



Flexible, Stackable Certificates: The Future of Education



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Executive Summary

ISACA® and UPCEA® have partnered to help academic learning institutions build capacity for faculty and students in high-demand areas such as IT, cybersecurity and emerging technologies through new courses, accelerated programs, learning materials and by embedding certificates or certifications in appropriate curricula. This report highlights recent data on stackable credentials, external partnerships and an overview of ISACA IT credentialing programs.

Over the last few years, students have been faced with several global events and an uncertain economy. A demand for specialized skills and continued learning has become not only a part of how employers hire, but also how they train their employees. Education and career paths for individuals of all ages and experience are being rapidly reshaped by time, technology, market factors and changing priorities. Whether they are recent graduates, entering the workforce later in life, or looking for advancement or changing careers, people are increasingly requiring new ways to access experiential learning. Academic institutions are facing challenges and competition from many fronts. To maintain and grow their leadership position, they need to evolve and deliver on the fast-changing—and growing—needs for flexible, quality, experiential educational content.

Stackable credentials can be the answer to introducing new and valuable specialized skills to a wide range of learners and professionals. This report showcases key numbers and figures to provide more information on stackable credentials, insights of ISACA certifications and how stackable models could be applied to other industries to show how they can be leveraged for a variety of learner populations.



- **New adult learners view traditional four-year programs as not worth the cost and time since they lack preparation for job skillsets.** A University of Chicago study found that 56% of Americans agree with the statement “A four-year college education is not worth the cost because people often graduate without specific job skills and with a large amount of debt to pay off.”
- **Stackable credentials are attractive to adult learners as they allow for gaining competencies in multiple areas which can be built toward credit or non-credit programs.** Studies conducted by many states have shown that from 32% to 43% of certificate earners are re-enrolling in college and stacking credentials.
- **Companies and universities have increasingly entered partnerships that provide invaluable benefits to both the employers and institutions.** In a 2023 study of employers, UPCEA found that of the respondents from companies that partner with four-year colleges or universities, 33% said that employee development was the main reason, 28% said recruitment and 12% cited access to quality staff/resources/programs.
- **Quality of content was most important for companies when partnering with a college or university.** Seventy-six percent cited the quality of content, 69% the reputation of the institution, 46% affordability, 45% the ability to get college credit for courses and 45% having previous experience with the institution.
- **Disengaged learners are more likely to pursue an undergraduate degree if an institution offers stackable alternative credentials.** A 2023 disengaged learners study conducted by UPCEA and StraighterLine showed that if an institution offers alternative or microcredentials that are stackable, over three-quarters (76%) of respondents said that this would greatly increase or increase their interest in pursuing an undergraduate degree.
- **Students who have credentials in emerging technologies are poised to receive generous compensation.** Employers are willing to pay large salaries to these students because they are equipped with the necessary skills to utilize massive corporate data sets in new ways and the latest machinery such as cloud computing, AI and machine learning. Median salaries for the profession rose from US\$152,500 in 2019 to US\$164,500 in 2020, an increase of nearly 8%.
- **Stackable credentials were cited as a key factor in achieving higher income.** Research conducted by RAND Corporation found that learners saw average wage gains of about 16% after completing certificates and that those who stacked credentials saw more than twice that increase.



Overview

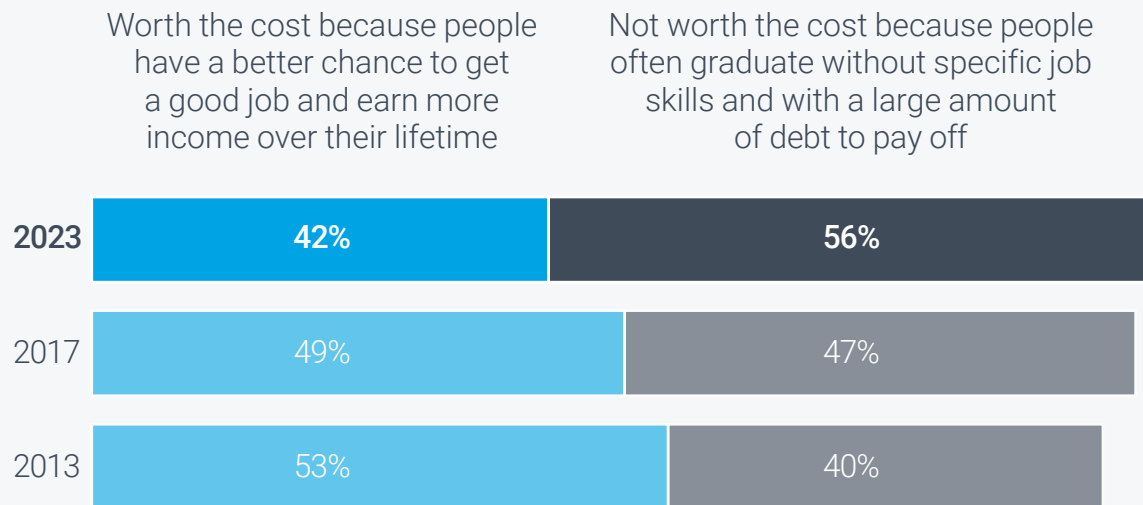
Today's fast-moving economy and increasingly digital landscape are driving change in how learners, from early age to adult, consume education. Advanced and innovative technology is drastically changing how the workforce operates, which in turn shifts how we view higher education. In many cases, these changes are happening faster than traditional colleges and universities are able to adapt. Employers need skilled workers now, not in four to eight years. Traditional four-year degrees are no longer going to cut it and will not properly prepare students to handle the new economy we're in. These degrees are increasingly losing value in the eyes of employers and new adult learners.¹ A University of Chicago study found that

56% of Americans agree with the statement "A four-year college education is not worth the cost because people often graduate without specific job skills and with a large amount of debt to pay off."²

Learners are looking for options in coursework and training on the latest approaches and developments in their fields that they can put to use in a short timeframe. They also have an eye toward the future and want to be prepared for the business and technology upgrades that lie ahead, particularly with artificial intelligence and other emerging technologies rapidly creating new opportunities and risks in the business landscape.

Academic institutions that want to fill this need must become nimble enough to deliver the mode and content of education that equips learners in this swiftly changing environment. To combat the static nature of these degrees, traditional four-year institutions have looked to external partnerships with companies to create interesting and innovative educational programs. One recent example is the 'Upskill Together' technology partnership between companies like Salesforce, Amazon Web Service, Pega and university partners such as Florida International University, Jacksonville University, University of Tampa and others. These partnerships focus on providing specific demographics into tech fields with a matching program. This gives students opportunities to take training programs and microcredentials in subjects such as cloud computing, CRM and automation.³ Employers are turning to these types of credentialing programs as a means to continue their employees' professional development. Institutions can look to develop and integrate these shorter-term credentials before their students graduate into the workforce.

FIGURE 1. When it comes to getting a four-year college degree, which of the following statements comes closer to your point of view? A four-year college education is...



Source: *The Wall Street Journal*

Stackable Credentials: The Future of Higher Education

Over the last decade, many public community colleges and other regional institutions have expanded their applied and technical programs to offer more accessible and affordable options for students. Learners are looking for more flexible options that can directly deliver the technical skills they need in the workforce. In the 2020–21 academic year, undergraduate credential earners increased 1.1% from the number reported the previous two years. This growth largely came from students with prior qualifications who were stacking credentials.⁴ Students are often taught at an early age how to break big jobs down into smaller, manageable tasks to reduce procrastination and make their goals seem more realistic and reachable. This concept of learning via microproductivity is increasingly used in today's business world to keep skills updated.

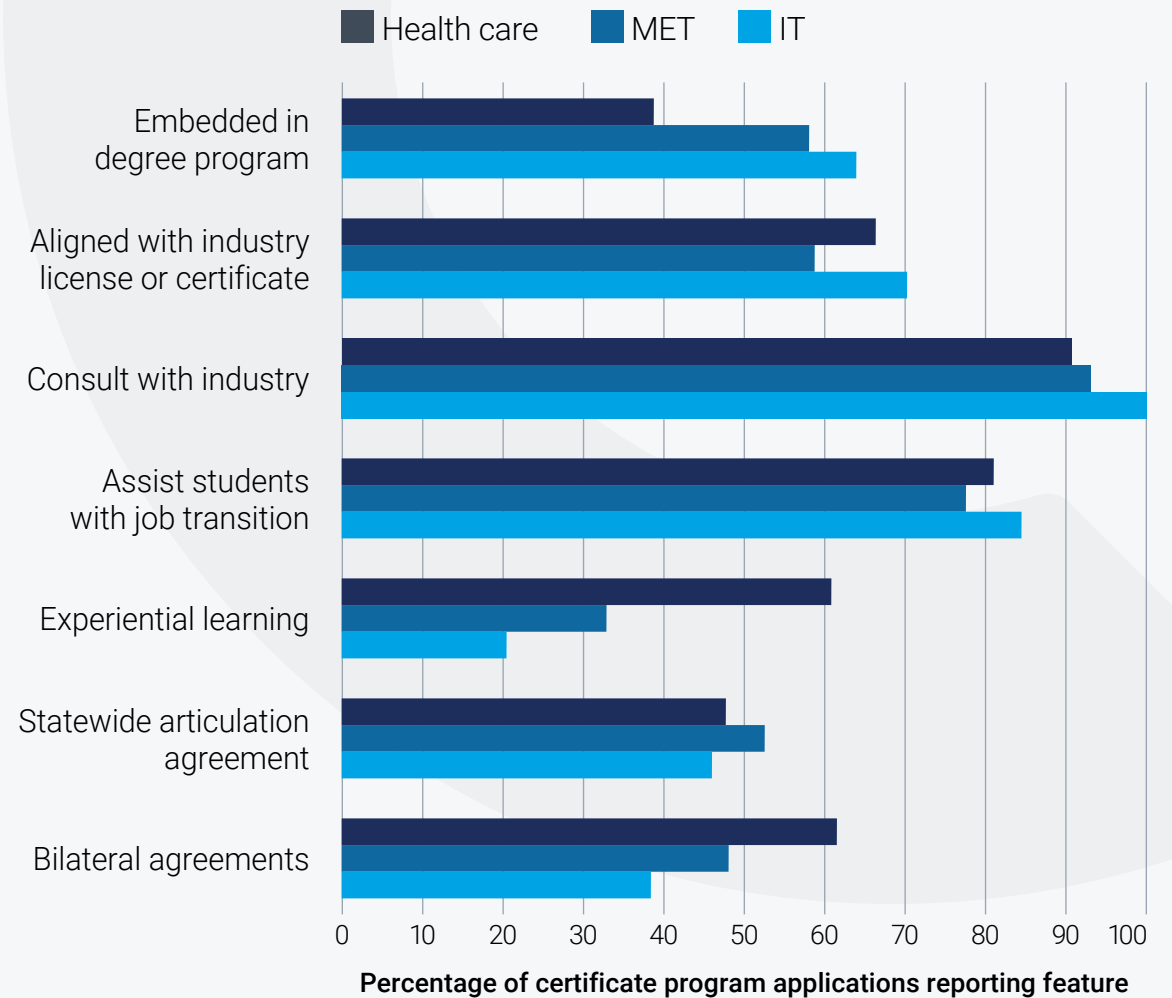
Often referred to as stackable microcredentials, this method provides shorter and more highly focused programs that enable learners to gain and validate knowledge and skills in a faster time frame. A microcredential can be used to gain expertise in a specific area, or a learner can build up (“stack”) a series of microcredentials as a pathway to a larger certification, degree or career opportunity. Stackable microcredentials are also an effective pathway for lifelong learning. Enterprises use them to fill skills gaps, identify qualified candidates and increase staff morale. Individuals, whether new to the workforce, recently graduated, changing careers, or going back to work after an extended break, are using them to gain skills at their pace in high-demand fields.



These credentials have encouraged institutions to be intentional with how they build their program pathways and expand their academic portfolios. These shorter-term credential pathways allow individuals the opportunity to progress from one credential type to the next within the same institution, continuously building upon the skills or knowledge topic. Findings from several state studies have shown that 32% to 43% of non-degree certificate earners are re-enrolling in college and stacking credentials. Among those who participate in stacking credentials, most also went on to earn a degree.⁵

In 2021, RAND Corporation conducted a study of the Ohio workforce and examined statewide educational records, focusing on stackable credentials. The goal was to evaluate how stackable credentials can make postsecondary education and training more accessible to individuals who didn't want traditional college degree programs. The study found that Ohio experienced strong growth in short-term credential programs over the last 15 years, particularly in the healthcare (146%) and manufacturing and engineering technology (171%) fields. In addition, these certificate programs reported more stackable features over time, with more than half being new manufacturing and engineering technology (MET) and IT certificate programs.⁶

FIGURE 2. Programs Offered Stackable Features



Source: RAND Corporation

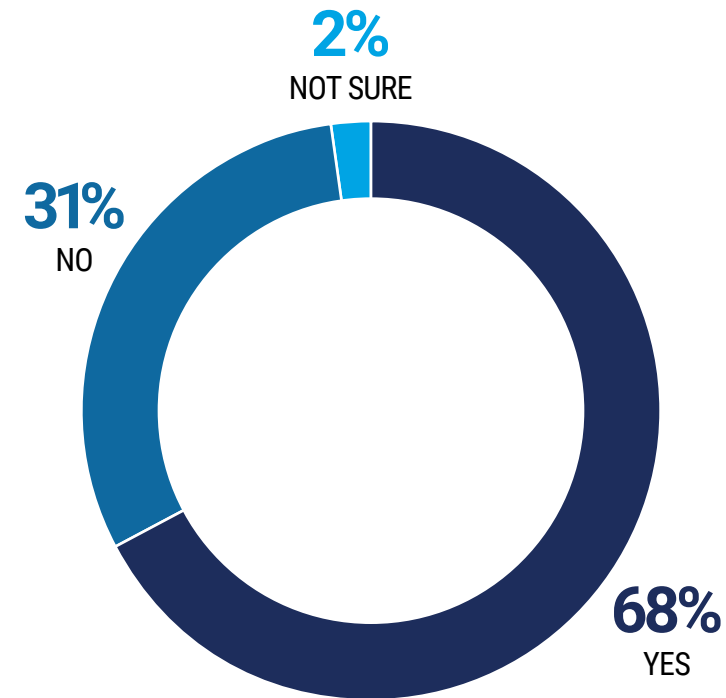
COLLABORATION WITH ACADEMIA

Generational changes, an evolving economy and shifts in the global marketplace have dramatically increased the demand for flexibility in how to approach education, skills-building and career advancement. To fill these needs and gain the benefits of microproductivity in a time- and cost-efficient manner, academic institutions can partner with an established provider of quality certificates and certifications such as ISACA, a professional association in IT audit, risk, security, privacy and governance that has for 50+ years equipped individuals and enterprises with the knowledge, credentials, education, training and community to progress their careers, transform their organizations and build a more trusted and ethical digital world.

Over the last decade, companies and universities have increasingly entered research deals that offer invaluable benefits to both the employers and institutions, such as early-stage research and recruitment, content development and corporate sponsorships.⁷ Tech giants that originated on the West Coast have established East Coast headquarters over the years. Facebook, Twitter and Amazon have all opened new HQs and R&D offices across the institution-heavy East Coast. These partnerships highlight the importance of direct employer collaboration to produce successful long-term relationships and opportunities for four-year colleges and universities.

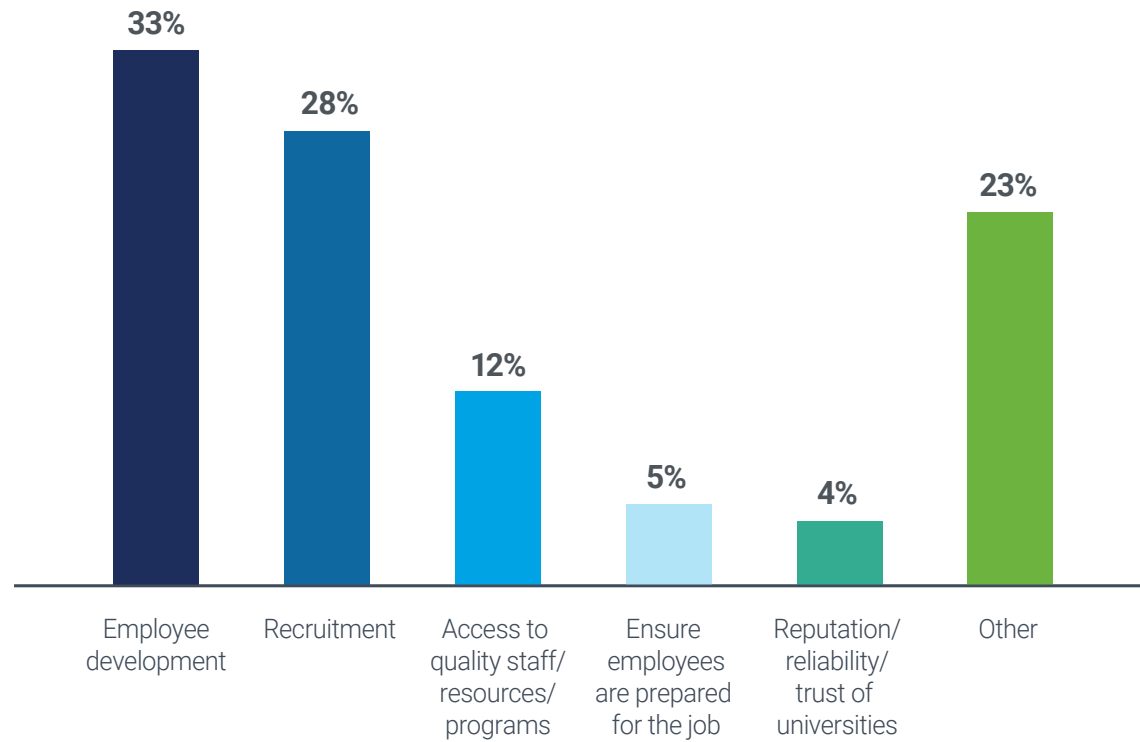
In its 2023 study of employers, UPCEA partnered with Collegis Education to conduct a survey to better understand how they perceive external partnerships with higher education institutions and associations.⁸ Overall, the number of respondents whose companies have existing external partnerships with organizations or institutions increased from 54% in 2022 to 68% in 2023.⁹

FIGURE 3. Do you have any existing external partnerships or relationships with organizations or institutions that provide training or professional development opportunities to your employees? (n=516)



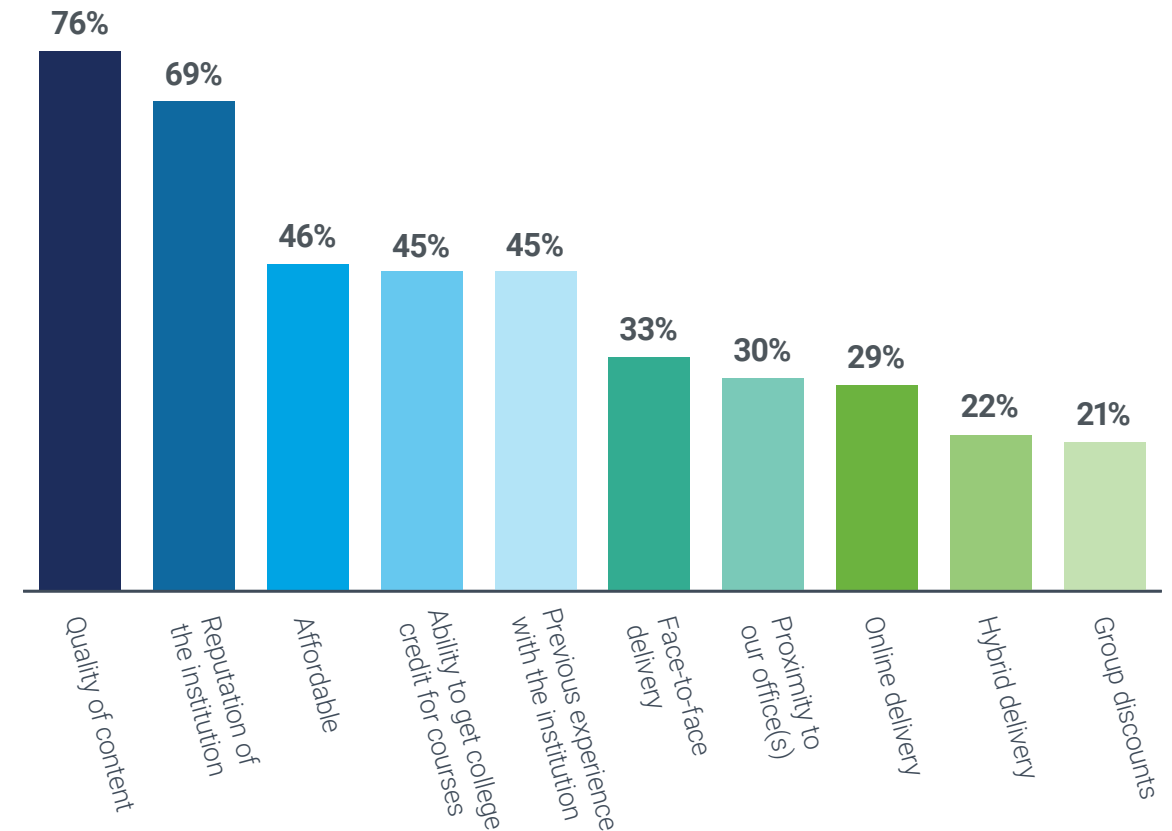
Of respondents from companies that partner with four-year colleges or universities, 33% said the main reason is for employee development, 28% said recruitment and 12% cited access to quality staff/resources/programs. Responses mentioned fewer than four times were placed in the “Other” category and included student rotations, cost effectiveness, and to help the community and educate students, among others. (Multiple responses were allowed).

FIGURE 4. What is the main reason your company chooses to have partnerships or relationships with four-year colleges or universities to provide training or professional development opportunities for your employees? (n=137)



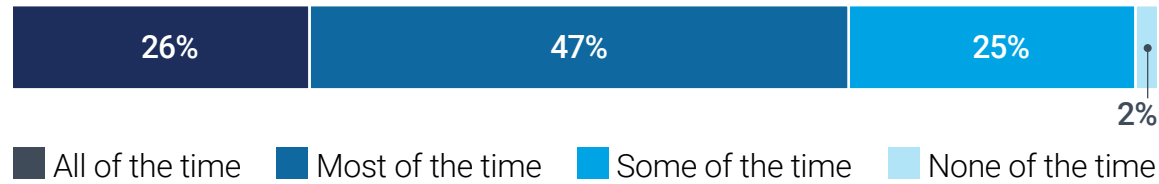
When participants were given a list of reasons for companies to partner with a college or university, 76% said the quality of content, 69% the reputation of the institution, 46% affordability, 45% the ability to get college credit for courses and 45% having previous experience with the institution. (Multiple responses were allowed).

FIGURE 5. Which of the following are reasons your company chooses to have partnerships or relationships with four-year colleges or universities to provide training or professional development opportunities for your employees? Please select all that apply (n=137)



Seventy-three percent of respondents said their partner colleges or universities create custom programming for their organizations, either most of the time (47%) or all the time (26%), while 25% said custom programming is created some of the time.

FIGURE 6. How often do partner four-year colleges or universities create custom programming for your organization? (n=137)



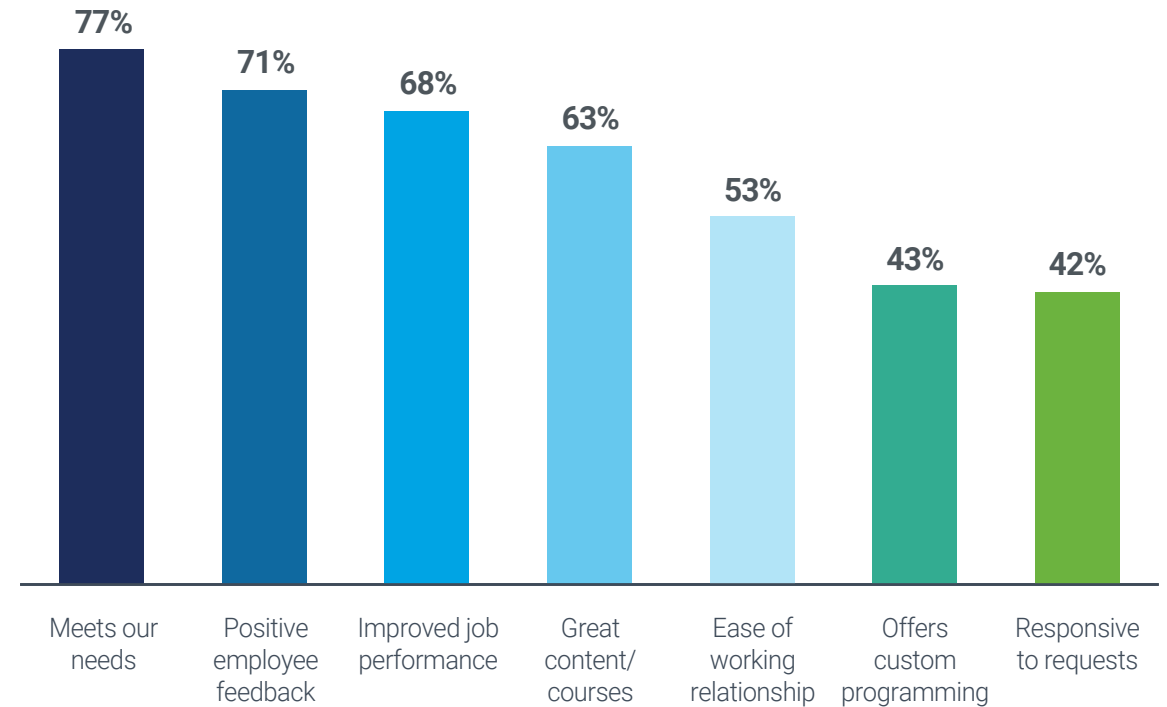
Representatives from organizations that partner with colleges and universities strongly agree (58%) or agree (40%) that for the foreseeable future, they plan to continue to do so to provide training or professional development opportunities for employees.

FIGURE 7. Please rate how strongly you agree or disagree with the following statement: For the foreseeable future, my organization plans to continue to partner with four-year colleges and universities to provide training or professional development opportunities for our employees (n=137)



When asked why their organizations would want to continue partnerships with colleges and universities, 77% of respondents said these institutions meet their needs, 71% said they have positive employee feedback and 68% said they have seen improved job performance.

FIGURE 8. Which of the following reasons detail why your organization would want to continue partnerships with four-year colleges and universities? Please select all that apply (n=137)



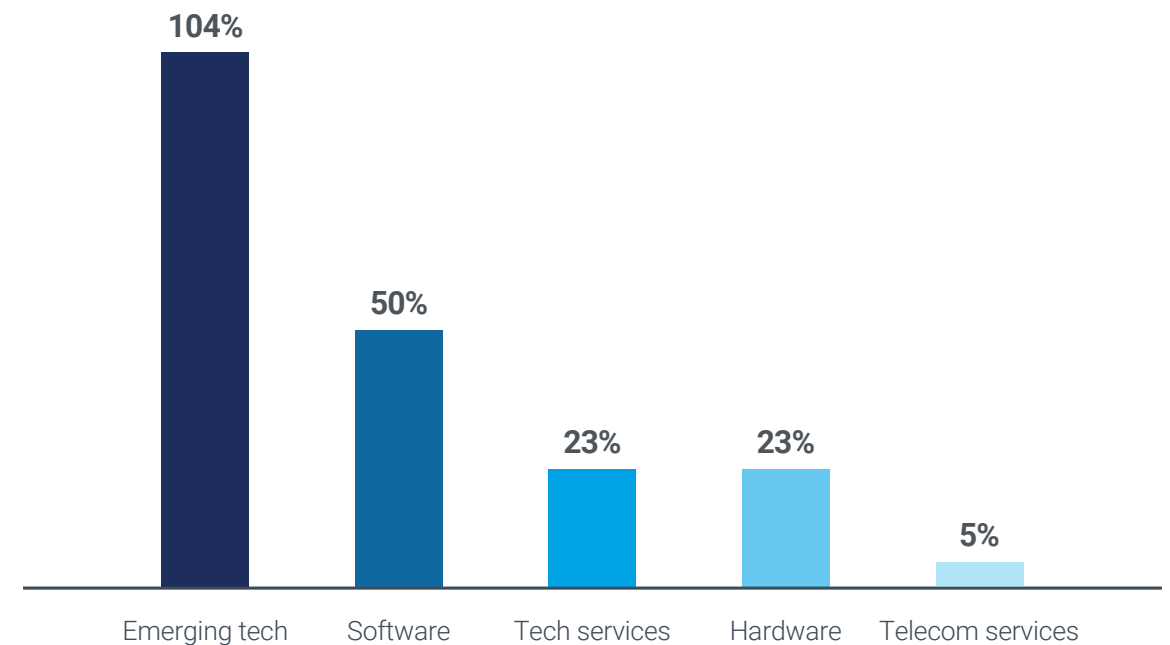
Based on these findings, employers find value in partnerships with colleges and universities to develop professional development programming. By collaborating on the creation of stackable pathways, institutions can develop partnership programs to create stackable credentials in various subject areas and will have the unique ability to cater their certificates and courses toward skills that can be directly applicable to in-demand occupations.



ISACA Credentials Provide Value in the IT Industry

Stackable credentials can provide value to individuals employed in all types of careers, and those working in the IT industry are no exception. New technological innovations are changing the way in which business is conducted. As a result, the IT industry is growing at an expected compound annual growth rate of 8.4% from 2022 to 2023.¹⁰ Emerging technology companies are expected to grow at a rate of 104% worldwide, followed by software companies at 50%.¹¹

FIGURE 9. IT Industry Growth Rate Forecast Worldwide by Segment (2018–2023)



Source: Statista, 2023¹²



With the dominance of the IT industry and the necessity of technical skills, companies are encouraging their employees to develop the skills necessary to continue to innovate upon the technological advances that are fueling this market growth. Much of this adult learning can be found in internal workshops, professional development partnerships and professionals returning to school. Recent data indicates this to be the case; a study conducted by Pluralsight, a technology workforce development company, found that 72% of tech leaders plan to increase their investment in tech skills development despite economic uncertainty.¹³ This focus is not only being adopted by employers but also by employees. Another study by the same company found that 48% of tech workers consider changing jobs due to lack of upskilling resources.¹⁴ These studies suggest that upskilling is being heavily sought after for long-term success within the IT industry. Stackable credentials are the optimal way to upskill, and ISACA offers many programs that teach core competencies specifically relevant to IT.

For example, learners looking to move into IT may want to start their stackable journey with ISACA's Cybersecurity Fundamentals certificate, which was developed for students, recent graduates, individuals or teams looking to upskill and rising IT professionals. The certificate combines knowledge and practical, hands-on learning, enabling candidates to demonstrate their understanding of the principles that frame and define cybersecurity, and the integral role of cybersecurity professionals in protecting enterprise data. Instructors are industry-certified current practitioners who share proven techniques and expertise. Learners may continue with specialty certificates in areas such as artificial intelligence (AI), blockchain, cloud and other areas. After gaining this knowledge and combining it with work experience, they may decide to progress to earning in-demand certifications such as Certified Information Systems Auditor® (CISA®), Certified Information Security Manager® (CISM®) or Certified in Risk and Information Systems Control® (CRISC®).



**Certified Information
Systems Auditor®**
An ISACA® Certification



**Certified Information
Security Manager®**
An ISACA® Certification



**Certified in Risk
and Information
Systems Control®**
An ISACA® Certification

In addition to this linear growth, learners may choose different pathways during different phases of their careers. At some point they may want to take advantage of their knowledge and move to a related area that requires additional specialized knowledge. For example, a cybersecurity professional may want to move into compliance, or IT audit, or move into or out of the GRC space before trying more technical roles. ISACA's stackable credentials help those people move into the new area with a globally recognized program to expand and validate their skills. Throughout the journey, these professionals gain solid insights into many areas that will help increase their options for promotions or career changes.

Stackable certificates are also vital to staying ahead of the lightning-fast tempo of technology. Cloud computing, for example, has expanded over just a few years to focus on hyperscale cloud, and professionals now need to know how to bring multiple cloud providers together at scale. They also need to know how to audit these new structures and ensure their organization has optimal risk and governance postures. Keeping up with this pace requires a strong partnership among learning institutions, student learners and professional associations.

ISACA Information Technology Certified Associate™ (ITCA™) Program

ISACA's ITCA program provides training across five domains, including fundamentals of computing, cybersecurity, data science, networks and infrastructure and software development.¹⁵ As with the Cybersecurity Fundamentals Certificate, groups that would benefit from ITCA are students and recent graduates, teams and individuals looking to upskill and rising IT professionals.¹⁶ Specifically, recent graduates and newcomers in IT disciplines can benefit from acquiring new skills that elevate their chances among other candidates for the same positions.

In recent years, careers in data science, which align with components of the ITCA credential, have experienced significant growth in demand. Median salaries for the profession have risen from US\$152,500 in 2019 to US\$164,500 in 2020, an increase of nearly 8%.¹⁷ Employers are willing to pay large salaries to students who come equipped with the necessary skills to utilize massive corporate data sets in new ways and emerging

technologies such as cloud computing, AI and machine learning.¹⁸ Recent research has shown that online job posting demand for ITCA-related skills has steadily grown at 10% on average, year-over-year since 2015, and in 2022, 12 million ITCA-skills related jobs were posted.¹⁹



Due to the higher salaries, more students are most likely pursuing degrees for this career path. For instance, according to Data USA, 59,565 degrees in Computer Science were awarded in 2021, a figure that grew by 10.9% over the previous year.²⁰ As more students pursue careers in data science,

the job market may become more competitive. Students will need to find ways to differentiate themselves from other candidates, and upskilling through the ITCA program is one way to do this. By passing each of the five certificate exams and then earning the certification, students can highlight their skills with greater confidence to employers, which should increase their chances of entering the IT field.



ISACA Certified in Emerging Technology™ (CET™) Program

Another program offered by ISACA is CET, which provides training across four domains, including fundamentals in Cloud, IoT, Blockchain and AI. As with the ITCA program, the groups that would benefit are students and recent graduates, teams and individuals looking to upskill and rising IT professionals.²¹ According to a specialized analysis by Lightcast, students with CET-related skills can expect a US\$2,000-US\$7,300 higher salary when being recruited for a job, depending on relevant factors. Additionally, demand for CET-related skills was projected to grow 11–12% over the next five years, with 5 million CET-skill-related job postings in 2022.²²

Rising IT professionals could see the most benefit since CET can equip them with the competencies to utilize emerging technologies to elevate the success of their roles. Several emerging technologies are growing in importance across

careers in IT. For example, AI has experienced tremendous growth in recent years. According to a report by McKinsey, by 2030, up to 800 million jobs could be displaced by automation and AI technologies, highlighting the potential prevalence of AI technologies in the corporate world.²³ To keep up with this trend, 53% of organizations surveyed by Deloitte actively invest in reskilling programs to help their workforce adapt to the changing job market.²⁴ Employees who want to remain competitive in this industry must consider how to keep up and even exceed the skills development of their peers, especially employees

who are not receiving upskilling in AI or any emerging technologies from their employer. CET provides high-quality training in a wide breadth of technologies that will give rising IT professionals the ability to demonstrate their value to their employer and to advance within the company.



**Certified in
Emerging
Technology**
An ISACA® Certification

Measuring the Opportunity for Stackable Credentials Across Industries

While ISACA specializes in the IT and digital trust space, organizations and individuals in many industries and sectors also benefit from Stackable Certificates. Technology organizations are leading the way, but other professions are involved in innovative initiatives, too. One of these industries is manufacturing, evidenced by the change in educational trends among manufacturing employees. Before 2005, workers with a high school diploma or less held the largest number of good jobs in manufacturing.²⁵ However, from 1991 to 2016, the number of employees with bachelor's degrees increased from 2.8 to 3.6 million.²⁶ These figures indicate that the desire for education within the manufacturing industry has increased significantly. Additional evidence for this underlying theme can be seen in new research in England that reveals that in 2022, 80% of workers in the manufacturing and utilities industry are interested in learning new work skills.²⁷ The top areas workers wanted to explore included IT and digital (20%), finance (16%) and business (16%).²⁸

In the same way that new technologies are proliferating throughout the corporate world of

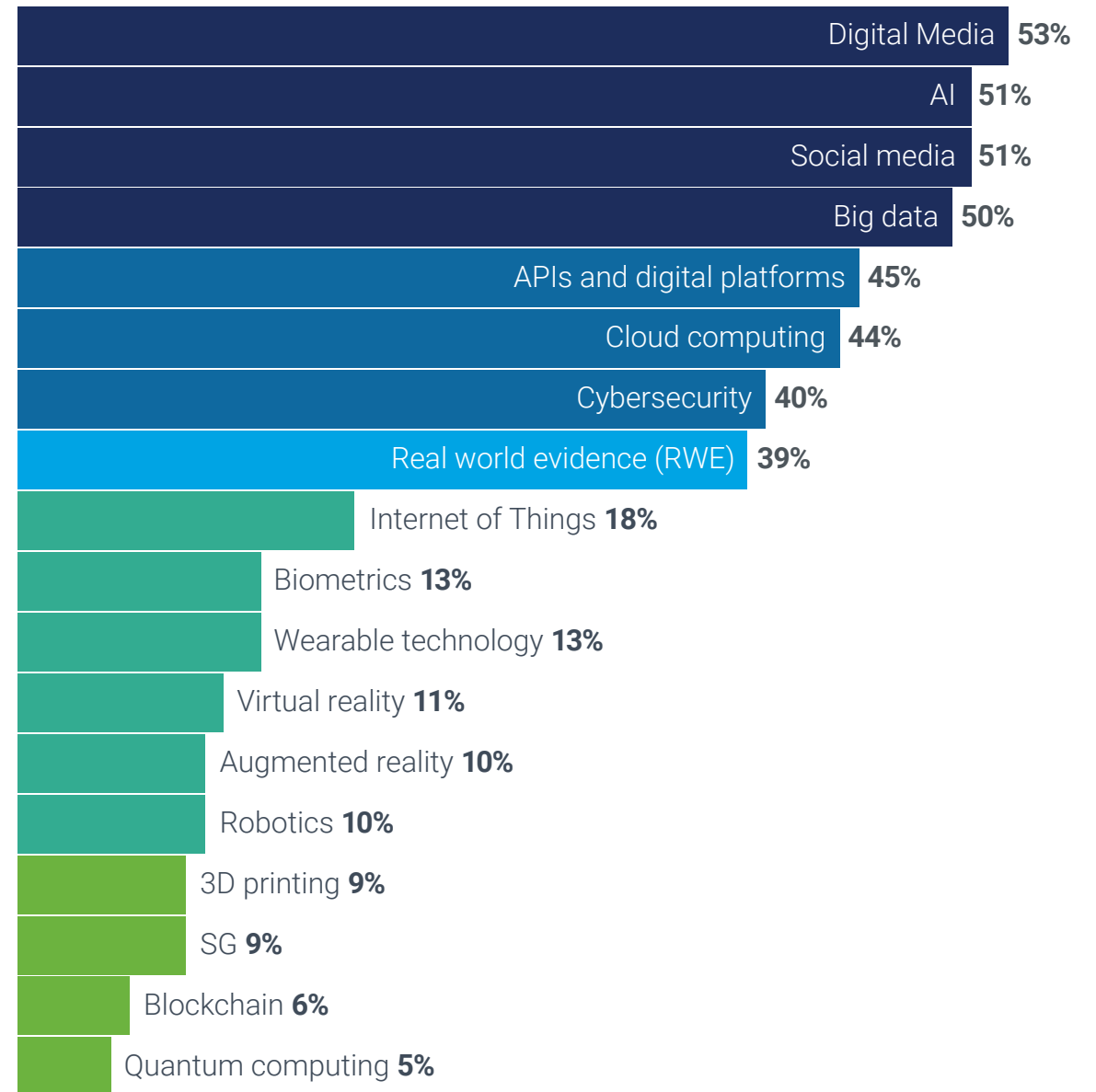


IT, new technology is spreading throughout the manufacturing industry, creating opportunities to develop more efficient processes that make employees who have the skills to utilize those processes more valuable. There are numerous options to develop the skills to capitalize on this trend, and stackable credentials provide one of the best strategies. One set of opportunities for upskilling is offered by Smart Automation Certification Alliance (SACA). SACA offers four certifications designed for workers or students in high school or college, which cover competencies including basic operations, advanced operations, robot system operations and networking and data analytics.²⁹ Obtaining certifications like these will enable students to be prepared to enter a rapidly evolving workforce and achieve success quickly.

In addition to the manufacturing industry, the healthcare industry also has opportunities for upskilling through stackable credentials, particularly within digital technologies. In a study conducted by Healthcare and Information and Management Systems Society (HIMSS®), 80% of health systems plan to increase their investment in digital tools over the next five years.³⁰ This figure is related, in part, to the increased urgency brought on by the COVID-19 pandemic to offer virtual healthcare services, since the supply of doctors and nurses was significantly less than the demand. According to a survey conducted by Local Circles during the first wave of COVID in India, only 4% of patients who needed an ICU bed were able to find one, while 78% used connections in the hospital to secure a bed.³¹ This disparity highlights the need for hospitals to have the ability to deal with a sudden surge of demand for healthcare by offering digital services for care not requiring in-person interaction.

The technologies that stand to be at the forefront of this digital revolution in healthcare include virtual consultations, wearable technology that assists with

FIGURE 10. Technologies Pharma is Prioritizing for Current Investments

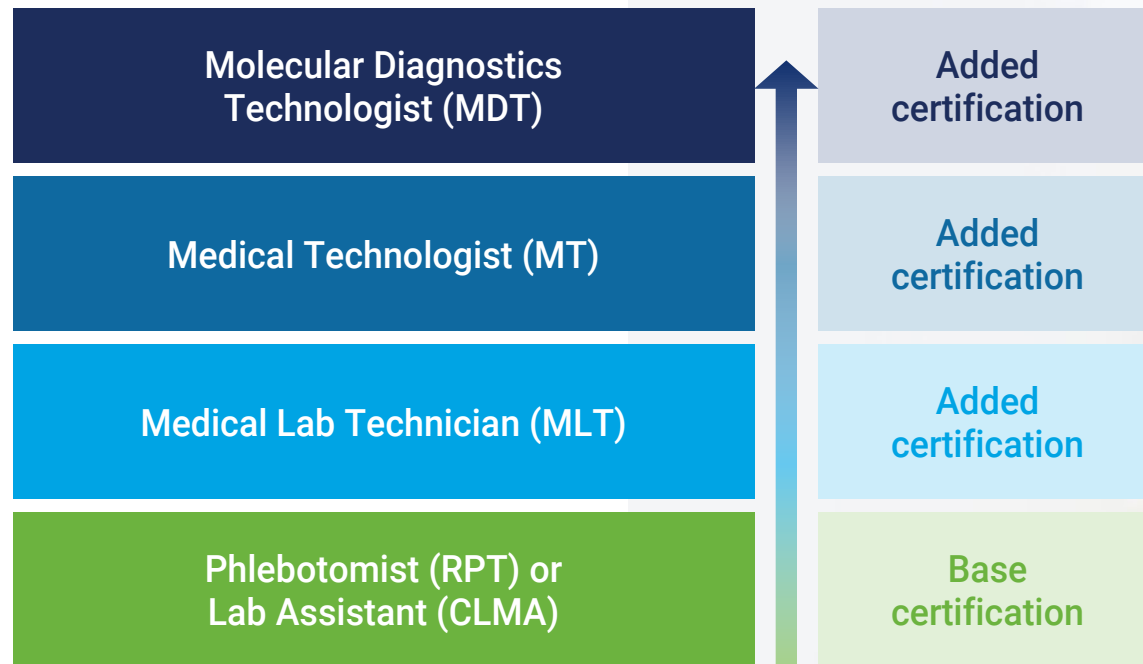


monitoring vital signs continuously and artificial intelligence, among others.³² In a survey of pharmaceutical companies, the most cited emerging technologies in which they invested were digital media (53%), AI (51%), social media (51%) and big data (50%).³³ The skills that are important for upskilling in the information technology industry are also important in the healthcare industry, and upskilling can be obtained through stackable credentials to equip employees with the ability to utilize these new technologies.

FIGURE 11. Vertical Stacking Example for a Registered Phlebotomy Technician (RPT)

Vertical stacking

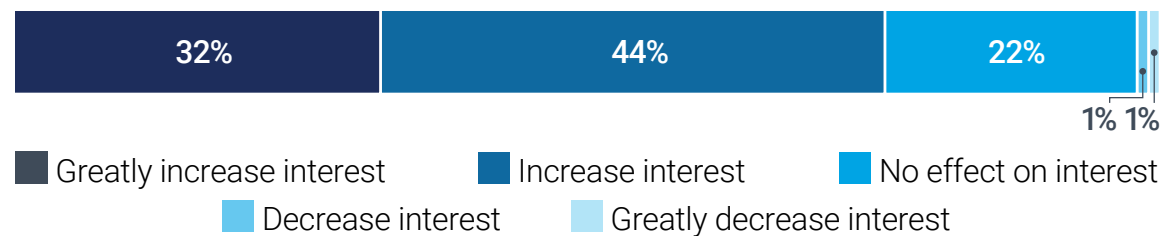
Advance up the career ladder



One method of obtaining relevant skills is by working through the Digital Health Specialization certificate offered by Coursera®. This set of courses introduces learners to the role and application of digital health technologies, such as mobile applications, wearable technologies, health information systems and telehealth.³⁴ This type of certificate can enable healthcare workers to maintain relevancy within the industry.

Regardless of industry, stackable credential programs can be a great bridge between academic programs and the industry-intensive certification programs for mid- and senior-level professionals. Students who want to advance in their careers may not be able to go back to school full time or may even struggle to learn at the same pace as students at traditional institutions. A 2023 disengaged learners study conducted by UPCEA and StraighterLine showed that if an institution offers alternative or microcredentials that are stackable, over three-quarters (76%) of respondents said that this would greatly increase or increase their interest in pursuing an undergraduate degree.³⁵

FIGURE 12. Stackable Microcredentials Impact on Interest in Pursuing Undergraduate Degree (n=1,074)



For these reasons, stackable credentials offer opportunities for upskilling in relevant areas that allow employees to advance in their careers. Research conducted by RAND Corporation found that learners saw average wage gains of 16% after completing certificates and that those who stacked credentials saw more than twice that increase.³⁶ While employees could boost their wages with stackable credentials, they could also continue to advance into higher positions within the company at a faster rate.

Businesses are looking to hire workers with relevant skill sets and postsecondary credentials that can assist in identifying qualified workers, upskilling their current workforce and helping them better compete in the marketplace. For job seekers, obtaining credentials can improve their employability by documenting the skills and competencies they bring to an employer, and can lead to higher earnings, greater advancement opportunities and enhanced job security. Stackable certificates and other microcredentials can provide individuals the opportunity to not only make a difference in their salary, but also in the trajectory of their career path.

By acquiring stackable credentials, employees can build upon their skills to advance up the corporate ladder. The advantages can apply to a wide audience while also offering the flexibility to imbed credentials into institutions' existing program portfolios.

Conclusion

Stackable credentials can provide institutions with the means to create more accessible and wide-ranging content for a variety of learners. These certificates allow institutions to help their current students develop additional skills imbedded in their existing programs while also attracting new student professionals looking to adopt new skills. Many individuals are no longer interested in expensive and time-consuming traditional four-year programs and are turning toward stackable credentials to open up employment opportunities.

Institutions have the ability to connect students directly with employer needs. Companies have the ability to collaborate with higher education institutions to deliver and develop the content most on target with workforce needs. When asked why employers partner with institutions, 33% said the main reason was employee development, with added benefits of recruitment and access to quality resources.³⁷ While other organizations and companies can offer certifications, it is the unique ability to stack credentials toward larger offerings that creates an unparalleled value equation that cannot be replicated outside of higher education. While many organizations recognize and aspire to a stackable model, some simply don't know where or how to begin.

ISACA can help institutions provide value particularly in the digital age. Research found that employers are willing to pay higher salaries for students who have credentials in emerging technologies. Data scientists' median salaries rose nearly 8% from 2019 to 2020.³⁸ ISACA offers two programs, ITCA and the CET, which provide credentialing in high-demand domains. ITCA covers computing and data science fundamentals, which can help students and professionals learn to upskill in the IT department, while CET dives into the world of emerging technologies, such as artificial intelligence and the cloud. With these existing programs, institutions can derive immediate value to deliver the skills and benefits of stackable credentials directly to their students and in their program portfolios. While ISACA specializes in the IT and digital trust space, organizations and individuals in many industries and sectors also benefit from Stackable Certificates, such as manufacturing and healthcare, among others.

Certificate programs and microcredentials that work in unison with existing institution portfolios are the future of professional development and upskilling in higher education. With the cost- effectiveness and stackable nature of these credentials, students and professionals may find the appeal to be greater than a traditional higher ed degree. Stackable credentials will be the way to advance the skills of the workforce by leveraging both the resources of institutions and the expertise of the employer.



FOOTNOTES

- ¹ <https://www.insidehighered.com/news/2023/04/03/majority-americans-lack-confidence-value-four-year-degree>
- ² <https://www.wsj.com/articles/americans-are-losing-faith-in-college-education-wsj-norc-poll-finds-3a836ce1>
- ³ <https://www.govtech.com/education/higher-ed/universities-software-giants-partner-on-tech-upskilling>
- ⁴ <https://www.highereddive.com/news/credential-stacking-drove-11-increase-in-undergraduate-degrees-earned-las/625912/>
- ⁵ <https://www.rand.org/blog/2023/08/stacking-certificates-and-degrees.html#:~:text=Stackable%20credential%20pathways%20allow%20individuals,as%20well%20as%20course%E2%80%94requirements>
- ⁶ https://www.rand.org/pubs/research_briefs/RBA207-1.html
- ⁷ <https://hbr.org/2018/01/why-companies-and-universities-should-forge-long-term-collaborations>
- ⁸ UPCEA & Collegis 2023 “Addressing Employer Barriers to Engage with Institutions”
- ⁹ <https://collegiseducation.com/resources/effect-of-employer-understanding-and-engagement-non-degree-credentials/>
- ¹⁰ <https://www.globenewswire.com/news-release/2023/05/11/2667047/0/en/The-Information-Technology-Industry-is-Expected-to-Growth-at-a-Rate-of-More-Than-8-During-The-Forecast-Period-2022-2032-By-The-Global-Market-Model.html>
- ¹¹ <https://www.statista.com/statistics/967095/worldwide-it-industry-growth-rate-forecast-segment/>
- ¹² Ibid
- ¹³ <https://www.prnewswire.com/news-releases/pluralsight-study-finds-72-of-tech-leaders-plan-to-increase-their-investment-in-tech-skills-development-despite-economic-uncertainty-301775542.html>
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- ¹⁵ <https://www.isaca.org/credentialing/itca>
- ¹⁶ Ibid
- ¹⁷ <https://fortune.com/education/articles/a-hot-market-for-data-scientists-means-starting-salaries-of-125k-and-up-this-year/>
- ¹⁸ Ibid
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