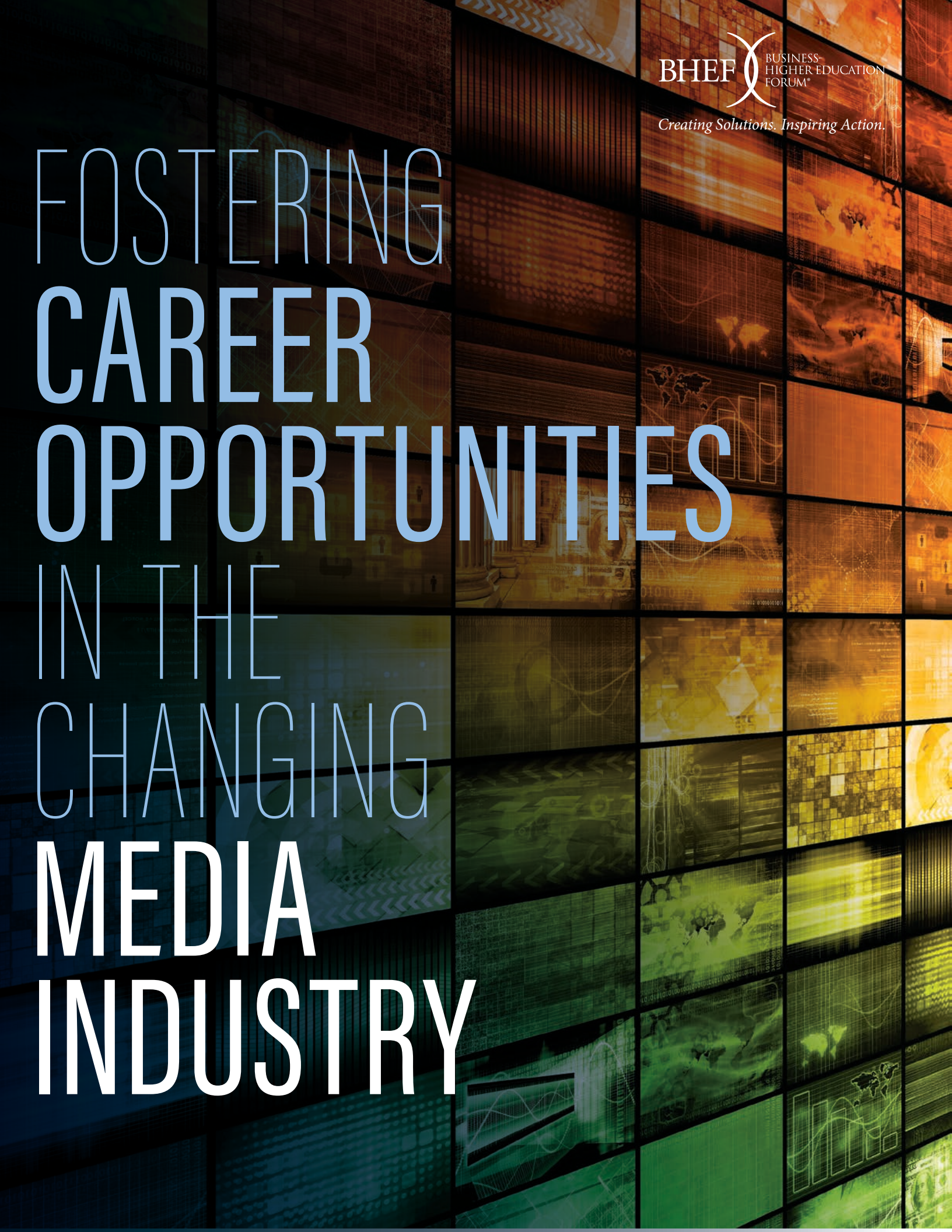
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FOSTERING
CAREER
OPPORTUNITIES
IN THE
CHANGING
MEDIA
INDUSTRY

There is a need for employees who not only have the foundational skills of a computer scientist or electrical engineer, but also possess technical skills associated with this new media ecosystem.

TABLE OF CONTENTS

01 Introduction

02 Overview of the Changing Media Industry

05 Demand for Media Engineers

06 Changing Skill Sets

08 Top Industry Sectors and Geographic Locations

09 Opportunities Beyond Media Engineering

10 Benefits of Higher Education-Industry Partnerships

11 The Way Ahead

12 About

NBCUniversal

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INTRODUCTION

TECHNOLOGICAL DEVELOPMENTS in recent years mark a significant moment of opportunity and innovation in the media industry, as media is now driven by the Internet rather than by television and radio. As analog technology transitions to digital technology, media producers are seeking new ways to deliver content to smartphones, tablets, and computers. Advances such as TV Everywhere, 4K TV, smart TV applications that work on operating systems, and Wi-Fi-enabled smart TVs are changing the way we think of and view television and the technology needed to support it.[1]

With online and computerized media now drawing more viewers than television, these changes provide significant opportunities for growth in traditional media companies. To implement these changes and remain competitive, there is a need for employees who not only have the foundational skills of a computer scientist or electrical engineer, but also possess technical skills associated with this new media ecosystem.

In response, NBCUniversal is addressing the rapidly changing skill needs and the difficulty it is facing in finding college graduates who possess the required skills by partnering with the Business-Higher Education Forum (BHEF) and Stevens Institute of Technology to develop an innovative solution: an academic minor in media engineering.

1. Pearl, M. The Future of Television According to Vice. *Vice*. January 15, 2015. Retrieved from *http://www.vice.com/read/frustrating-lack-of-availability-is-the-main-tv-trend-in-2015.*

OVERVIEW

of the Changing Media Industry

According to PriceWaterhouseCoopers *Global Entertainment and Media Outlook 2015–2019*, the U.S. media and entertainment (M&E) market, which represents nearly one-third of the global industry, is the largest M&E market worldwide, and it is expected to reach about $625.2 billion in revenue in 2016. The digital transformation is fueling the projected 5.1 percent annual growth rate through 2019.[2]

Recent data show that revenues from online media and entertainment will increase by around 13 percent a year for the next five years and that streaming services can increase profits at media companies.[3]

According to *Intelsat's Global Survey of Media Executives: 4K Ultra High Definition Television Adoption and Business Models*, more than 80 percent of media executives expect 4K to become the normal media service in the next 10 years. In addition, nearly 63 percent of respondents believe that 4K ultra high-definition television adoption will occur within the next five to seven years.[4]

Similarly, traditional news print outlets are moving quickly to increase digital subscriptions and add new business ventures. The need to archive programs for streaming and rebroadcast allows older and unusual content to be monetized. Finally, standalone streaming services are delivering more content to viewers every year. Programming changes such as linear channels and dynamic ad insertion also require new proficiencies and approaches for the media industry.[5]

These trends suggest incredible potential for growth if the industry has the firepower in the form of highly trained media engineers. Successful media companies will need to employ uniquely qualified individuals with the proficiencies required to innovate, develop, and implement new-media tools and technologies. As a result, engineering schools have an opportunity to enhance or develop undergraduate programs that equip students with the skills required in this changing industry.

$625.2

BILLION IN EXPECTED REVENUE BY THE U.S. MEDIA AND ENTERTAINMENT MARKET IN 2016

5.1%

PROJECTED ANNUAL GROWTH RATE FUELED BY THE DIGITAL TRANSFORMATION THROUGH 2019

13%

INCREASE IN REVENUES PER YEAR FOR THE NEXT FIVE YEARS FROM ONLINE MEDIA AND ENTERTAINMENT

80%

OF MEDIA EXECUTIVES EXPECT 4K TO BECOME THE NORMAL MEDIA SERVICE IN THE NEXT 10 YEARS

2. PriceWaterhouseCooper's Global Entertainment and Media Outlook 2015-2019 in *The Hollywood Reporter*. Retrieved from *http://www.hollywoodreporter.com/news/pwc-forecast-80-hollywood-revenue-799401.*

3. Digital Media: Counting the Change. *The Economist.* August 17, 2103. Retrieved from *http://www.economist.com/news/business/21583687-media-companies-took-battering-internet-cash-digital-sources-last*

4. Intelsat. *Intelsat commissioned independent market research firm Market Connections, Inc. to survey Intelsat's media customers on awareness of and plans for 4K UHDTV content demand, development, and distribution. The statistically valid response from 77 media professionals features the opinions of content and platform providers from 24 different countries.* July 2014. Retrieved from *http://www.intelsat.com/news/global-survey-of-media-executives-reveals-that-4k-ultra-high-definition-television-is-headed-for-broad-adoption.*

5. Wolk, A. The Future of monetising television. *The Guardian*. May 9, 2014. Retrieved from *http://www.theguardian.com/media-network/media-network-blog/2014/may/09/future-tv-advertising-pvr-vod*

KEY FINDINGS OF THE BURNING GLASS TECHNOLOGIES REPORT:

- Nationally, there were 5,106 postings for media engineers. For the data set, the **AVERAGE ADVERTISED SALARY WAS $71,457.**

- Demand for media engineers was found to be most heavily **CONCENTRATED IN CITIES WITH A STRONG NATIONAL MEDIA PRESENCE,** including New York, Los Angeles, and Denver. In each of these cities, average salaries for media engineers were documented as significantly higher (by $12,000 to $20,000) than the national average for media engineers.

- Demand for media engineers and related roles is primarily **CONCENTRATED IN THE INFORMATION, PROFESSIONAL SERVICES, AND MANUFACTURING INDUSTRIES.**

- **MEDIA ENGINEERING JOBS ARE HARD TO FILL.** On average, media engineering job postings remain open for 44 days, 11 days longer than the overall average of 33 days for all job postings.

- Media engineers **REQUIRE A DIVERSE MIX OF BROADCASTING, TELECOMMUNICATIONS, AND IT-RELATED SKILLS,** including Linux and Cisco software. This wide-ranging skillset offers media engineering students and workers ample opportunity in secondary career areas that use many of the same skills required in media engineering.

- Among the most highly demanded skills for media engineers is **PROFICIENCY WITH CONTENT CREATION TOOLS,** such as Cinema 4D and Pro Tools, as well as markup or programming languages such as HTML5 and Python.

DEMAND

for Media Engineers

MEDIA ENGINEERS are in high demand and require a broad set of skills. In 2014, NBCUniversal commissioned Burning Glass Technologies to assess industry demand for this profession.[6] To identify and analyze the demand for media engineers, Burning Glass Technologies mined its database of nearly 100 million unique online job postings to gather information on the overall demand, skill requirements, top employers, and hiring difficulty.

Media engineering jobs include positions that support the electronic broadcasting of media and digital information. Examples of job titles for media engineers include: chief engineer, broadcast engineer, maintenance engineer, media network engineer, and systems design engineer.

The review found that, like NBCUniversal, other companies in the industry have relatively high demand for jobs in audiovisual (AV) and media engineering, networking and technical infrastructure, and software development and quality assurance categories.

6. Burning Glass Technologies, *Analysis of Media Engineering Demand*, 2015. Prepared for NBCUniversal.

CHANGING

Skill Sets

For the most part, engineers working in the media industry today have learned their profession by shadowing those who came before them. Therefore, there is an opportunity for engineering schools to enhance existing academic programs to incorporate the new skills necessary to prepare the next generation of media engineers.

The jobs that will drive the U.S. economy in the 21st century require employees with both mastery of core-content knowledge in a given field and well-developed workplace competencies, such as the ability to think critically and solve complex problems, work collaboratively, communicate effectively, and learn how to learn (e.g., self-directed learning). The Burning Glass Technologies report validates the blend of core-content knowledge and workplace competencies that are required in media engineering. Media engineers need a combination of specialized technical skills, knowledge of software programs, and 21st century workforce skills—in other words, a "T-shaped professional." (See page 7.)

Table 1 shows the range of skills required by today's media engineers. Many of the fastest growing skills for media engineers include content-creation tools and high-level programming languages. The Burning Glass Technologies report found that demand for skills related to content creation tools such as Cinema 4D and Pro Tools has increased 24 percent and 31 percent respectively, as calculated at the percentage change in the total number of job postings requiring the specific skills between 2011 and 2014. Markup and programming languages such as HTML5 and Python have also increased in demand.

Given the proliferation and increasing complexity of assorted technologies required to produce and distribute media content, there is a concomitant need for media engineers who have an understanding of systems engineering in order to ensure that these technologies function effectively as a system.

Although the media industry principally needs electrical engineers and computer engineers, much of the recruitment for talent has traditionally come from students who majored in video and television production, but not engineering. While these programs expose students to the industry, they offer limited technical competencies.

NBCUniversal, along with other peer companies, is increasingly looking to hire engineering graduates who have exposure to media. This path is not traditional for engineering students, and therefore most are not exposed to or even aware of the career possibilities within the media and broadcasting industry.

T-SHAPED PROFESSIONALS The concept of a "T-shaped" professional refers to an individual with a deep knowledge of his or her discipline (the leg of the T), but also the breadth of skills and knowledge that allow the individual to see how one discipline interacts with others (the horizontal arm) and contributes to multiple dimensions of a company's operations. The T-shaped professional stands in contrast to the I-shaped employee, an individual who specializes in one field and whose skills may come to be devalued following changes in technology or market conditions. T-shaped professionals are both collaborative and adaptive innovators, prized for the depth of their problem-solving skills in one field and the breadth of their communication skills in many others.

SOURCES:

Donofrio, N., Spohrer, J., & Zadeh, H. 2010. *Research-Driven Medical Education and Practice: A Case for T-Shaped Professionals.* Retrieved from *http://www.ceri.msu.edu/wp-content/uploads/2010/06/A-Case-for-T-Shaped-Professionals-20090907-Hossein.pdf*

Spohrer, J. 2013. *What's Up at IBM University Programs.* Retrieved from *http://www.slideshare.net/spohrer/t-shaped-people-20130628-v5l*

TABLE 1: RANGE OF SKILLS REQUIRED BY TODAY'S MEDIA ENGINEERS

SPECIALIZED TECHNICAL SKILLS	21ST CENTURY WORKFORCE SKILLS	SOFTWARE KNOWLEDGE
Broadcasting	Communication Skills	Microsoft Office
Technical Support	Troubleshooting	Linux
Systems Engineering	Writing	Cisco
Network Engineering	Organizational Skills	Transmission Control Protocol/Internet Protocol
Telecommunications	Planning	Unix
System and Network Configuration	Editing	AutoCAD
Test Equipment	Problem Solving	Perl
Firewalls	Research	Python
Video/Television Production	Detail Oriented	SQL
Software Installation	Project Management	Microsoft Visio

TOP INDUSTRY SECTORS AND GEOGRAPHIC LOCATIONS

The Burning Glass Technologies report found that **media engineer positions are primarily concentrated in the information sector.** However, there are also positions in education services and the professional, scientific, and technical services sectors. Employers who advertise media engineering positions most frequently include Disney, Sports Media Technology Corporation, Sinclair Broadcast Group, and major television and radio broadcasting networks such as NBCUniversal, CBS, Fox, and Clear Channel Communications. Social media companies, such as Facebook, also seek individuals with these skills.

Geographic demand for media engineers is strongest in states with a substantial national media presence. These states include California, Colorado, Connecticut, Georgia, and New York. Within these states, the demand is concentrated in cities with the strongest national media presence, such as Bridgeport, Denver, and Los Angeles, as well as cities with strong technology sectors such as San Jose. The New York City metropolitan area leads all cities with the most media engineering job postings.

OPPORTUNITIES

Beyond Media Engineering

THE SKILLS NEEDED in media engineering are valued in other occupations as well. As such, media engineers have transferable skills that can be used in several sectors. According to the Burning Glass Technologies analysis, the following five occupations required similar skill sets to those demanded of media engineers.

1. **SYSTEMS ENGINEERING AND ANALYSIS**: design, purchase, and install information technology (IT) systems and infrastructure. Responsibilities include designing IT system solutions, as well as scalability, technology, and cost requirements.

2. **CYBERSECURITY:** design, implement, and execute systems and processes to prevent, monitor, and respond to electronic security issues.

3. **DESIGN ENGINEERING AND TECHNOLOGY:** contribute to the preparation, broadcasting, and technical support of electronic media and audiovisual technology.

4. **RADIO FREQUENCY ENGINEERING:** design, install, and maintain transmission systems, electronic hardware, circuit boards, antennas, and other technologies utilizing radio frequency.

5. **HELP DESK AND SUPPORT:** provide front-line support to personal computer users and address basic telecommunications and networking issues.

Occupations such as help desk and support provide an important entry point into the IT workforce and can serve as a stepping stone to more advanced technical roles. On the other end of the spectrum, occupations in systems engineering and analysis are relatively sophisticated IT roles that require advanced IT skills. Cybersecurity is one of the most lucrative secondary career areas for media engineering graduates. Since both cybersecurity and media engineering jobs require a cross-functional mix of IT and networking and information security skills, moving from media engineering to cybersecurity may represent a logical career transition.

BENEFITS

of Higher Education-Industry Partnerships

Extensive research conducted by BHEF and other organizations indicates that appropriate undergraduate academic coursework, combined with applied work experience, enables students to learn core content knowledge and understand the connections between their learning and careers. A new model of strategic business engagement with higher education aligns strategies to move from transactional relationships to strategic partnerships between the two sectors.

When fully implemented, the model enables business and higher education to effectively build sustainable, high-impact partnerships to increase student interest and persistence toward degree completion and to align undergraduate education with emerging workforce needs. Positioning these strategies requires:

- Commitment to **SUSTAINED ENGAGEMENT** to improve education outcomes
- **COLLABORATION** to develop a shared understanding of academia's and business' interconnected challenges, based on research and data that link college readiness and success to workforce requirements
- Development of **A SHARED VISION** for systemic solutions
- Collaboration with each other and with other **STRATEGIC PARTNERS** to implement solutions[7]

7. Business-Higher Education Forum. 2013. *The National Higher Education and Workforce Initiative: Forging Strategic Partnerships for Undergraduate Innovation and Workforce Development.*

THE WAY AHEAD

A PROJECT TEAM COMPRISED of NBCUniversal engineers and corporate social responsibility staff, BHEF staff, and Stevens' faculty and administrators from the Schaefer School of Engineering and Science and the School of Systems and Enterprises identified the key qualities and skills necessary for a media engineer. This collaboration led to the development of a minor in media engineering for computer and electrical engineering majors.

The minor is composed of four existing technical courses, one new systems engineering course tailored to the media industry, and a two-semester senior design project based on a media engineering-related topic. In addition, NBCUniversal engineers and Stevens' faculty developed several modules to expose first semester engineering students to the exciting careers in media engineering. Table 2 shows the specific courses included in the media engineering minor.

The minor combines academic fundamentals in engineering with industry involvement. It also integrates hands-on experiences, internships, and capstone projects to position computer science and electrical engineering students with the skills demanded in the media industry. The curriculum could easily serve as a guide for other institutions with the flexibility to customize it to meet their own needs.

TABLE 2: ELEMENTS OF THE MEDIA ENGINEERING MINOR

FUNDAMENTAL COURSES	Introduction to Image Processing and Coding
	Introduction to Multimedia Networking
	Introduction to Cloud Computing OR Enterprise and Cloud Computing
	Web Programming
	Elements of Operations Research
NEW COURSE	Introduction to Systems Engineering (tailored to the media industry)
SENIOR DESIGN PROJECT WITH A MEDIA ENGINEERING FOCUS	Engineering Design VII and Engineering Design VIII

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ABOUT BHEF The Business-Higher Education Forum is the nation's oldest membership organization of Fortune 500 CEOs, college and university presidents, and other leaders dedicated to the creation of a highly skilled future workforce. BHEF members collaborate and form strategic partnerships to build new undergraduate pathways; improve alignment between higher education and the workforce; and produce a diverse, highly skilled talent pool to meet demand in emerging fields.

NBCUniversal

ABOUT NBCUniversal NBCUniversal owns and operates a valuable portfolio of news and entertainment television networks, a premier motion picture company, significant television production operations, a leading television stations group, world-renowned theme parks, and a suite of leading Internet-based businesses. NBCUniversal understands the power and possibilities of media and technology. As a company uniquely positioned to inform, empower and inspire, NBCUniversal embraces the opportunity to create conversation and mobilize action to address some of the world's most critical issues. NBCUniversal is a subsidiary of Comcast Corporation.

STEVENS INSTITUTE *of* TECHNOLOGY
THE INNOVATION UNIVERSITY®

ABOUT STEVENS INSTITUTE OF TECHNOLOGY Stevens Institute of Technology, The Innovation University®, is a premier, private research university situated in Hoboken, N.J. overlooking the Manhattan skyline. Founded in 1870, technological innovation has been the hallmark and legacy of Stevens' education and research programs for 145 years. Within the university's three schools and one college, more than 6,800 undergraduate and graduate students collaborate with more than 380 faculty members in an interdisciplinary, student-centric, entrepreneurial environment to advance the frontiers of science and leverage technology to confront global challenges. Stevens is home to three national research centers of excellence, as well as joint research programs focused on critical industries such as healthcare, energy, finance, defense, maritime security, STEM education and coastal sustainability. Stevens is in the midst of a 10-year strategic plan, *The Future. Ours to Create.*, designed to further extend the Stevens legacy to create a forward-looking and far-reaching institution with global impact.

National attention to the outstanding quality of a Stevens education continues to grow. Stevens is consistently ranked among the nation's elite for return on investment for students, career services programs and mid-career salaries of alumni.

NBCUniversal is addressing the rapidly changing skill needs and the difficulty it is facing in finding college graduates who possess the required skills by partnering with BHEF and Stevens Institute of Technology to develop an innovative solution: an academic minor in media engineering.

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