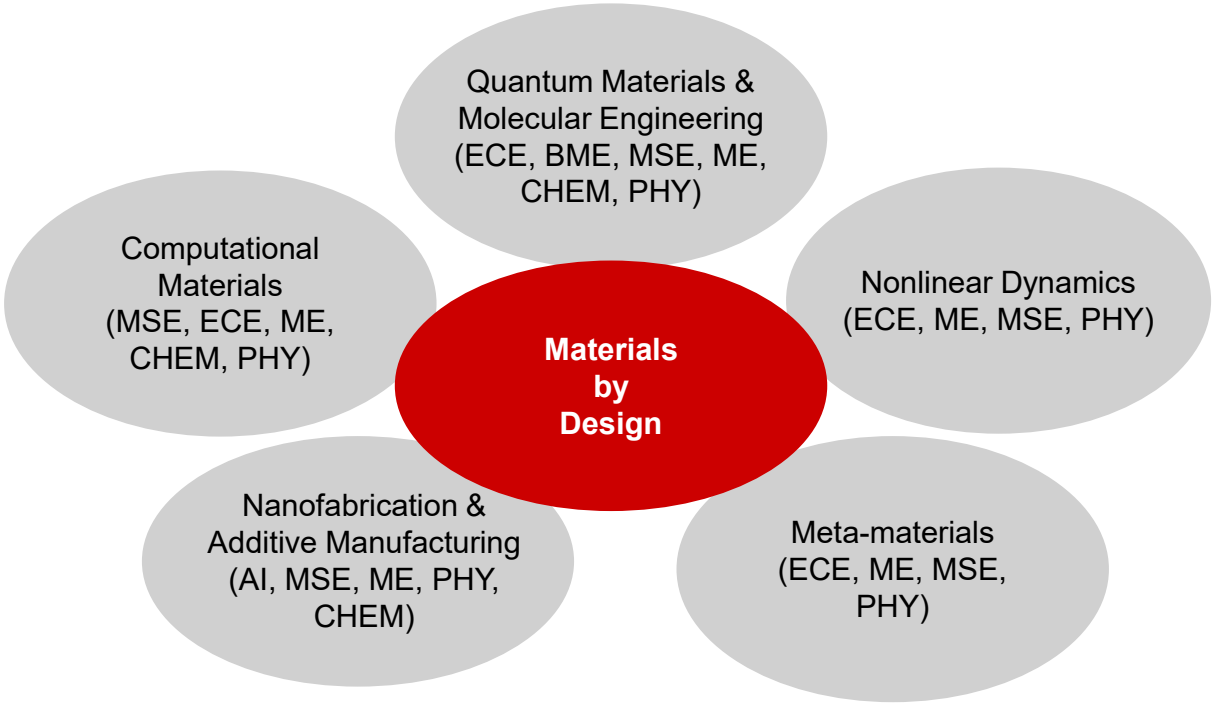
Label-Free & Super High Resolution Imaging eg.,for Detecting Cancer & Infectious Diseases

Secure networks, faster greener telecom & computing

Optical-Chips for Machine Learning, AI and high-performance computing.

Integrated photonic systems for data transport & networking

Materials by Design



Potential Societal Applications Driven by BU Engineering

Nano-sensors for personalized, digital medicine and chemical sensing

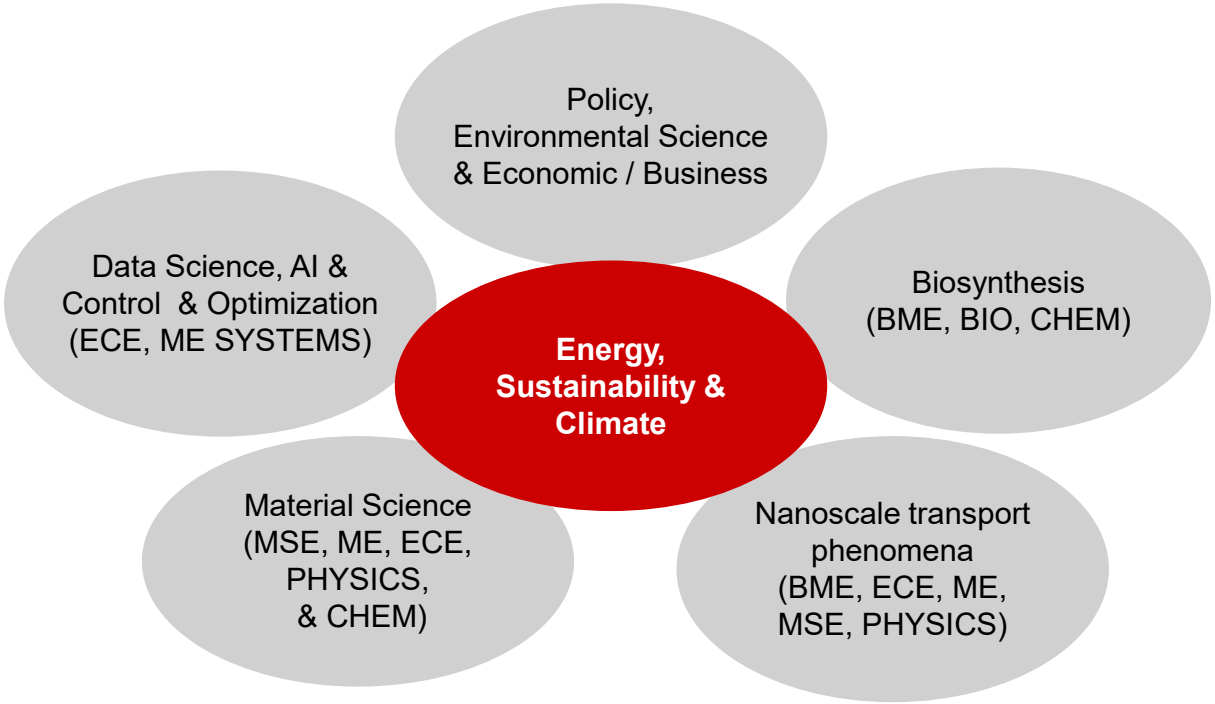
Materials for Cleaner Energy and Reduced Energy Consumption

Noise Reduction for defense, HVAC, etc: A Quieter world

Materials Driven by Nature: Strong, Tough & Environmentally Friendly, etc.

Smart Functional Materials & Additive Manufacturing

Energy, Sustainability & Climate



Potential Societal Applications Driven by BU Engineering

Green and secure distributed energy generation

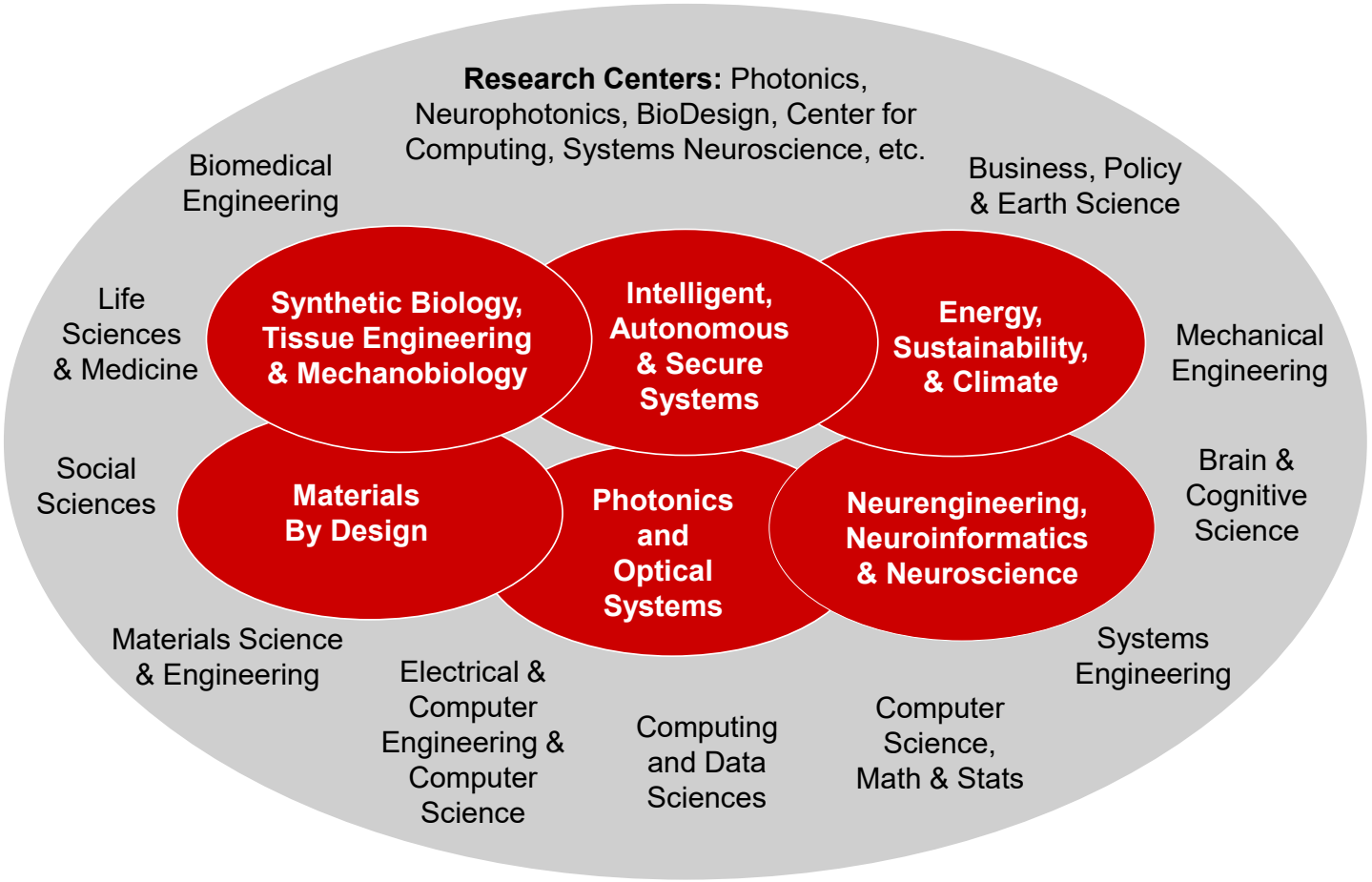
Carbon mitigation: synthetic biology for environmental application, synthetic fuels, carbon sequestration

Sustainable energy generation and storage (eg., electrochemical devices)

Energy Solutions that are affordable, equitable, accessible, and environmentally sustainable

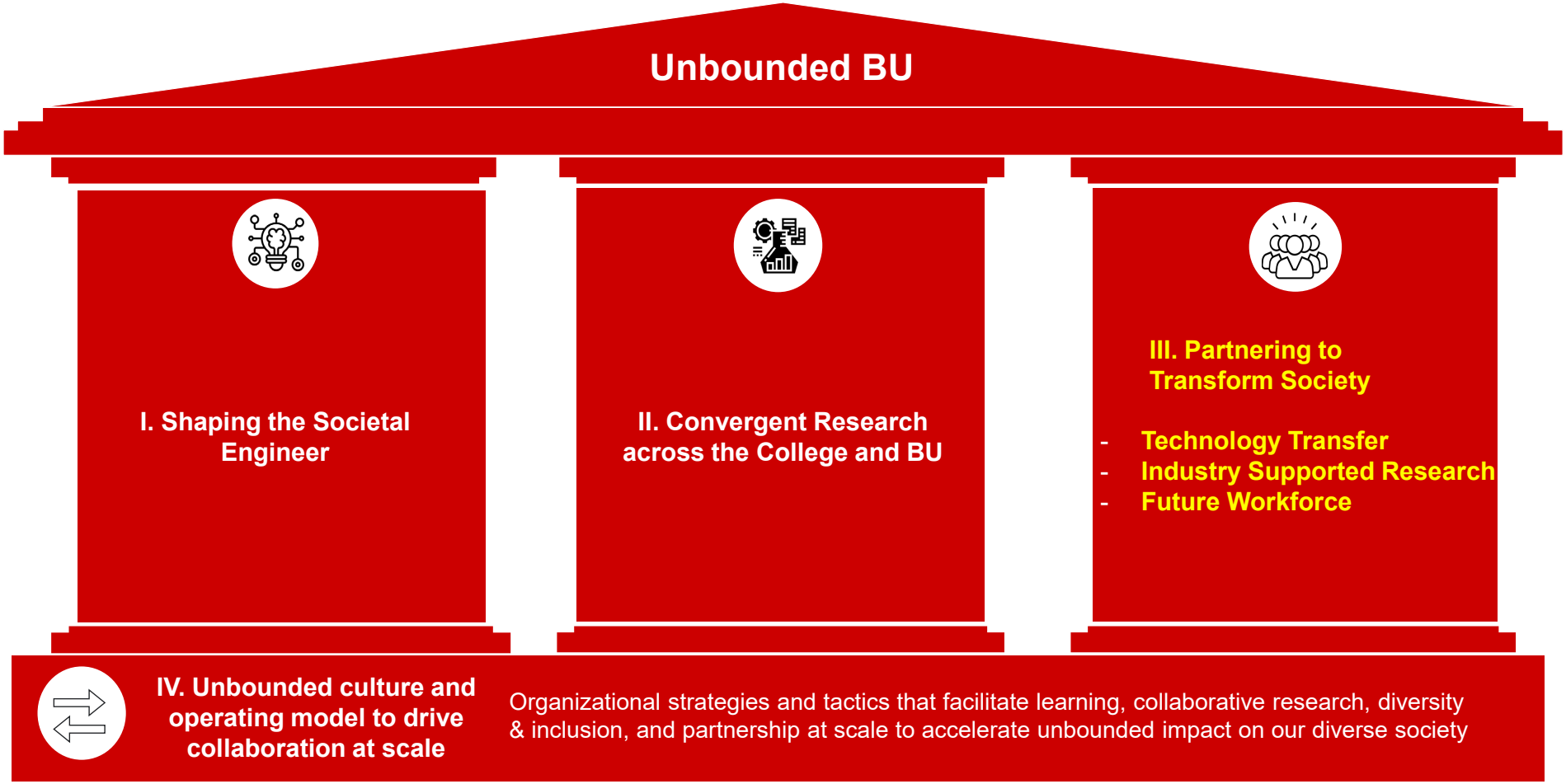
Smart grids and transportation systems

The College has generated momentum around six convergent themes that resonate with strengths and priorities for all of BU



These convergent themes both support and are supported by surrounding academic units and research centers aligned with BU strengths

Unbounded BU – The College of Engineering 2030 Strategic Plan



Engineering Product Innovation Center: EPIC

Facility Includes:

- Computer Aided Design
- 3-D Printing
- Robotics
- Laser Processing
- Materials Characterization
- Supply chain management
- CNC, etc

A Unique 15,000 sq. ft. Hands-On Maker-Space Facility To ***Educate All*** Engineers On Product Design-to-Deployment-to-Sustainability

amazon robotics
GE Aviation
SAINT-GOBAIN
Schlumberger
P&G Procter & Gamble
PTC the product development company
Arrow Electronics
Rolls-Royce

BU College of Engineering

BIOENGINEERING TECHNOLOGY & ENTREPRENEURSHIP CENTER

AT BOSTON UNIVERSITY'S COLLEGE OF ENGINEERING

Molecular, Cellular, and Tissue Engineering Suite

Biosensors and Instrumentation Suite

Digital and Predictive Medicine Design Suite

PHILIPS

Medtronic

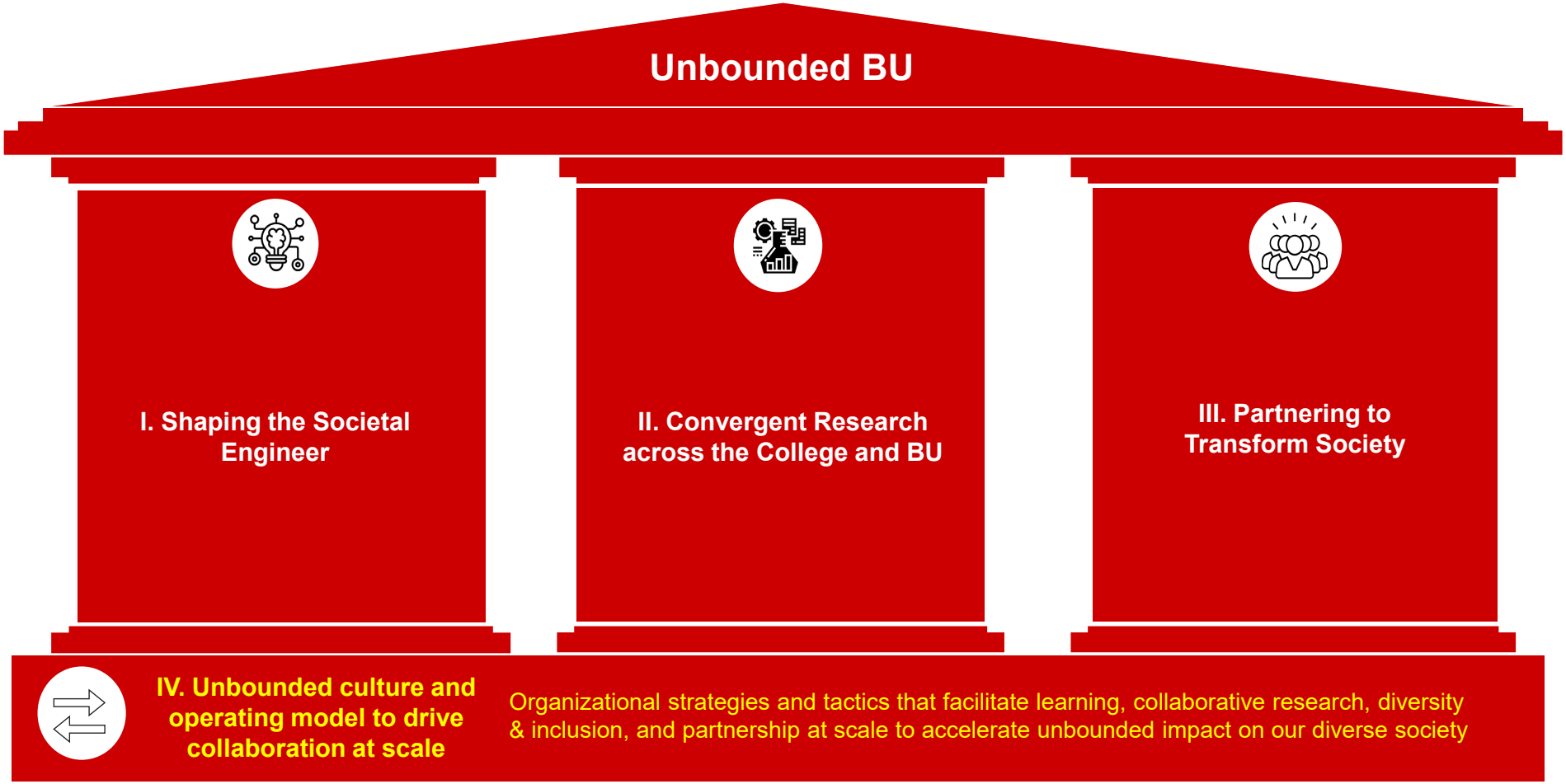
NOVARTIS

ThermoFisher SCIENTIFIC

Pfizer

Takeda

Unbounded BU – The College of Engineering 2030 Strategic Plan



Bold moves are needed to propel the success of an Engineering School Committed to the Power of Convergence. *What must these moves accomplish?* :

- **Hiring world-class faculty in convergent themes**
- **Support & mentoring for convergent/collaborative faculty**
- **Periodic evaluation of convergent themes.**
- **Resources to Invest in Existing or Seed Emergent Convergent Research**
- **Convergent Student "Educational" Experiences**
- **Proactive multi-dimensional industry relationships**
- **Create a culture of impactful inclusion**
- **Robust marketing & communication campaign**

Bold moves are needed to propel the success of an Engineering School Committed to the Power of Convergence. *What must these moves accomplish?* :

Hiring world-class faculty in convergent themes

Support & mentoring for convergent/collaborative faculty

Periodic evaluation of convergent themes.

Resources to Invest in Existing or Seed Emergent Convergent Research

Convergent Student "Educational" Experiences

Proactive multi-dimensional industry relationships

Create a culture of impactful inclusion

Robust marketing & communication campaign

Attracting an unfair share of top faculty through endowed professorships, clear evidence of convergent strengths, and BU's collaborative culture

The College of Engineering's value proposition for prospective faculty

The Most Talented and Ambitious Faculty:

- Are attracted to institutions that have **exceptional faculty in their convergent research area**.
- Want a clear commitment to **invest in their convergent research area** (e.g., faculty hires, best PhD students, collaborative physical space, etc.)
- Seek a **culture embracing the power of collaboration**
- Seek **ease of working across disciplines** (eg. multiple appts. & PhD students from anywhere).
- Want a license to **innovate and teach convergent course electives**
- Want **Institutional leadership** that is flexible and committed to the model
- Seek recognition via **Endowed Professorships "named" along convergent themes**.

Recent successes to build upon

- **Chris Chen:** Recruited from UPenn (ranked 18), $14.9M in grants secured since 2017
- **David Boas:** Recruited from Harvard (ranked 22), $10.6M in grants secured since 2017
- **Ji-Xin Cheng:** Recruited from Purdue (ranked 7), $9.3M in grants secured since 2017

Bold new operating processes to drive impact across the strategy

Category	Bold Moves
Hiring world-class faculty in convergent themes, appointed in multiple departments.	Perform ~1/3 of Engineering's faculty searches to be along prioritized convergent themes (**requires Career Development Professorships**) with appointments in multiple departments Recruit (senior) & Retain world-class faculty along convergent themes (**requires Endowed Professorships**)
Support & mentoring for convergent faculty and evaluating convergent theme impact	Design/Create a new position (e.g., **Associate Dean for Research and Faculty Development**) for: ▪ Coordinate mentoring of **collaboration beneficial to TT-faculty** ▪ Oversee periodic assessment of existing and emerging convergent themes

Claim: Mentored faculty hired from convergent searches will naturally add excellence to multiple departments

Bold moves to drive impact across the strategy

Bold move category	Bold Moves
Targeted Seed Invest In Convergent Themes	Design a **Seed/Blue Sky grant program** to catalyze high risk high impact ideas along convergent themes
Societal Engineers with Convergent Student Educational Experiences	Undergraduate (examples) Cross-Department (Senior) Capstone Design Teams Identify and develop a suite of new (team taught) "Convergent" undergraduate technical electives Graduate **1st Year Distinguished PhD fellowships explicitly along convergent research themes** Design Ph.D degree concentrations along convergent themes to allow *additional* "branding" of existing PhD (eg, PhD in Electrical Eng., with Concentration in Intelligent, Autonomous & Secure Systems)
Proactive industry relationships	Build corporate partnerships for research and educational programs (workforce) aligned with convergent themes
Culture of Impactful Inclusion	Identify courses and curricular opportunities to convey impact of inclusion vs exclusion re innovation **PhD Fellowships and Professorships Dedicated to Underrepresented Groups**

Preliminary draft

Leading goals to define the College of Engineering by 2025

2025 goals	Metrics to define success	Current state	2025 target
Be a top destination for students—with a distinctive reputation, experiences, and programs	Undergraduate acceptance rate	26%	20%
	PhD acceptance rate	23%	15%
	PhDs granted per year	84	120
	Peer (private engineering school) ranking of PhDs per faculty member	15	10
Launch diverse groups of students into successful, satisfying careers	Undergraduate job or continuing education placement rate 6 months after graduation	95%	97%
	Share of undergraduates who have participated in an internship prior to graduation	35%	75%
	Number of PhD graduates that get positions in AAU institutions (TBD)	X[2]	X[2]
Strengthen scale and impact of research enterprise	Annual research expenditures per engineering faculty	$740K	$1,080K
	Peer ranking of annual research expenditures per engineering faculty	10	5
	Number of high-visibility, multi-PI research & training grants in convergent themes	5	10
Attract and cultivate world-class diverse faculty in distinctive convergent themes	Number of new faculty hired in convergent themes (existing and new faculty lines)	--	31
	Win rate of top candidates that have cross-offers with peers	--	X%[2]
Build external partnerships to enable research and diverse talent transfer for societal impact	Total research expenditures funded by industry (TBD)	X[3]	X[3]
	New, multi-year research or educational partnership with industry	--	5
Increase reputation and ranking among Engineering colleges, with distinction in convergent themes	Ranking amongst private US engineering schools	16	12[4]
	Ranking amongst all public and private US engineering schools	36	25[4]
	US News and World Report peer assessment score	3.2	3.6[4]

1.Peers defined as top-20 ranked private engineering schools as ranked by US News and World Report in 2021 ranking. See appendix for detail
2.Metric to be defined
3.Data source to be defined
4.Goals may need longer timeframe to achieve given rankings are lagging indicators

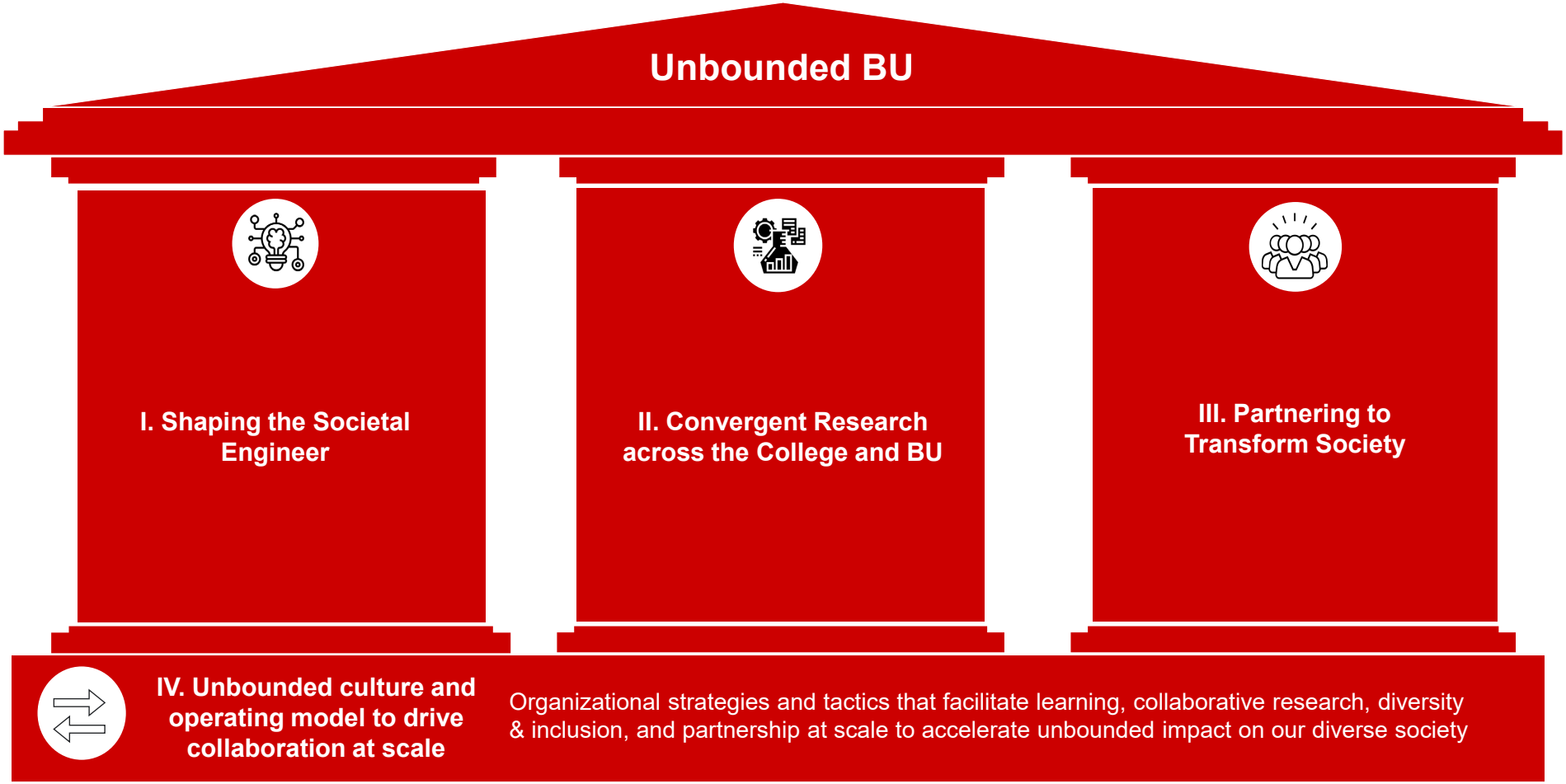
BOSTON UNIVERSITY

Unbounded BU

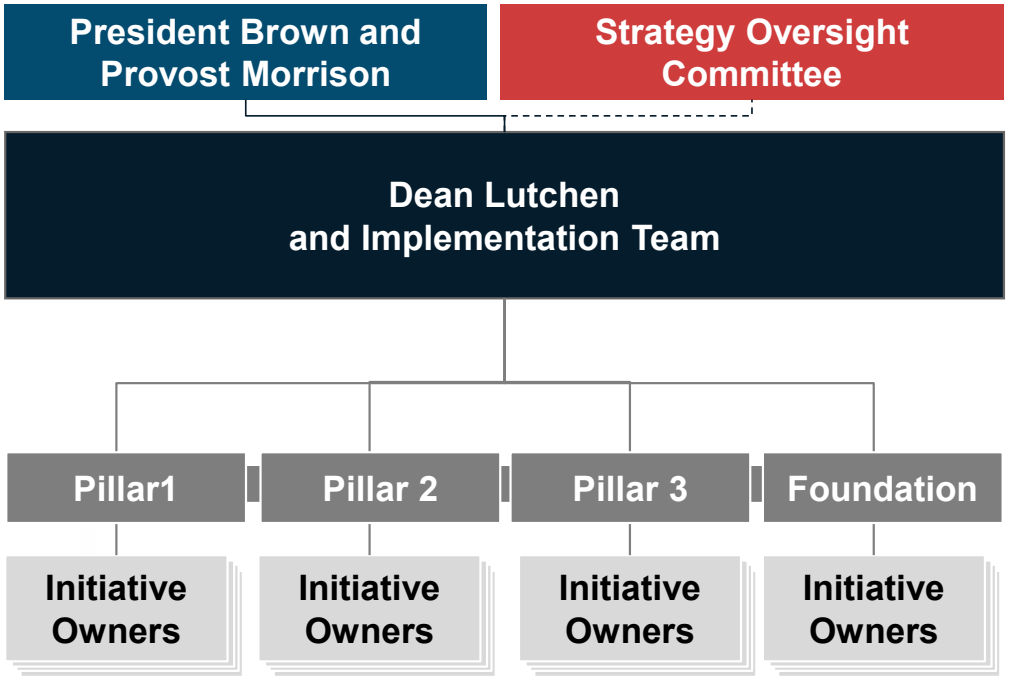
IMPLEMENTATION

BU's unbounded culture and operating model will enable high-impact convergent research, education, and partnership at scale to propel world-class excellence in engineering and societal impact

Unbounded BU – College of Engineering 2030 Strategic Plan: Implementation Initiatives



The strategy will be driven by the Dean and a small implementation team, executed by initiative owners, and guided by BU leadership and a Strategy Oversight Committee



Each Pillar & the Foundation have proposed initiatives: Some require additional resources & space. Entire Process originally proposed to be managed by new "MBA-level" hire.

Initiative number*	Initiative Name	Initiative Owner	Other stakeholders involved and engaged
1A	Curriculum for the Societal Engineer	**Sol Eisenberg**	Ken Lutchen, Wynter Duncanson, Jean Morrison
1B	Undergraduate Convergent Courses & Capstones	**Tom Little**	
1C	Graduate pathways at the convergence of disciplines	Tom Little	
1D	Proactive Career Pathways	**Doug Edwards**	Rich Lally
1E	Diversity Across Core Experiences	**Wynter Duncanson**	
2A	Endowed Convergent Professorships	**Ken Lutchen**	
2B	Convergent PhD & postdoc fellowships	Ken Lutchen	Allocating fellowships: Asc. Dean of Research & Convergence
2C	Amplified Dean's Catalyst Award	**Jen Marron**	Asc. Dean for Research & Convergence
2D	Capacity to win and lead large-scale research grants	Jen Marron	Wynter Duncanson
2E	Conferences, hosted meetings, and relationship-building to enhance research impact	**Asc. Dean for Research & Convergence**	Jen Marron, leaders from CAS and BUSM
3A	Reflection of external partnerships in recognition mechanisms	Jen Marron	Asc. Dean for Research & Convergence
3B	Cross-functional teams for partnership cultivation	**John Hartnett**	Ken Lutchen, Marc Scatamaccia, leaders from CAS and BUSM as applicable
3C	Headline "center" of gravity to attract industry partnerships	John Hartnett	Exec. Directors of Photonics, BDC, CISE, & other centers
3D	Industry talent and knowledge exchanges	**Gerry Fine**	Diane Joseph-McCarthy, Doug Edwards, Wynter Duncanson
3E	Enhanced student entrepreneurship offerings	Tom Little (curricular supports)	Gerry Fine (EPIC), Diane Joseph-McCarthy (BTEC), Ziba Cranmer (Spark)
3F	Enablers for efficient collaboration	**Mike Pratt**	Marc Scatamaccia
4A	Organizational support for convergent impact	Ken Lutchen	Eventually Asc. Dean has the portfolio
4B	Faculty recruiting and Collaborative Mentoring (Junior and Senior)	Asc. Dean for Research & Convergence	Jean Morrison, Leaders from CAS and BUSM
4C	Tenure criteria for a convergent community	Asc. Dean for Research & Convergence	Executive Committee
4D	Strategic use of physical space	**Rich Lally**	Ken Lutchen, Jean Morrison, leaders of CAS and BUSM
4E	Enhancing networks across the College & BU	Asc. Dean for Research & Convergence	Leaders of CAS and BUSM
4F	Awards for excellence in convergent impact	Asc. Dean for Research & Convergence	Ken Lutchen
4G	Telling the BU Engineering Story	**Steve Burgay**	Mike Seeley
4H	A more representative, inclusive College	**Wynter Duncanson**	Ken Lutchen

*** Numbers correspond to Pillars (1-3) & Foundation (4) Committees**

+ MBA Level New Staff

Pillar 1 initiatives

Shaping the Societal Engineer

An educational program designed with inclusive curriculum and experiences to ensure all students have the skills and mindsets to excel in their careers and positively impact society

1A **Curriculum for the Societal Engineer**

A holistic undergraduate engineering curriculum that builds a deep appreciation of the role of humanities and social sciences in technology & engineering through inclusive programs and essential capacities in the BU Hub and other university offerings

1B **Undergraduate Convergent Courses & Capstones**

A set of undergraduate technical electives engaging convergent themes & relying on the BU Hub to integrate disciplines from within and beyond engineering, culminating in a capstone project with support from convergent leaders

1C **Graduate programs at the convergence of disciplines**

Development of unique graduate programs at the intersection of emerging, convergent disciplines that leverage BU's distinct strengths and prepare students to solve complex challenges in careers and society

1D **Proactive Career Pathways**

Enhance the capabilities of and services provided by the College to proactively match students with internships, career opportunities, and other experiences to propel them to meaningful roles after graduation

Relates to Pillar 1 – initiative 3D

1E **Diversity Across Core Experiences**

Design and build explicit programs to enhance the impact and power of diversity in core experiences for all students (e.g., introductory classes, design courses, and capstone)

Relates to Foundation – initiative 4H

Pillar 1:
Societal Engineer from UG - Grad

- ***Potential*** Committee Members
  - Co-Chair: Eisenberg* & Little;
  - Members: A. White, Nazer, Zaman, Holmes, Duncanson, Densmore, D. Edwards, C. Bailey*

- Deliverables for Year 1
  - Implementable plan(S) to achieve about 25% Senior Design Projects engage cross-departmental student teams with projects that engage convergent approaches and diversity in design
  - Identify suite of 3-4 new technical electives (and faculty) for upper division in BS programs or as MS/PhD courses that engage convergent themes (eg., Nanomedicine, Autonomy and Neuroscience, Synthetic Biology and Cellular Manufacturing, etc) while recommending changes in allowable electives going forward in each program.
  - Determine advantage or not of formalizing adding to our existing PhD degree titles a concentration along convergent themes
  - Plans for achieving Diversity across core UG course experiences

- Longer Term Goals (plus Post-Covid Questions)
  - Plan for achieving 70% of UG and 40% Grad with an industry experience (internship, joint project, etc)
  - Periodic assessment of societal engineering attributes and/or BU Hub attributes success

Pillar 2 initiatives

Convergent Research across the College and BU

An interconnected, diverse, fearless research community, with disciplinary excellence that works seamlessly at the intersection of life sciences, physical sciences, and engineering to solve society's complex challenges

BU will build capabilities and distinction across dedicated convergent themes:

- Synthetic Biology, Tissue Engineering, and Mechanobiology
- Photonics and Optical Systems
- Neuroengineering, Neuroinformatics, and Neuroscience
- Intelligent Autonomous, and Secure Systems
- Materials by Design
- Energy, Sustainability, and Climate

2A Endowed Convergent Professorships

Attract and retain the best talent by means of new endowed chairs and career development professorships in BU's convergent themes

Relates to Foundation – initiative 4A

2B Convergent PhD & postdoc fellowships

Create new fellowships for PhDs and postdocs in convergent themes to accelerate research impact and attract young talent to the themes

Relates to Pillar 1 – initiative 1C

2C Amplified Dean's Catalyst Award

Enhance and expand the Dean's Catalyst Award to spark collaborations across faculty as well as to test promising, higher-risk research areas

Relates to Pillar 3 – initiative 3A

2D Capacity to win and lead large-scale research grants

Ensure faculty and staff have capacity and support to apply for and win large-scale, high-visibility research and training grants across diverse research communities that tackle complex problems in prioritized themes

2E Conferences, hosted meetings, and relationship-building to enhance research impact

Support faculty and students to lead global conversations and market BU's distinctive research in convergent themes with travel grants and convenings

Pillar 2:
Convergent Research

- ***Potential*** Committee Members
  - Chairs: Lutchen & Marron*;
  - Members: Bellotti, C. Chen, Paschalidis, K. Brown, Boas, Dunlop, Bifano, Morgan
- Deliverables for Year 1
  - Re-Design Deans Catalyst Award to Fuel seed grants aligned with existing or emergent convergent themes
  - Plan to phase in portion of new 1st year PhD fellowships (from existing pool) awarded by convergent theme rather than dept./division
  - Identify high priority convergent themes for creating common research space.
  - Identify highest priority and people to pursue training grants along convergent themes
  - Discuss potential upcoming “upgrades” to themes, new emerging themes
  - Describe some best practices for performing convergent searches at junior and senior level (also in Foundations committee)
  - Recommend key people/groups/areas at BU outside of ENG to engage and strategies for win-win.
- Longer Term Goals
  - Specific people/ideas for BU to host research workshops aligned with convergent themes (eg., branding us as a leader in such)
  - Specific plans/priorities/people to pursue large infrastructure or center grants as lead institution
  - Begin discussion of priorities for next 2-3 senior searches re convergent themes.

Pillar 3 initiatives

Partnerships to transform society

Ensuring the College's research and discovery yield economic and social impact via a targeted approach to cultivating partnerships with leading external organizations in themes aligned to BU's unique strengths

3A Reflection of external partnerships in recognition mechanisms

Recognize successful partnerships and translatable research in seed funding, awards, and reviews

Relates to Pillar 2 – initiative 2C

Relates to Pillar 4 – initiatives 4B, F

3B Cross-functional teams for partnership cultivation

Formalize working model for building and developing pipeline of potential partners, with a cross-functional team responsible for delivering partnerships in each high-potential convergent theme

Relates to foundation – initiative 4E

3C Headline "center" of gravity to attract industry partnerships

Utilize new or existing center (e.g., Photonics Center, Biological Design Center) to build "center of gravity" around prioritized convergent themes to attract industry partners

3D Industry talent and knowledge exchanges

Grow sustainable corporate relationships through knowledge and diverse talent exchanges with industry, including rotations/internships for students, corporate input into workforce needs, co-supervision of post docs, and/or industry co-appointments for faculty

Relates to Pillar 1 – initiative 1D,E

3E Continued growth of student entrepreneurship offerings

Grow and enhance offerings related to entrepreneurship, including connecting classroom experiences more deeply to BU's popular co-curricular offerings (e.g., Innovate@BU) and expanding venture coaching programs

Relates to Pillar 1

3F Enablers for faculty research to impact society

Provide faculty resource and training for technology translation & Entrepreneurship (Innovate@BU)

Become regarded as the university that most efficiently enables partnerships through continued relentless improvement and prioritization in the IP transfer and contracting processes

Pillar 3: Connecting to Society

- ***Potential*** Committee Members
  - Chair(s): Bishop* & Hartnett;
  - Members: Fine, Pratt, Joseph-McCarthy, Little, Roblyer, Kreiger, D. Edwards*,
- Deliverables for Year 1
  - Identify 1-2 faculty from each convergent theme to serve as Innovation & Outreach Leader(s)
  - Identify sets of potential Corporate/Societal external partners for 2-3 initial convergent themes and a strategic approach to engage them and define the partnership goals
  - Create external-advisory board for 2-3 themes inclusive of VCs and/or Entrepreneurs to help develop best ways to advance, tech-transfer, sponsored research and workforce development in this space. Define value proposition.
  - Develop concept model for training (via Innovate@BU) to enhance faculty & student skills to interface with companies
- Longer Term Goals
  - Develop marketing and engagement strategy for success along all convergent themes above
  - Refine above for sustainable and growing suite of companies that want multi-dimensional partnerships with ENG at BU along these convergent themes,

Foundation Initiatives

Preliminary draft

Unbounded culture and operating model to drive collaboration at scale

Organizational strategies and tactics that facilitate learning, collaborative research, inclusion, and partnership at scale to accelerate unbounded impact on our diverse society

4A Organizational support for convergent impact

Associate Dean position dedicated to mentoring convergent faculty, supporting convergent hiring processes, and leading an annual evaluation of progress across convergent themes

Relates to Pillar 3 – initiative 3B

4B Faculty recruiting and onboarding

Reshape hiring practices and onboarding to explicitly integrate emphasis on collaboration and convergent research capabilities

Relates to Pillar 2 – initiative 2A

4C Tenure criteria for a convergent community

Enhance tenure goals and processes to align with values of collaboration (both internal to BU and with external partners) and encourage convergent research in and outside the College

4D Strategic use of physical space

Reassigned, redesigned, or new shared physical spaces that enable more faculty/ student interactions to spark new connections and research ideas

4E Enhancing networks across the College & BU

Targeted supports, knowledge-sharing platform, and events to facilitate growth of new and existing networks

4F Awards for excellence in convergent impact

Refine the criteria of existing awards or create new awards to recognize faculty and students in the College who best exhibit the collaborative and convergent culture

4G Telling the BU Engineering Story

Build and execute a robust, multi-year marketing and communications plan to share the BU Engineering story and help accelerate execution of the strategy

4H A more representative, inclusive college

To advance a collaborative culture whose success depends on diversity of people and ideas, develop and resource programs that enhance diversity & inclusion at all levels

Foundation: New Operating Processes For Implementing Convergence as Guiding Principal

- ***Potential*** Committee Members
  - Chair: Morgan & Lutchen*;
  - Members: J. White, C. Karl, Cassandras, Steve Burgay (or Designate), Duncanson, Park, Lally*
- Deliverables for Year 1
  - Formalize roles of of AD for Research & Convergence and AD for Research Administration
  - Develop narrative conveying expectations for the role of collaboration for success (TT and post-tenured)
  - Develop processes for mentoring collaboration pre & post tenure and for assessing at merit and tenure and full promotion reviews (eg., add language to request for reference letters).
  - Design best approach(es) for a convergent faculty search at junior and senior levels and the AD role in faculty searches that are designed to engage convergence broadly
  - Develop Strategic initiatives to enhance graduate student and faculty DEI
  - Begin Branding & Marketing Strategy for ENG with distinct stake holders and constituents
- Longer Term Goals
  - Convene groups of leaders from related schools/colleges periodically to enhance convergent networks across campus
  - Develop awards related to convergent research impact
  - Processes for internal and external periodic assessment of convergent themes

Full implementation of the strategy would accelerate faculty hiring considerably

Scenario	Total hires FY21-FY26
1 **"Business as usual" hiring** (i.e., hiring to replace attrition and maintain steady-state growth of the College)	**~20**
2 **"Aspirational" implementation of the strategy (assumes major new resources & philanthropy)**	**~33**

Aspirational Plan: Requires Significant New Resources for Recruiting and retaining world-class faculty in convergent themes: a key lever for success in this strategy

Initiatives to recruit and retain faculty in prioritized convergent themes	Target to recruit by 2026	Target to retain by 2026
Create new Endowed Professorships in convergent themes to recruit new faculty and retain existing stars	▪ **10** Endowed Professorships for recruiting new faculty	▪ **5** Endowed professorships to offer existing faculty stars for retention
Create Career Development Professorships to recruit rising stars (as incremental recognition to existing faculty line)	▪ **6** Career Development Professorships for recruiting new junior faculty	
Target 30-50% of faculty lines in normal hiring process now dedicated to convergent themes	▪ **15** targeted hires from existing positions available (~3/year based on hiring trends); would not require new resources	
Create Endowed PhD Fellowships And Blue Sky Funding Programs	▪ **22** Endowed PhD Fellowships	

Designed to greatly accelerate plan success and impact relative to metrics of excellence and reputation.

It is projected to support 36 faculty dedicated to prioritized convergent themes over the next 5 years, adding to the existing foundation of faculty doing work in convergent themes across the College and BU

A ~$125M one-time endowment ($5.1M sustainable run-rate) & ~$115M total one-time over 5-7 yrs; Would accelerate progress across the strategic plan over the next 5 years

High-level view of investments needed to accelerate the strategic plan (thousands USD)

Investment areas	Ongoing expenses requiring sustainable funding (thousands USD, annual run rate)		One-time investments (thousands USD, total over 3-5 years)	
Recruit and retain top faculty in prioritized convergent themes[1] through endowed professorships and career development professorships for promising early-career scholars	5 endowed chairs to drive retention of leading faculty in convergent themes	$800	Startup funding for new faculty in convergent themes	$32,000
	10 endowed chairs to recruit additional stars in prioritized themes	$2,000		
	6 Career Dev. Professorships to recruit promising early-career scholars	$360		
Attract and train the next generation of world-class talent	22 PhD fellowships to cover research in prioritized convergent theme areas	$980		
Propel targeted research	12 awards/seed funds of varying size to inspire convergent and/or translatable scholarship[2]	$800	Upgrades to labs and other physical spaces	$75,000
Enable student curricular and career programs	Curriculum development stipends and Career Development Office resources	$130		
Provide additional faculty support	Support staff for faculty & convergent research	$600		
Launch robust, multi-year marketing/comms plan	Marketing campaigns and communications support	$1,000		
	Total annual run rate	**$6,670**	**Total one-time investments**	**$107,000**

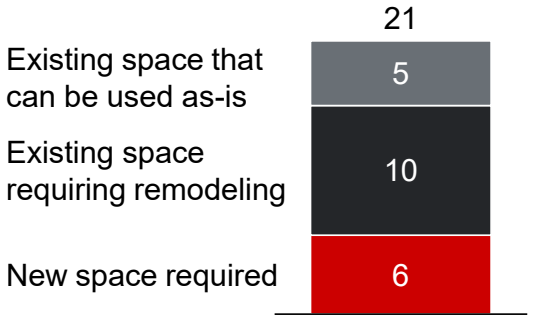
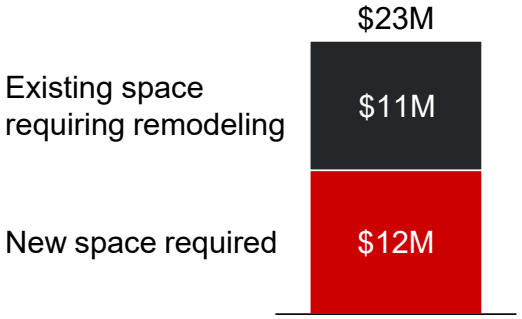
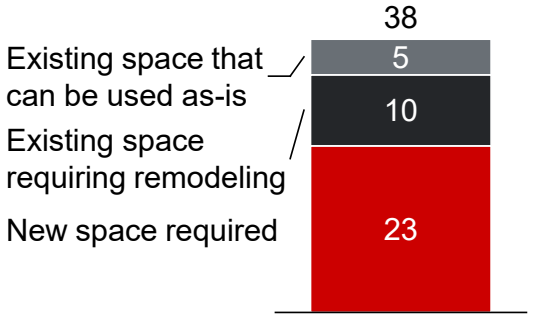
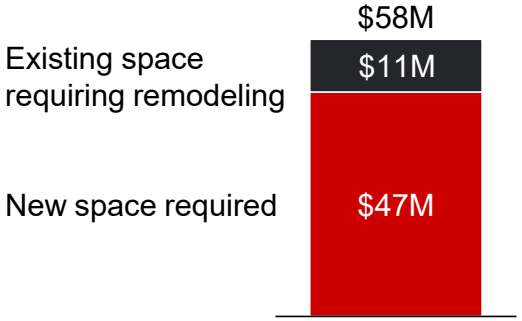
1.Assumes incremental annual expense per endowed chair of $160k/year; annual expense per newly hired endowed chair of $200k/year; Career Development stipend worth $60k/year/awardee; startup costs of $2M per new hire in first year only. Does not include 15 targeted hires from existing faculty lines
2.Number of active awards in a given year is a function both of number granted and duration

Note: Expenses for all personnel are inclusive of salary and benefits

BOSTON UNIVERSITY

Aspirational Plan would require ~$58M in facilities investments and ~23k sq. ft. of new space

Preliminary Draft

Scenario	Expected space required for new faculty by FY25, *Usable sq. ft., K*	Expected facilities CapEx associated with new hiring, *USD, M*
1 "Business as usual" hiring 5 net new faculty • 15 faculty departures • 20 faculty hires ~75% junior, 25% senior		
2 Aspirational implementation of the strategy 18 net new faculty • 15 faculty departures • ~33 faculty hires ~65% junior, 35% senior		

Key Assumptions
- Attrition of 3 faculty members / year, who vacate 1000 sq. ft.
- Junior faculty hire requires 820 sq. ft., and senior faculty hire requires 1760 sq. ft.
- $2,000/usable sq. ft. for acquisition or construction and, for renovations: $1,500/sq. ft. for wet labs, $1,000 sq. ft. for dry labs, and $500/sq. ft. for office only
- Wet lab: 1000 sq. ft.; dry lab: 750 sq. ft.; office only: 600 sq. ft.
- Wet lab: 2500 sq. ft.; dry lab: 1500 sq. ft.; office only: 800 sq. ft.