

CLOSING THE SKILLS GAP

How developing relationships between industry and academia can reduce the skills gap



INTRODUCTION:

Not only has talent scarcity become a new norm for many companies, but digital technologies are profoundly transforming the workplace. As a result, developing relationships between industry and academia has never been so important – to both foster employability and close the skills gap.

In this whitepaper, we dive deeper into the reality of this situation. With help from experts spanning industry and academia, we explore the biggest challenges that result from the skills gap, and find out what strategies are already proving successful in closing that gap.

We will highlight some best practices to building relationships between industry and academia. Moreover, we shine a spotlight on how Dassault Systèmes **3DEXPERIENCE®** Edu is partnering with leading businesses and universities. In 2021, the company launched a **3DEXPERIENCE** Edu customer board to create a community of experts that identify and align on the future key skills needed in the workplace and provide insights related to industrial and technological transformations.

Recognizing the need for better alignment between the skills taught by academic institutions and the skills needed by the industry, the board decided to investigate the matter further. In this whitepaper, those experts share their ideas and best practices for success.

WHOSE RESPONSIBILITY IS IT TO CLOSE THE SKILLS GAP?

There are four main groups of stakeholders that are best equipped to close the skills gap. These are universities, employers, governments and students. However, they all face different challenges.

Let's address universities first. Universities should play a role in equipping students with the science and technical skills required in employment while some organization-specific skills will be taught in the workplace. A EU funded study called EUGENE identifies a number of best practices for universities, including the formation of industry advisory boards, conducting surveys with employers, ensuring placement feedback and the creation of joint educational innovation projects.



Employers, meanwhile, also have some responsibility and are uniquely situated to diagnose their own needs and shortfalls. But putting it into practice is proving challenging. In India, for example, while all stakeholders agree that work-based learning through internships is an essential instrument to increase employability, companies are not equipped to create the multitude of internship positions that would be necessary. As a result in 2017, only one percent of Indian engineering students had substantial internship experience and 60% of graduates remained unemployed.

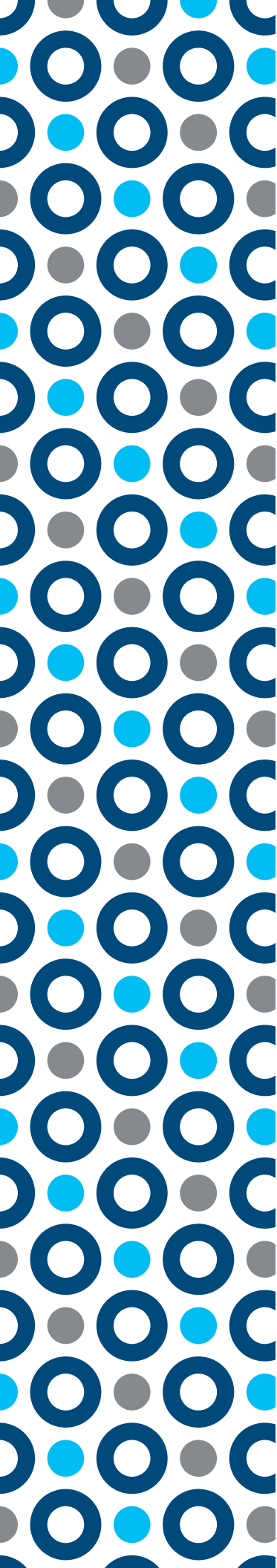
Governments also have sway. They can implement regulations and initiatives encouraging both industry and academia to take action. This approach is already proving successful in France, where internships are mandatory for all engineering roles. As a result, all graduates leaving schools have work-based experience.

A fourth group is the students that act to reduce the gap through online learning and certification, for example. It's important that they learn and acquire skills that will help them boost their employability.

THE SKILLS SHORTFALL

Research suggests that many graduates across the world are not 'workplace ready'. In the UK, for example, nearly 80% of employers believe graduates aren't work-ready on entering the employment market, according to a survey by the Chartered Management Institute.

Meanwhile, almost one-fifth of recent graduates in the US said their college education did not provide the skills necessary for their first job, and about half decided not to apply to entry-level positions because they felt they were not qualified, according to a recent survey by Cengage.



The numbers are even more dramatic in India, where 90% of students are not workplace ready, according to one report from 2018 and 60% of engineering graduates stay unemployed every year, according to a report of the India Council of Technical Education.

According to the 2020 Survey for Skills Gaps in Recent Engineering Graduates by the American Society for Engineering Education (ASEE), some of the key skills lacking in students concern additive manufacturing, digital twin and model-based systems engineering, with 46% to 66% of respondents expressing that they were inadequately prepared in these three disciplines.

"I wished I had more preparation for working on enterprise level software programs," remarked one student. Meanwhile, another explained: "My transition to industry was met with a steep learning curve to be truly effective with FEA tools, statistical analysis software, and computational platforms."

EXPECTATIONS VS REALITY

French aircraft and rocket engine manufacturer Safran Group is all too familiar with these problems. "When a graduate joins a company, it's understood that they will have to learn about the culture and its specific ways of working," said François Siegel, the company's industrial skills development leader. "However, there's an expectation that they will understand how to use generic industry tools such as project lifecycle management (PLM) and material requirements planning (MRP) technology. Unfortunately, often this is not the case."

Valérie Begin, Safran Group's head of industrial skills development, agrees that there are many important skills lacking. "Even when they have a theoretical background, university students often find it difficult to apply that theory to real world problems," she said.

This ability will become increasingly important as the industry continues to evolve. "Industry 4.0 and the resulting 'factory of the future' is developing at a rapid pace," Begin adds. "This demands employees who constantly renew their skills so they can master new production tools. Digital skills are now a non-negotiable, but the new generation does not seem adequately prepared."

It's this ability to apply theory to real world problems that Kerenza Harris, senior associate at interdisciplinary architecture firm Morphosis, looks for in all her graduates. "I want to put graduates in front of a problem without them panicking," she said. "Even though they may not know the answer to the problem or even the tools or experience to solve it, I want to see a methodological approach to solving it in a rational way. Flexibility and adaptability are, to me, the most crucial skills and I would hire people that seem the most ready to approach those problems."

"The graduates we hire need at least a year to acquire the level of skills required for their job," said Siegel. "That means that, during those early months and years, they are not fully operational. So, not only do we have to invest time in training and coaching, but we also experience lower productivity and efficiency during the initial stage. This is costly for the company – it takes quite a while before we see a return on investment."

Ultimately, what all of this means is that companies are forced to invest months – and often years – of additional, expensive training in their new hires.

CLOSING THE GAP IS KEY

87% of executives said they face a skills gap in the workplace, according to the McKinsey Global Survey. By closing the gap, new hires can be more productive. Kerenza Harris agrees. "By closing the gap, everyone is better off," she said. "From an employer's perspective, we will need to spend less time teaching the basics. But at the same time, the graduates get more independence – which means they become more well-rounded. That's a far better experience."

According to Harris, the answer lies in creating a stronger relationship between industry and academia. "This is required to create academy training paths that meet industry needs," she said.

BEST PRACTICE APPROACHES TO REDUCING THE GAP



Pioneering educators are working hard to instigate change and to reduce the skills gap as much as possible. The following three approaches have proven to be effective:

1. Industry professionals teaching university classes

According to Lionel Roucoules, a professor in the Engineering Laboratory of Physical and Digital Systems at the Arts et Métiers school in Paris, France, industry professionals teaching university classes is a tried-and-tested way of fostering better collaboration between industry and academia. "The value of closing the skill gap is to increase the confidence in a win-win approach: Industries can provide recommendation, via steering board for example, or fund some research projects that will in return provide benefits. Academics have more resources to train the next generation of students and to investigate new scientific and industrial issues. However, it needs to be done carefully," he warns. "Often professionals have a specific point of view. It's important that biases are understood."

Harris is seeing real benefit from this type of approach. "I teach at the Southern California Institute of Architecture (SCI-Arch) where much of the faculty are practicing architects," she said. "I think this works perfectly – it gives the teaching a certain level of relevance as we're able to pull from our own experiences. We can provide information about the reality of what our students are learning and what an architecture practice looks like in the real world. The value of closing the gap is to accelerate hands-on education".

2. Teaching university students to solve real-world problems

A hands-on, project-based approach to learning – which gives students a chance to learn by doing as opposed to traditional lectures – is seen by the experts as integral to closing the gap between industry and academia.

"There's no doubt about it – students learn by doing," said Siegel. "They need to be on the shop floor doing on-the-job training together with further theoretical training on manufacturing processes."

This view is backed up by the Institute of Student Employers' 2021 Student Development Survey which saw an overwhelming majority (78%) of employers agreeing that graduates who had completed an internship or work placement were more skilled than those who had not.

Valérie Ferret, **3DEXPERIENCE** Edu Vice president at Dassault Systèmes believes that technology has a significant role to play here. "We want to redefine the way academic institutions and

businesses collaborate to accelerate the adoption of new methods in industry, and transform education through experience-based learning,” she said.

3. Academics inviting Companies to co-create curricula

According to Harris, the co-design of an academic training path between industry and university is a must. “Job and competency planning and training co-built by industry and universities can be incredibly effective at closing the skills gap,” she said.

Getting this right, however, can be difficult. “Currently some industries participate in academic steering boards,” said Roucoules. “However, it is important that industry representatives push for the generic evolution of knowledge, and not for their own specificities.”

And, as students work on projects outsourced to their universities by nearby employers, they gain first-hand-experience not only on the types of projects they’re likely to do if hired by that employer, but on the design, simulation and manufacturing applications and processes they are likely to use.

3DEXPERIENCE EDU CENTERS OF EXCELLENCE: A SUCCESS STORY

Dassault Systèmes Edu recognized the need to create a learning environment at multiple levels – from advanced research to the engagement at all levels of students needed to build the workforce of the future for Industry 4.0. That’s why, in 2021, it inaugurated several centers of excellence around the world to maintain their continuous awareness about required skills and new methods and processes. The centers provide academic learners with project opportunities to contextualize the **3DEXPERIENCE** platform within specific business situations.



Image credit: Cyril Abad/CAPA Pictures/Safran

One of these is CampusFab, a training facility near Paris created by a consortium of French manufacturers, apprenticeship training centers and professional organizations.

“CampusFab is a kind of simulator for the factory of the future,” said Begin. “It provides training for both students on work-study programs and employees taking continuing education courses. They learn about new production methods based on networked machines, connected objects, additive manufacturing, augmented reality, collaborative robots and more. All CampusFab students work on real world problem solving – this is thanks to the industrial professionals that teach the classes, as well as the use of the **3DEXPERIENCE** platform.”

Meanwhile, the Dassault Systèmes **3DEXPERIENCE** Edu Center of Excellence in Advanced Composites at Purdue University was established in October 2020.

“Together we will advance the digital enterprise,” said Byron Pipes, the John L. Bray Distinguished Professor of Engineering at Purdue University. “We’ll do this by developing the human talent essential to this new paradigm and by utilizing the **3DEXPERIENCE** platform to exercise digital twins of complex composites manufacturing and performance to demonstrate the power to predict phenomena that are understood today only by empirical experiences.”

Here, a professional staff of engineers are engaged in helping students solve real-world customer problems. “The **3DEXPERIENCE** Edu Center of Excellence in Advanced Composites will bring significant benefits to university students and faculty and Dassault Systèmes’ clients in an environment where university and industry collaborate to solve society’s challenges,” said Pipes.

At Wichita State University in the United States, their **3DEXPERIENCE** center, embedded inside the university’s National Institute for Aviation Research, is an interconnected community of top researchers, corporations and laboratories to accelerate innovation. The center is home to a multitude of tools and technology used to execute multiple virtual twin programs for the U.S. military, employing hundreds of students in applied learning positions on a yearly basis.

“Our partnership with Dassault Systèmes is integral to educating student technicians in the **3DEXPERIENCE** platform, said John Tomblin, WSU senior vice president and NIAR executive director. “These students are driving forward industry and military technology while getting first-hand experience in critical engineering tools.”

A PLATFORM FOR THE FUTURE

Experts agree that gaining experience with the advanced digital engineering tools used by many employers is an increasingly important part of students’ hands-on training. And this is where platforms, such as Dassault Systèmes’ **3DEXPERIENCE** platform, can be incredibly useful.

“By using tools such as Dassault Systèmes’ **3DEXPERIENCE** platform during education, students will be far more equipped with the necessary skills they need for success in the workplace,” adds Marion McDevitt, a program manager in the Transformation Office at French semiconductor manufacturing company STMicroelectronics. “It doesn’t have to be as complex as the platforms used by industry, but it should be enough to teach the methodologies, the way of working and the mindset that is required in the real world.”



Harris agrees: “A platform approach to education can help students hit the ground running when it comes to employment,” she said. “It means that very technical skills such as 3D modelling, design, analysis, documentation, visualization and rendering can all be brought together in a way that is accessible to as many students as possible in the school.”

"At this point," Harris continues, "students will naturally start to use these tools for more of their projects. If there is greater accessibility and a way for them to get everything they need out of a platform, then little by little, the culture in the school will shift."

She is teaching using the **3DEXPERIENCE** platform at the Southern California Institute of Architecture (SCI-Arch). "It allows us to break the mold of the traditional teaching format," she said. "It gives our students hands-on technology skills not only to land their first jobs, but also to play an active role in shaping the future of architecture practice."

Siegel believes that a platform approach could be just what is needed to not only ensure graduates enter work with the right skills, but to help take the industry into the future.

"A platform approach could be incredibly successful if it reflects the main evolution of the industry in terms of jobs and skills and useful when it comes to bringing industry and academia closer together," he said. "It can help ensure the factory of the future with digital continuity. What's important, however, is that the platform is used to replicate real-world scenarios. These scenarios should be co-designed between industry and academics, and then the platform should be used by both university students during their academic training path and also employees from industry. All this combined could result in an incredibly powerful solution."

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