BHEF 2015 ANNUAL REPORT

BHEF BUSINESS-HIGHER EDUCATION FORUM®

Creating Solutions. Inspiring Action.®

GIVEN THE GROWING DEPENDENCE ON DATA, WE HAVE RECENTLY DEEPENED OUR FOCUS ON EXCITING OPPORTUNITIES IN DATA SCIENCE.

BHEF 2015
CHIEF EXECUTIVE OFFICER'S MESSAGE

DEAR COLLEAGUES,

As more organizations intensify their dependence on data, higher education faces the challenge of preparing data-literate professionals for a vast digital economy. Tomorrow's workforce must be ready to think critically and solve complex problems, work collaboratively, communicate effectively, and engage in continuous learning, often in newly emerging fields.

The singular focus of the Business-Higher Education Forum (BHEF) is to facilitate cooperation between higher education and business so that graduates are equipped for high-skill, high-demand jobs. In 2015, BHEF helped academic and business leaders work together to develop and accelerate new educational pathways for college students. As a part of BHEF's National Higher Education and Workforce Initiative (HEWI), these successful partnerships are built on in-depth research and interests that align the needs of business with existing and enhanced educational opportunity.

These kinds of partnerships—founded on long-term strategic goals rather than short-term transactional objectives—create sustainable new opportunities for undergraduates. Students learn about emerging fields by engaging directly with employers and dedicated mentors and through applied learning experiences, such as paid internships.

BHEF continually scans the innovation landscape to identify emerging fields. Given the growing dependence on data, we have recently deepened our focus on exciting opportunities in data science.

To do this important work, we are thankful for the generous support provided by our members' companies and higher education institutions, private philanthropies, government agencies, and other stakeholders. We are especially grateful to BHEF Executive Committee Member Ryan Oakes and to Accenture, whose donation of time, expertise, and resources enabled BHEF to complete a rigorous strategic visioning assessment that will guide our efforts in the years ahead. Their consideration and leadership left a lasting imprint on the organization and solidly positioned BHEF to create and refine the connections between undergraduate education and the 21st-century talent pipeline. We are excited by our anticipated outcome: a robust, diverse, high-skill workforce.

Regards,

Brian K. Fitzgerald, Ed.D.
Chief Executive Officer
Business-Higher Education Forum

BHEF 2015
EXECUTIVE SUMMARY

L-R: Brian Fitzgerald, CEO, BHEF; Eduardo Padrón, president, Miami Dade College; Wes Bush, chairman, chief executive officer, and president, Northrop Grumman Corporation.

Since BHEF established the National Higher Education and Workforce Initiative (HEWI) in 2012 to catalyze partnerships between business and higher education, participants continue to gain important insights into preparing undergraduates for success in an innovation-driven workforce. HEWI identifies metrics and processes that facilitate the planning, launch, and assessment of new undergraduate pathways.

Further, analysis shows that emerging technological fields are poised to fundamentally reshape the science, technology, engineering, and mathematics (STEM) career pipeline. In some cases, credentials that reflect skills in several fields can offer a sound path to these new careers. Career pathways that build skills in emerging fields, for example, can begin in a variety of academic programs and at many levels—a high school diploma plus work experience, sub-baccalaureate certificates, military experience, or an associate's degree—as well as entry through the more traditional four-year college program. A multi-track approach can widen the undergraduate pipeline, especially for women and minorities, lower-income students, and veterans.

BHEF's experience with employers from many sectors demonstrates the need for graduates familiar with technology and up to date on analytical methods for their discipline. Graduates in non-STEM disciplines (e.g., the liberal arts) who are *enabled* in cybersecurity or data science are as critically needed as graduates with traditional STEM degrees. These employees do not need to be scientists or engineers with conventional training that may include years of postgraduate work. Rather, they need knowledge in STEM or related fields (such as cyber and data science) along with the ability to apply their knowledge in the day-to-day tasks of their jobs. This makes them invaluable to companies.

BHEF helps its members create new undergraduate programs in cybersecurity and data science that are relevant to many sectors, including financial services, media, and aerospace and engineering. It also maps job competencies and uses labor analysis and employer input on talent needs to create knowledge and build new educational tracks that not only meet industry demand, but also widen opportunity for a more diverse field of students. This work reinforces BHEF's value as the premier membership organization for business and higher education leaders who want to transform tomorrow's workforce.

IDENTIFYING WORKFORCE NEEDS

BHEF helps business leaders identify a workforce need and search for solutions through extensive planning and a robust exchange of ideas. In 2015, BHEF convened academic and industry leaders to explore opportunities for collaboration in financial services, media engineering, cybersecurity, and data science.

1. Facilitated the launch of almost a dozen business-higher education partnerships producing several new academic programs and a nationally recognized process for strategic business engagement
2. Coordinated the undergraduate STEM Interventions with the Industry (USI^2) Consortium, supporting five lead business-higher education partnerships, funded by the National Science Foundation
3. Developed new undergraduate trajectories for students in cybersecurity in Maryland, Washington, D.C., and Virginia, funded by the Office of Naval Research and the Alfred P. Sloan Foundation
4. Led the Financial Services Industry Workforce Project, bringing CEOs together to address critical workforce needs, beginning with new directions for study of data science and analytics at Baruch College's Zicklin School of Business
5. Launched the New York City Data Science Task Force, funded by the Alfred P. Sloan Foundation

Nancy Zimpher, chancellor, State University of New York.

Tim Sowton, vice president, Government Affairs and Public Policy, Business Leaders for Michigan.

BHEF 2015
BHEF'S STRATEGIC VISIONING PROJECT

To develop a roadmap for its future, BHEF worked with member company Accenture to define a vision for the organization, articulate its value to members, and clarify and put into action the organization's services and offerings. The resulting vision statement aligns with BHEF's organic development:

Create a partnership of business and higher education leaders to develop a highly skilled workforce of the future.

BHEF is a convener, facilitator, and accelerant. BHEF identifies and brings together diverse interests from business and higher education to identify and tailor effective approaches to talent development. Guided by this vision, and to create the greatest value for members and stakeholders, BHEF will focus on

- building action-oriented relationships;
- strengthening business members' workforce initiatives;
- assisting academic members navigate emerging trends and challenges in new curricula.

THE NEXT BIG THING: DATA SCIENCE

In 2015, HEWI deepened its efforts in the emerging field of data science. Content created over centuries is now being digitized, while countless new data are produced from online content, mobile devices, digital pictures and videos, transaction records, sensors, and metadata. *MIT Sloan Management Review* estimates that most organizations' data volume expands by 35 percent to 50 percent every year.[1] IBM estimates that 2.5 quintillion bytes of data are created every day and that 90 percent of the world's data have been created in the past two years.[2]

A vast swath of industry will be challenged to curate, assemble, and manage data. Projections by Gartner, Inc., indicate that 4.4 million IT jobs supporting big data will be created globally in the coming year, with about 1.9 million of those jobs within the United States. At the same time, big data has the potential to create three times as many jobs outside of IT.[3] In the private sector, data science emerged from the IT/computer science departments and is used throughout companies. Data science and analytics are central to government, cultural, medical, and business organizations that use data and analytics tools to understand and attack challenges.

Data science, as an academic discipline, did not exist a decade ago. BHEF is stepping forward to respond to the need for a skilled data science workforce. The organization and its members can play a pivotal role in defining, designing, and delivering new approaches that will prepare and educate undergraduates to enter the workforce as data science-enabled employees. Building on its success in cybersecurity, BHEF will continue to support existing programs while fostering new partnerships to develop a highly skilled workforce, first in data science, and then in emerging, perhaps as yet unidentified, fields.

[1] "The Talent Dividend"

[2] "IBM – What is Big Data?"

[3] "Major Myths About Big Data's Impact on Information Infrastructure"

2015 DATA SCIENCE ESTIMATES

35-50%

DATA VOLUME EXPANSION

in most organizations every year

2.5EXA

BYTES OF DATA

are created every day

90%

OF GLOBAL DATA

has been created in the past 2 years

L-R: Duane Farrington, EVP and CAO, State Farm Mutual® Automobile Insurance Company; Captain Robert Palisin, assistant chief of naval research, Office of Naval Research.

Above: L-R: Roger Ferguson, president and CEO, TIAA; Wes Bush, chairman, chief executive officer, and president, Northrop Grumman Corporation; Nancy Zimpher, chancellor, State University of New York.

Below: DJ Patil, U.S. chief data scientist, White House Office of Science and Technology Policy.

Randy Woodson, chancellor, North Carolina State University.

PREPARING THE FINANCIAL SERVICES INDUSTRY WORKFORCE OF TOMORROW

While highly trained data scientists are in demand, there is an even greater need for generalists who combine a deep background in a specific field (e.g., economics, finance, or business) with a strong understanding of the application of data analytics and visualization tools. They are able to turn data into intelligence and will be increasingly essential to decision-making by governments, businesses, and nonprofits.

Financial services firms rely on sophisticated use of data, yet they face challenges in recruiting data-enabled professionals with the kind of knowledge, skills, and abilities that are essential to business decision-making.[4] Research prepared for BHEF by Burning Glass Technologies, a Boston-based labor market analytics firm, shows that the demand for analytical skills is higher within the finance industry than in other industries and that such skills are important across a range of positions within the industry, including marketing, human resources, sales, and project management.

To address this demand, CEOs, academic leaders, and executives from top financial services firms have committed to BHEF's Financial Services Industry Project, a joint effort with the Business Roundtable. The project focuses on creating a more diverse talent pool of candidates equipped with data science and analytics skills. BHEF and Business Roundtable staff provide support by researching workforce needs and competency models and identifying employer partners that can help enhance or create new pathways to careers in financial services.

In 2015, the project launched a broad effort to integrate data science and analytics into the undergraduate curriculum at the City University of New York's (CUNY) Baruch College. The effort led to CUNY establishing three new majors and tracks and two new data analytics minors, which will be offered in spring 2016.

The process that led to this enhanced curriculum began in March 2015 when BHEF and the Business Roundtable convened a working group of leaders from Baruch College's Zicklin School of Business and financial services companies to discuss how to prepare students for careers in financial services.

The working group

- compared Baruch College's curriculum offerings with the industry's workforce needs;
- identified opportunities to incorporate data science skills in course and program development in one or a combination of the areas of data science and analytics, cybersecurity, and risk management;
- mapped specific skills needed to qualify students as data science literate and to define business-relevant majors and minors;
- developed a process for business members to provide data sets, tutorials, and case studies to enhance Baruch courses;
- updated course descriptions to reflect the most current subject matter.

While this project is a significant milestone, more opportunities remain for financial services companies and higher education institutions to identify ways to educate professionals who will be well equipped to thrive in a world increasingly dependent on the intelligent use of data.

[4] "The Science of Winning in Financial Services: Competing on Analytics and Opportunities to Unlock the Power of Data"

Ryan Oakes, managing director, Accenture.

FINANCIAL SERVICES INDUSTRY WORKFORCE PROJECT

In November, leading financial services CEOs convened at KPMG in New York City to consider the job market analysis presented by Burning Glass Technologies with support from The Guardian Life Insurance Company of America®. Burning Glass research found the following:

- The finance industry is the largest and most important in the New York Metropolitan Statistical Area (MSA) labor market, accounting for 20% of total online job openings and 17% of local GDP.
- With the growth of big data, analytical skills are growing across industries. This growth is not only in jobs such as data scientists and data analysts but across a range of occupations, including marketing, human resources, sales, and project management.
- Demand for analytical skills is higher in the finance industry than in other industries.
- Driven in part by the finance industry, the demand for analytical skills is higher in the New York MSA than across the country.

FINANCIAL SERVICES CEO LEADERSHIP GROUP

- Roger Ferguson, CEO, TIAA (co-lead)
- Peter Weinberg, Partner, Perella Weinberg Partners (co-lead)
- Deanna Mulligan, President and CEO, The Guardian Life Insurance Company of America
- Steve Rasmussen, CEO, Nationwide
- Ed Rust, Chairman, State Farm Mutual® Automobile Insurance Company
- John Veihmeyer, Global Chairman, KPMG International
- Larry Zimpleman, Executive Chairman, Principal

> "The work that BHEF does is more important to our collective future than any other group I've ever been part of. If not for BHEF, I simply don't know who else would be focused on talent and workforce issues. What can be more important?"
>
> Larry Zimpleman,
> Executive Chairman, Principal

CREATING NEW PATHWAYS FOR LEARNING IN DATA SCIENCE AND ANALYTICS

Data flows from mobile devices, social networks, sensors, and every digitized and connected product, machine, and infrastructure. It takes many forms, ranging from text, audio, and video, to weather, location, and numerical. Intelligent use of data is an invaluable asset in decision-making. Large datasets, properly analyzed, can spur the creation of new businesses and business models, more transparent governments, and change how people lead their lives. Key to this revolution in data use is the need for new job categories, such as data scientists, data engineers, and chief data officers. The proliferation of data and its growing value also affect existing career paths, which must adapt and evolve. Most career paths will now require higher levels of data and analytics literacy. The speed of change is such that educators must accelerate the inclusion of data science and analytics in their programs to be competitive.

New York City Data Science Task Force

Industries and cultural institutions in New York City offer tremendous opportunity to advance data science education through an array of internship and employment options for undergraduate students seeking to become data science-enabled professionals. Lessons learned through such efforts will inform opportunities in other regions and fields.

In 2015 the Alfred P. Sloan Foundation awarded a $650,000 grant to BHEF to increase the number and diversity of undergraduate data science and analytics students in the NYC region prepared to enter graduate school or the workforce as data science-enabled professionals. To achieve this, BHEF convened the New York City Data Science Task Force, a multi-sector group of noted business, higher education, and cultural institutions, to plan, design, and implement new undergraduate pathways in the field.

NYC DATA SCIENCE TASK FORCE

The Task Force, with its focus on women and minorities, will

- identify and map competencies, skills, and knowledge for the broader data science workforce (e.g., data science-enabled professionals in selected sectors);
- develop a repository of undergraduate data science resources (e.g., data sets, exercises, and student work experiences);
- seed new undergraduate data science pathways (e.g., courses, concentrations, or minors) at three or more academic institutions within the task force that include women and minorities;
- establish a variety of high-quality, real-world learning experiences in data science to define what is essential for successful undergraduate experiences;
- develop and apply assessment metrics;
- disseminate its insights nationally through meetings, reports, and other platforms.

BHEF 2015 Summer Member Meeting: Focus on Data Science

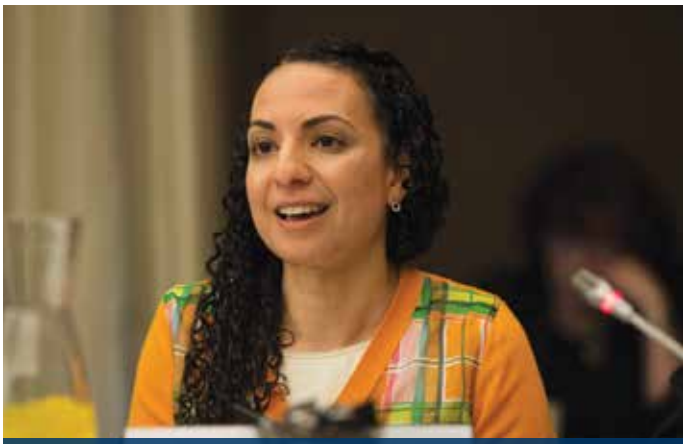
BHEF's 2015 Summer Member Meeting focused on the rapid emergence of data science. In a series of TED-style talks, experts shared their visions for the future of data science and analytics. They described the impact that data science will have on individuals, society, private institutions, and the government. In a series of moderated discussions, participants focused on data science as a driver of organizational change. Topics included

- BHEF's vision for the future of data science and analytics;
- how data science is driving organizational change;
- how to advance data science competencies in the incumbent workforce;
- the skills shortage in data science between new graduates and entry-level positions;
- how to create a national movement in data science.

Presenters reinforced the ubiquity of big data and its ever-increasing growth and complexity. It raises other critical issues that require further discussion and exploration beyond a narrow STEM focus, such as its role in privacy, social justice, ethics, and policy decisions. Non-STEM students need exposure to the power and limitations of data through a well-rounded curriculum that acknowledges real-world complexities.

Speakers confirmed the need for a greater range of skills and the ability to understand all points of the data lifecycle. While there is a need for highly skilled data scientists to develop better tools and conduct research, students also need to learn how to think about data. This kind of thinking is accomplished most effectively through workplace experience, thus permitting students to learn by doing. Many noted that data science and analytics education should no longer be optional, but a core requirement. Members stated that higher education's acknowledgement that data can transform academic disciplines can present significant opportunities for business partnerships that will provide one-of-a-kind opportunities for students and faculty.

Participants urged creation of a national movement in data science education. There was broad agreement that business and higher education can together address the nation's potential data science workforce deficit. Through collaboration with business, government, and nonprofit sectors, higher education can respond to clearly articulated skill needs, creating curricula and learning opportunities that will build robust undergraduate pathways and produce both data science experts and analytics-enabled graduates.



Mona Mourshed, director, Global Education Practice, McKinsey & Company.

Shaping Data Science and Engineering Pathways: BHEF-IBM Insight 2015 Roundtable

On October 26, 2015, BHEF convened and IBM hosted a roundtable of thought leaders in business and higher education to discuss strategies for building the data literate and data specialist workforce of tomorrow.

Business representatives reported that they are looking for employees who can apply advanced data and analytics to improve products and services, as well as work on fast-moving teams to help clients solve problems. They need versatile, curious problem solvers with the ability to communicate. Currently, companies are able to hire individuals with domain expertise, but they cannot find enough senior data specialist employees to serve as mentors or train new hires. Participants discussed a variety of approaches to data specialist programs, such as hiring consulting firms to conduct "boot camps" focusing on current employees, offering new majors with a domain concentration as a minor, and offering a domain major with a data science minor. Several takeaways emerged as the result of these discussions:

- Member academic institutions will be asked to provide information using a BHEF template on their data and analytics programs. Information will be compiled as a dynamic document available to those interested in fostering data and analytics pathways.
- IBM and BHEF will explore a position paper on data science workforce trends and projections, which will include recommendations for academic institutions developing programs and pathways.
- IBM will explore a rating system for data science programs.
- BHEF will create a member working group and convene its business and higher education leaders to discuss data science and analytics education. Topics may include: developing a set of shared resources, such as competency maps around the data science and analytics-enabled undergraduate; workforce trends across data science and analytics; data science as it relates to the humanities and across sectors; and implications for faculty and professional development with regards to data science skills.

Above: Carol Quillen, president, Davidson College.

Below: Eduardo Padrón, president, Miami Dade College.

Above: L-R: Brian Fitzgerald, CEO, BHEF; BHEF Chair Roger Ferguson, president and CEO, TIAA.

Below: Bob Jones, president, Education and Workforce Policy, LLC.

The Role of Data Science and Analytics in a Liberal Arts Education

Data science has been central to gleaning insights and new knowledge in the fields of economics, sociology, and biology. However, the recent explosion in data volume across many fields and the development of new tools to access and analyze data have created new opportunities for intellectual exploration in other traditional liberal arts fields. As a result, data science has the potential to engage a broad universe of liberal arts faculty and students in innovative, cross-disciplinary education and research that could enrich their academic focus and offer students the opportunity to develop new quantitative skills as they pursue their degrees.

On December 7-8, 2015, BHEF teamed with the Spencer Foundation and the Teagle Foundation to discuss these opportunities with college presidents and academic leaders, along with representatives of higher education associations, foundations, federal funding agencies, and nonprofit organizations.

The group agreed that current undergraduate students are digital natives, having grown up during the proliferation of digital tools and methods. However, gaining access to tools and data does not necessarily translate into intelligence or knowledge. Liberal arts colleges have the opportunity and responsibility to ensure that students are data literate, knowledgeable consumers of data, and possess data science competencies.

Making sense of data will continue to be part of the human experience, and if the liberal arts are the study of human experience, colleges will need to incorporate data science education into the curriculum. The liberal arts environment could provide a distinctive and richer experience for integrating data science with other domains than could a more broadly focused, research-based university. Further, the study of data science and analytics provides students with expanded vocational and post-college employment opportunities.

Discussions focused on ways to embed data science in the liberal arts curriculum and incentives to provide such education while also being realistic about the challenges of changing an institution. Liberal arts colleges can build capacity for such change by collaborating with public, private, or nonprofit organizations and other academic institutions and building better partnerships within their own institutions.

BUILDING ON SUCCESS IN CYBERSECURITY

Northrop Grumman and the University System of Maryland

Based on the success of an earlier initiative created with BHEF guidance, Northrop Grumman and the University System of Maryland expanded the Advanced Cybersecurity Experience for Students at the University of Maryland from a two-year series of courses into a four-year program and opened it to all students.

Office of Naval Research

BHEF continued its work with the Office of Naval Research on its efforts to address its civilian workforce needs, specifically in Virginia's Tidewater Region. In 2015, BHEF mapped the skills needed to enhance or develop curricula to support this endeavor.

Commonwealth of Virginia

BHEF played a leading role as the Commonwealth of Virginia considered expansion of cyber security education. BHEF

- presented its workforce analysis and model to the Virginia Cyber Security Commission;
- explored a cybersecurity physical systems minor at the University of Virginia;
- articulated its cyber approach at the Annual Virginia Summit on Higher Education and Economic Competitiveness, attended by business leaders and academics from throughout the Commonwealth;
- co-hosted the first Commonwealth Conference on Cyber and Education, where Governor Terry McAuliffe and Senator Mark Warner affirmed their commitment to cyber education and workforce development. BHEF organized and moderated the panel on government agencies, which included Dr. Larry Schuette, director of research at ONR.

MEDIA ENGINEERING: NBCUNIVERSAL AND STEVENS INSTITUTE OF TECHNOLOGY

As the new media industry faces rapidly changing skill needs and difficulty finding college graduates who possess these skills, NBCUniversal and Stevens Institute of Technology turned to BHEF for guidance.

Engineers and corporate social responsibility staff, BHEF staff, and faculty and administrators from the Schaefer School of Engineering & Science and the School of Systems & Enterprises at Stevens worked together to identify 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, introduced in 2015.

The minor combines academic fundamentals in engineering with industry involvement, integrating hands-on experiences, internships, and capstone projects. Specifically, it brings together four existing technical courses with a 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 are developing several modules to expose first semester engineering students to media engineering careers. The curriculum can serve as a guide for other institutions, with the flexibility to customize it to meet their own needs.

NATIONAL SCIENCE FOUNDATION SUPPORT FOR BUSINESS-HIGHER EDUCATION ENGAGEMENT MODELS

BHEF continued its work as part of a five-year grant from the National Science Foundation to implement business-higher education engagement models that evaluate and validate the role of business in helping students persist and succeed in STEM studies. Specifically, the effort focuses on business' involvement in students who transfer from community colleges to four-year institutions to complete STEM baccalaureate degrees.

With planning assistance from BHEF, these partner sites will launch their programs next year:

- The City University of New York System (CUNY) and IBM will develop a summer bridge program to support resiliency in climate change studies in New York City. The program will provide courses in quantitative literacy and data science skills to community college students transferring to a baccalaureate engineering degree program. Students will also participate in a senior research capstone project.
- Miami Dade College and NextEra Energy will create new research courses for students studying data science and analytics. As part of this work, Miami Dade College—together with BHEF business members Accenture, IBM, and others—will produce and approve a new baccalaureate degree in data science and analytics.
- Northeastern University and Raytheon will initiate a new cybersecurity pathway for students at the Lowell Institute for Professional Studies, beginning with a seminar series for community college students and a mentoring program.
- The University of Wisconsin-Milwaukee (UWM) and the Water Council will launch a pilot program for community college students and offer summer research experiences at UWM tied to internships with Water Council companies.
- Washington University and The Boeing Company will build a new leadership development program, scholarships, mentorships, and courses that assist students in the University of Missouri - St. Louis Joint Undergraduate Engineering Program.

UNDERGRADUATE STEM INTERVENTIONS WITH INDUSTRY CONSORTIUM

All project sites, together with the BHEF team and its evaluation partners, make up the Undergraduate STEM Interventions with Industry (USI²) Consortium. BHEF's Advisory Council for the project includes University of Maryland physics professor and National Medal of Science winner S. Jim Gates, Jr.; representatives from the Bill & Melinda Gates Foundation, the Helmsley Trust, the Lumina Foundation, and the Howard Hughes Medical Institute; and partners from the Association of American Universities, the American Council on Education, the Association of Public and Land-grant Universities, the Council on Undergraduate Research, the American Association of Community Colleges, and the Association of American Colleges and Universities.

Above: Anthony Monaco, president, Tufts University.

Mark Wrighton, chancellor, Washington University in St. Louis.

Below: Anita Zucker, chairperson and CEO, The InterTech Group.

CREATING KNOWLEDGE: EMERGING WORKFORCE NEEDS AND TRENDS

STRATEGY INFORMED BY EVIDENCE

A central feature of BHEF's work is its reliance on evidence to inform strategy. Since the earliest days of HEWI, BHEF gathered and analyzed data and independent assessments to guide its planning. Comprehensive business needs assessments, supply analyses, and literature reviews help identify strategies for addressing the need for both specialists in a given field and "enabled workers," or professionals, such as managers, grounded in one field but requiring the knowledge, skills, and competencies of another field to be effective.

For example, a strategy to develop a regional workforce with capabilities in data analytics might focus on both data scientists with in-depth knowledge of the field and "data analytics-enabled" professionals, which could involve providing students from a variety of majors with a core courses sufficient to constitute an academic minor, concentration, or professional certification.

Burning Glass Technologies, the labor market analytics firm, is a valued partner in helping BHEF identify emerging trends and challenges. Burning Glass collects comprehensive data on industry and labor market needs in sectors of interest to BHEF members. Its analysis informs BHEF's activities in cybersecurity in the Northeast region and financial services in NYC and serves as an example for emerging opportunities with other member companies.

Competency Mapping

Developing evidence-based approaches to higher education that meet business needs requires a thorough understanding of the desired skills and competencies. This understanding informs the development of programs and curricula. In November 2015, BHEF and the NYC Data Science Task Force convened a workshop: Defining the Competencies of the Data Science and Analytics-Enabled Graduate.

The group, which met at the Federal Reserve Bank of New York, comprised members of business, higher education, and cultural institutions. Workshop participants discussed and mapped national core data science and analytics competencies to develop business consensus and identify possible solutions to bolster and foster these competencies in the workforce. The group focused on the baccalaureate level regardless of discipline, and on students with little or no data science and analytics work experience but with domain knowledge in another field.

The group concluded

- learning opportunities in data science and analytics must be integrated into courses across the undergraduate curricula, beginning in the first year in either two- or four-year institutions;
- to be data science and analytics enabled, students need to master core competency in programming, analytics, data literacy, data communication, and behavioral skills;
- next steps are to develop a cross-sector industry competency map of the data science and analytics-enabled graduate for verification and refinement, develop modules for navigating the map, and then seek broad adoption and use of the map.

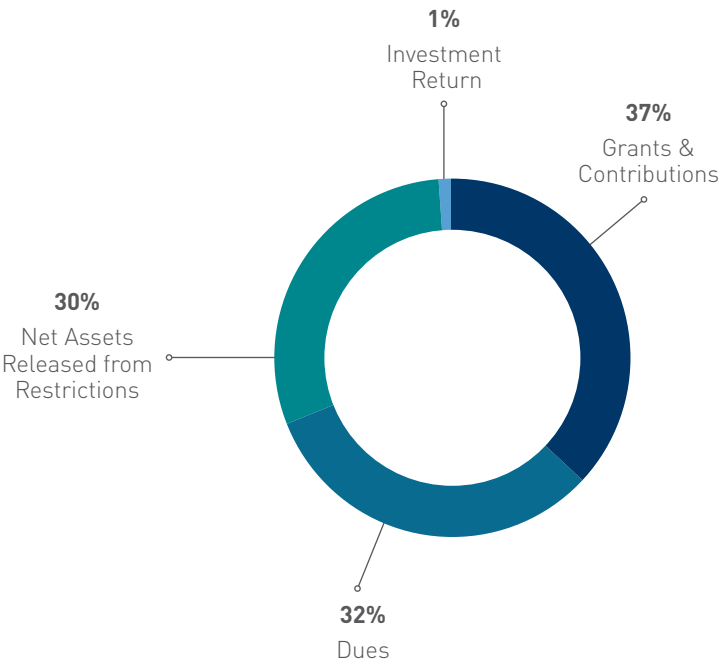
BHEF THOUGHT LEADERSHIP

BHEF published the following articles in 2015:

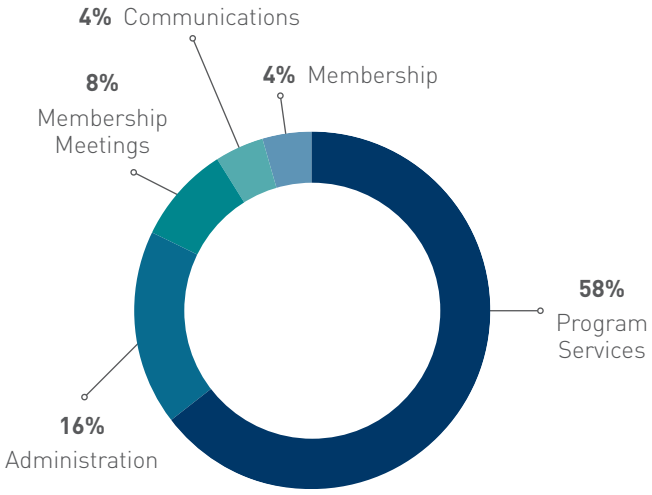
- *The BHEF National Higher Education and Workforce Initiative: A model for pathways to baccalaureate attainment and high-skill careers in emerging fields, Part 2*
  Brian K. Fitzgerald, Steve Barkanic, Isabel Cardenas-Navia, Karen Elzey, Debbie Hughes, and Danielle Troyan
  Industry and Higher Education, Volume 29, Number 5, October 2015, pp. 419-427(9)
- *The Broad Application of Data Science and Analytics: Essential New Tools for the Enabled Liberal Arts Graduate*
  Isabel Cárdenas-Navia and Brian K. Fitzgerald
  Change July/August 2015, pp. 25-32
- *Aligning Postsecondary Education with Regional Workforce Needs: A Tale of Two States*
  Steve Barkanic
  The Book of the States 2015. Council of State Governments, Chapter 9

BHEF 2015
FINANCIALS

REVENUE AS A PERCENTAGE OF SOURCE



EXPENSES AS A PERCENTAGE OF REVENUE



BHEF reflects our members' passionate commitment to the success of our nation's workforce and the undergraduates poised to become our next generation of innovators. Each member brings a credo of excellence that drives our work.

BHEF leadership is a true partnership between business and higher education, and our chairs personify the deep respect and admiration between the two sectors. We are deeply grateful to Roger W. Ferguson, Jr., president and CEO, TIAA, and Eduardo J. Padrón, president, Miami Dade College, for their wise counsel, heartfelt sincerity, and good humor throughout the past year. We are also grateful to our rising chair, Peter A. Weinberg, partner, Perella Weinberg Partners, for his expertise and enduring support. Lastly, BHEF thanks our Executive Committee members for their personal commitments, which ensure that the National Higher Education and Workforce Initiative continues to break ground and forge successful pathways for undergraduates into the known and yet-to-be-known fields that will define innovation and the 21st-century experience.

BHEF 2015
MEMBERSHIP

Joseph Aoun
President
Northeastern University

Jeffrey D. Armstrong
President
California Polytechnic
State University

Sondra Barbour
Executive Vice President,
Information Systems and
Global Services
Lockheed Martin Corporation

Lee C. Bollinger
President
Columbia University

Molly Corbett Broad
President
American Council on Education

Wes Bush
Chairman, Chief Executive Officer,
and President
Northrop Grumman Corporation

Robert L. Caret
President
University of Massachusetts

Carl Casale
President and
Chief Executive Officer
CHS Inc.

Christopher M. Chadwick
Executive Vice President
The Boeing Company

Jimmy G. Cheek
Chancellor
University of Tennessee,
Knoxville

James P. Clements
President
Clemson University

Raymond W. Cross
President
University of Wisconsin System

John DeGioia
President
Georgetown University

Michael V. Drake
President
The Ohio State University

Roger W. Ferguson, Jr.
President and CEO
TIAA

Nariman Fayardin
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Stevens Institute of Technology

Anthony A. Frank
Chancellor
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E. Gordon Gee
President
West Virginia University

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