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HIGHER EDUCATION AND INDUSTRY COLLABORATIONS

A PRIMER

IN SUPPORT OF THE USAID HIGHER EDUCATION LEARNING AGENDA

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PREPARED BY

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COVER PHOTO

USAID El Salvador—Flickr Account Education Album

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1. BACKGROUND

This document supports USAID's Higher Education (HE) Learning Agenda and the goals of USAID's HE Program Framework.[1] Shown in part in Figure 1, USAID's HE Program Framework captures the tripartite mission of higher education systems and is further described in the introduction below. The document provides an overview of the existing scholarship to strengthen evidence-based activity implementation to assist USAID Missions, implementing partners, and other practitioners in better supporting higher education programming in collaboration with the private sector.

From the ten learning questions of the HE Learning Agenda, **this primer captures key considerations for question 7:**

"How can HEIs collaborate more effectively with the private sector to enhance the relevance and quality of teaching and learning, and research and innovation?"

Figure 1: USAID Higher Education (HE) Program Framework

TABLE 1. USAID Higher Education Learning Agenda Questions

NO.	QUESTION
1.	How can higher education systems and institutions become more strategic in planning, implementing, and monitoring core activities (e.g., enrollment, academic programs, research, and outreach)?
2.	How can financing of higher education systems and institutions become more sustainable?
3.	How can the viability and effectiveness of online and other forms of distance education be improved?
4.	How can skills or competencies (e.g., technical and soft skills) for employability best be identified, analyzed, and incorporated into curricula, teaching, and learning?
5.	How can the practice and culture of teaching become more learner-centered?
6.	How can higher education systems and higher education institutions (HEIs) play a more active role in developing and strengthening national and regional innovation ecosystems?
7.	How can HEIs collaborate more effectively with the private sector to enhance the relevance and quality of teaching and learning, and research and innovation?
8.	How can USAID best partner with HEIs to make use of local knowledge and expertise?
9.	How can higher education access, retention, and completion rates be improved for underrepresented populations (e.g., women, indigenous and marginalized populations, and people with disabilities)?
10.	What institutional and behavioral changes are needed to improve gender awareness and gender equity?

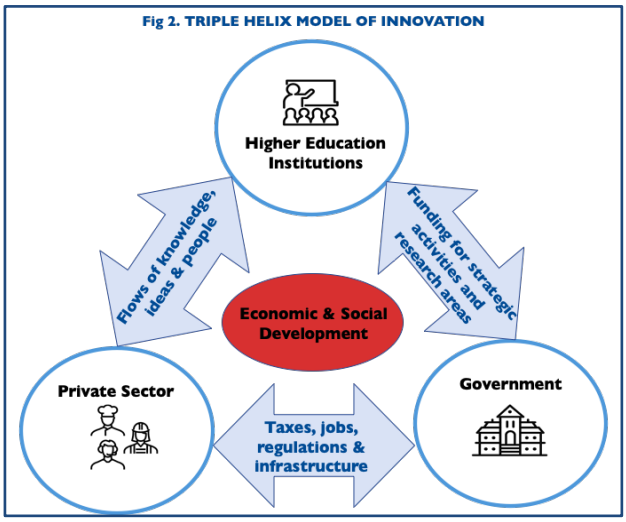
[1] USAID Office of Education. "Higher Education as a Central Actor in Self-Reliant Development: A Program Framework," October 2020. https://www.edu-links.org/sites/default/files/media/file/Higher%20Education%20Framework_Oct%202020.pdf.

2. INTRODUCTION

Historically, higher education systems have held three overlapping, central missions: teaching, research, and outreach—the latter of these involves connecting higher education activities to the development and betterment of society and the economy.[2] As higher education institutions (HEIs) have come under pressure to demonstrate their relevance to the economic development of their countries,[3] attention has grown around collaborations between HEIs and industry. Existing higher education-industry collaborations (HEICs) take various forms, including, but not limited to: co-developing curricula aligned to market needs, innovating through joint research, and preparing graduates for employment through workplace-based learning opportunities, which benefit HEIs, the private sector, governments, and society.[4] Still, many HEIs struggle to engage due to a lack of internal capacity, public funding, or understanding of how to structure HEICs for mutual benefit.[5]

3. THE RATIONALE FOR HIGHER EDUCATION-INDUSTRY COLLABORATIONS

HEICs can be bi-directional (HEIs and industry), tri-directional (HEIs, industry, and public sector partners), or multi-stakeholder (HEIs, industry, the public sector, and other partners). Regardless of the design, HEICs should "enable the diffusion of creativity, ideas, skills, and people with the aim of creating mutual value over time. "



There are two main theories that highlight the importance of HEICs as critical inputs to a country's development. The first is the **triple helix model,** which argues that increased interactions with HEIs, the private sector, and the government lead to the rise of hybrid institutions, like science parks and technology transfer offices, that fosters economic and social development. The second is the **national innovation system approach** (NIS), which posits that HEICs are central to a country's

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[2] Ssebuwufu, John, Teralynn Ludwick, and Margaux Béland. "Strengthening University-Industry Linkages in Africa." Ghana: Association of African Universities (AAU), 2012. http://www.heart-resources.org/wp-content/uploads/2015/09/strengthening-university-industry-linkages-in-africa-report-2012.pdf?x30250.

[3] Nsanzumuhire, Silas, and Wim Groot. "Context Perspective on University-Industry Collaboration Processes: A Systematic Review of Literature." *Journal of Cleaner Production*. 2020. https://doi.org/10.1016/j.jclepro.2020.120861.

[4] World Economic Forum, The World Bank, and The African Development Bank. "The African Competitiveness Report 2011." Geneva: World Economic Forum, 2011. https://www.weforum.org/reports/africa-competitiveness-report-2011.

[5] Zanello, Giacomo, Xiaolan Fu, Pierre Mohnen, and Marc Ventresca. "The Creation and Diffusion of Innovation in Developing Countries: A Systematic Literature Review." *Journal of Economic Surveys,* 30, no. 5 (2015): 884-912. https://doi.org/10.1111/joes.12126.

[6] Plewa, Carolin, and Pascale G. Quester. "Key Drivers of University-Industry Relationships: The Role of Organisational Compatibility and Personal Experience." *Journal of Services Marketing,* 21, no. 5 (2007): 370-382. 10.1108/08876040710773679.

[7] Leydesdorff, Loet, and Henry Etzkowitz. "The Dynamics of Innovation: From National Systems and "Mode 2" to a Triple Helix of University—Industry—Government Relations." *Research Policy*, 29, no. 2 (2000):109-123. https://doi.org/10.1016/S0048-7333(99)00055-4.

innovation system because they drive knowledge production and flows of technology and information between businesses, HEIs, and public research institutes.[8] Across both theories, HEICs secure resources for higher education, promote innovation through research and development (R&D), and ensure that graduates have the skills required to contribute to the workforce.[9]

4. COMMON BENEFITS OF SUCCESSFUL HEICS

HEICs provide a variety of economic, institutional, and social benefits at the HEI, industry partner, and country level.[10] A comprehensive list of benefits to both HEIs and industry is presented below. Some of the most important of these include the following:

1. **HEICs can bridge the gap between graduates' skills and employers' needs to reduce youth unemployment.** By consulting the private sector in designing curricula, HEIs and training institutes can develop programs that are responsive to employers' needs and priority hiring skills.[11] These efforts are particularly important in countries like Nigeria, where demand for jobs outpaces job opportunities, and four in ten people under 35 years old are unemployed.[12]
2. **HEICs can foster innovation in emerging industries by supporting high-technology activities.** In countries like Brazil, which has achieved technological competence in certain sectors but is lagging behind in others, policy makers have pursued HEICs to accelerate the "catching up" process by supporting the development of scientific research and innovative capabilities with national firms.[13]
3. **HEICs can help institutions with funding constraints access alternative funding.** HEICs can lead to funding through commissioned research, investments in laboratories and equipment, student scholarships, and funding for graduate research. Funding may vary depending on the HEI's research capability, location, and

> "Preparing the students for the final exam, in our case the State-recognized diploma for higher technicians, will make them anything but employable—its curriculum hasn't been reviewed since 1960."
>
> Former director of a TVET in Ivory Coast (Busson, 2020)

[8] Organisation for Economic Co-Operation and Development (OECD). "National Innovation Systems." 1997. https://www.oecd.org/science/inno/2101733.pdf.
[9] Ssebuwufu, John, Teralynn Ludwick, and Margaux Béland. "Strengthening University-Industry Linkages in Africa." Ghana: Association of African Universities (AAU), 2012. http://www.heart-resources.org/wp-content/uploads/2015/09/strengthening-university-industry-linkages-in-africa-report-2012.pdf?x30250
[10] AL-Tabbaa, Omar, and Samuel Ankrah. "Universities—Industry Collaboration: A Systematic Review." *Scandinavian Journal of Management*, 31, no. 3 (2015): 387-408. http://dx.doi.org/10.1016/j.scaman.2015.02.003.
[11] Mastercard Foundation. "Harnessing the Potential of Hospitality and Tourism for Young People's Employment, 2018. https://mastercardfdn.org/wp-content/uploads/2018/08/MCF14003-Youth-Think-Tank-2018-Report-vFA-AODA.pdf.
[12] Busson, Svenia. "Skills Development and Youth Employability In West Africa." Association for the Development of Education in Africa, 2020, http://www.adeanet.org/en/knowledge-and-resources/skills-development-youth-employability-west-africa-senegal-ghana-ivory-coast.
[13] Freitas, Isabel Maria Bodas, Rosane Argou Marques, and Evando Mirra de Paula e Silva. "University–Industry Collaboration and Innovation in Emergent and Mature Industries in New Industrialized Countries," *Research Policy*, 42, no. 2 (2013): 443-453. http://dx.doi.org/10.1016/j.respol.2012.06.006.

academic expertise. HEICs should be mutually beneficial; funding alone should not be a motivator for HEIs to enter an agreement.[14]

4. **HEICs can help private sector partners enhance productivity and competitiveness.** Evidence has shown that businesses that collaborate with HEIs are more competitive when compared to businesses that lack collaborative relationships.[15]
5. **HEICs can enhance outdated teaching materials developed to meet national standards, not market needs.** In many countries, educators follow strict government-imposed curricula to prepare students for national exams required to receive a certification or a diploma. HEICs can infuse curricula, even if informally, with timely and relevant learning opportunities, including real-world case studies from professionals in industry.[16]

TABLE 2. Benefits of Higher Education-Industry Collaborations

	TO HIGHER EDUCATION INSTITUTIONS	TO INDUSTRY
Economic	• Potential source of revenue (public & private) • Patents or licensing income • Additional income or incentives to researchers • Increased interest from future private sector partners, potential students, or new faculty • Funding for equipment and technology • Industry engagements bring credibility to faculty, leading to future consultancies or opportunities	• New products and/or processes • New patents or prototypes • Cost savings over research in-house • Access to public grants • Promote economic growth and overall wealth creation • Cutting-edge technology and research to increase competitiveness

[14] Ssebuwufu, John, Teralynn Ludwick, and Margaux Béland. "Strengthening University-Industry Linkages in Africa." Ghana: Association of African Universities (AAU), 2012. http://www.heart-resources.org/wp-content/uploads/2015/09/strengthening-university-industry-linkages-in-africa-report-2012.pdf?x30250.
[15] Malairaja, Chandra, and Girma Zawdie. "Science Parks and University-Industry Collaboration in Malaysia." *Technology Analysis and Strategic Management*, 20 (2008): 727-739. https://doi.org/10.1080/09537320802426432.
[16] Ssebuwufu, John, Teralynn Ludwick, and Margaux Béland. "Strengthening University-Industry Linkages in Africa." Ghana: Association of African Universities (AAU), 2012. http://www.heart-resources.org/wp-content/uploads/2015/09/strengthening-university-industry-linkages-in-africa-report-2012.pdf?x30250.

	TO HIGHER EDUCATION INSTITUTIONS	TO INDUSTRY
Institutional	• Opportunities for faculty and students to work on groundbreaking research • Exposure and access to state-of-the-art technology for students and faculty • Improvements to curricula and course design • Training and employment for students through exposure to technical skills and hands-on training • Tech advancements or research in key areas Stimulating development of spin-off companies • Joint publications between faculty & industry	• Stronger R&D /innovation capabilities • Advance new technologies • Accelerate commercialization of technologies • Access to knowledge and multidisciplinary research expertise • Influence HEI research directions and new programs • Access to expertise from faculty • Joint publications Hiring of qualified graduates
Social	• Contributing to reduce youth unemployment and boosting economic growth • Enhancement of the HEI's reputation • Contributing to local/regional development • Large-scale communications reach with industry support	• Improved reputation as a socially responsible business • Boosting economic growth and employment by hiring graduates • Enhanced credibility and academic grounding with HE support

5. COMMON BARRIERS TO EFFECTIVELY IMPLEMENTING HEICS

Although the benefits of HEICs outweigh the disadvantages, HEIs and industry partners should anticipate potential barriers and put preventative policies in place to mitigate failure and ensure the success of the relationship. Managing partner expectations is important, and most of these potential barriers can be overcome if addressed and planned for. A full list of barriers is presented in the table below; of these, some of the most critical are below:

- **Cultural conflicts or mismatched goals can hinder trust and communication.** As HEICs generally involve partners from a variety of sectors, it is important to be aware of the dynamics of organizational cultures, which may lead to differences in institutional responsiveness or performance.[17] In addition to resources, contractual mechanisms; political

[17] Al-Youbi, Abdulrahman, Adnan H. Zahed, and William G. Tierney, eds. "Successful Global Collaborations in Higher Education Institutions." N.p.: Springer Open, 2020. https://doi.org/10.1007/978-3-030-25525-1.

and social contexts; and issues like communication, mutual trust, and cultural alignment can play an important role in facilitating or inhibiting success.

- **Lack of buy-in from senior leaders can trickle down to faculty and staff.** Lack of institutional commitment from senior management can lead to non-collaborating faculty, poor training for staff responsible for managing HEICs, and low quality of research outputs. Commitment from senior management is also critical for collaborations focused on R&D and technology transfer, which can take years to complete.[18]
- **Designing and implementing HEICs can be costly and time intensive.** Partners may need to develop specific managerial and administrative competencies, as well as redistribute or increase the workload of those leading the collaboration, which can be a time-consuming process and lead to higher administrative overhead costs.[19] Partners should engage in collaborations with realistic cost and time commitment expectations.
- **Pressure from industry partners or institutional leaders can threaten the autonomy or integrity of faculty research.** HEIC partners should avoid influencing or redirecting long-term faculty research solely for commercial advantage, as it could have a negative impact on a culture of open science and affect the HEI's mission.[20]

TABLE 3. Barriers of Higher Education-Industry Collaborations

Misalignment	• Differing time management (corporate vs. academic timetables) • Mistrust (worries about stealing of ideas or lack of trust in education system) • Different expectations (mutual lack of understanding of working practices) • Worries about patents (conflicts about intellectual property rights and confidentiality concerns) • Higher education teaching and research not focused on industry relevance
Motivation	• Multidisciplinary collaboration in academia can be detrimental to career progression, which relies on individual publications and deep research expertise • Faculty who collaborate with industry may become unpopular as some admin support may be diverted to their projects • Lack of financial support or reputational incentives for faculty to establish HEICs • Perceived lack of need for HEIC if private sector partners' R&D is self-sufficient
Capability	• Insufficient institutional support for finding partners and implementing HEICs • Lack of training for managing HEICs and low quality of research outputs • Teaching and administrative commitments allow little time for collaborations • Lack of understanding of corporate world or access to industry contacts • Low public and private funding to support HEICs • Incentive structures for HEI researchers

[18] Safrit, Lynne Scott. "The Intersection of Academia and Industry: Avoiding Pitfalls and Navigating Successful Partnerships." *Carolina Digital Repository*, 2014. https://cdr.lib.unc.edu/concern/dissertations/6m311q29c.
[19] AL-Tabbaa, Omar, and Samuel Ankrah. "Universities—Industry Collaboration: A Systematic Review." *Scandinavian Journal of Management*, 31, no. 3 (2015): 387-408. http://dx.doi.org/10.1016/j.scaman.2015.02.003.
[20] AL-Tabbaa, Omar, and Samuel Ankrah. "Universities—Industry Collaboration: A Systematic Review." *Scandinavian Journal of Management*, 31, no. 3 (2015): 387-408. http://dx.doi.org/10.1016/j.scaman.2015.02.003.

Governance	• Inexperienced institutions and firms have no established collaboration procedures (developing Memoranda of Understanding, buying equipment, or tracking success) • Turnover/attrition in private sector can hinder continuity of agreements • Bureaucratic restrictions in higher education setting can slow decision making
Context	• Absence of policies to incentivize higher education institutions to innovate or legislation for companies (particularly multinationals) to co-fund HEICs • Lack of government support or appropriate private and public funding schemes • Absence of firms to cooperate with and difficulty identifying academic experts • Geographic distance between target firms and desirable HEIs

6. COLLABORATION MODELS IN PRACTICE

The evidence reviewed outlined two bodies of literature on HEICs: the first, **research and innovation**, and the second, **teaching and learning;**[21]both will be covered in this section.

Types of Collaborations

HEICs generally fall under three different types: operational, transactional, or strategic, which can differ in length, frequency of interactions between partners, and focus areas.

Operational collaborations generally last between 1–3 years and focus on short-term, joint research projects with a particular academic division or R&D lab, leveraging the academic strengths of HEIs and the research competence of industry. Transactional collaborations, which include limited duration or one-time interactions, focus on teaching and learning opportunities, such as industry leaders teaching courses at a HEI or faculty leading corporate training for an industry partner.

The most transformative HEICs are longer-term strategic collaborations, designed to last 5–10 years or more. These provide a longer stream of secure funding that can enhance an HEI's academic strength by modernizing teaching and learning, developing faculty and students with skills needed to transform markets and industries, and honing the competitiveness of companies and regions. Successful strategic collaborations can also help HEIs become centers of competence to help tackle social challenges and drive economic growth.[22]

[21] Kraybill, David. "USAID Higher Education Learning Agenda: Summary and Recommendations for Implementation." USAID, 2020. https://pdf.usaid.gov/pdf_docs/PA00X71W.pdf.
[22] Edmonson, Gail, Lori Valigra, Michael Kenward, Richard L. Hudson, Haydn Belfield, and Peter Koekoek. "Making Industry-University Partnerships Work: Lessons from Successful Collaborations." Science|Business Innovation Board AISBL, 2012. https://sciencebusiness.net/sites/default/files/archive/Assets/94fe6d15-5432-4cf9-a656-633248e63541.pdf.

Research & Innovation

Research and innovation collaborations involve pursuing innovative solutions to complex, systems-level problems that require multidisciplinary research and expertise. HEICs in this focus area fall into two categories: **research-related and academic-entrepreneurship.**[23]

1. **Research-related HEICs** involve academic and industry researchers tackling joint research to drive innovation and increase access to cutting-edge technology and talent. In this type of HEIC, industry and HEI partners rely on each other for their strengths: industry provides funding for research and the experience to commercialize a product, while HEIs leverage their research expertise to invent, develop, and test products.[24] The National Science Foundation's (NSF) Industry-University Cooperative Research Centers (IUCRC) Program has facilitated these types of collaborations between researchers from academia and industry to drive innovation since 1973.

   Joint research can benefit students, faculty, and HEIs through collaborative curriculum design, classroom delivery by faculty and industry researchers, internship or research opportunities for PhD students as pathways for employment, and creation and commercialization of joint R&D.[25] Additionally, research-related HEICs present opportunities for HEIs to access new sources of funding to undertake new research, diversify research areas, and leverage the funds in the form of scholarships or grants to attract and pay talented doctoral students.[26]

   Finally, in some cases, research-related collaborations can lead to the creation of multidisciplinary institutes or centers, which can be particularly helpful for R&D projects where co-locating researchers can improve knowledge dissemination.[27] For example, the Research and Engineering Center for Unmanned Vehicles (RECUV) at the University of Colorado at Boulder was established in 2003, as part of a university, government, and industry partnership dedicated to the development and application of unmanned vehicle systems. Today, the Center's research includes scientific experiments, commercial applications, security, and national defense; it draws faculty and students from across the College of Engineering and Applied Science to work with regulatory agencies and industry leaders on the adoption of new technologies. Establishing joint institutes or centers can enable partners to build trust, advance research, and create opportunities for knowledge transfer and new research, courses, and degree programs.[28]

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[23] Nsanzumuhire, Silas, and Wim Groot. "Context Perspective on University-Industry Collaboration Processes: A Systematic Review of Literature." *Journal of Cleaner Production*. 2020. https://doi.org/10.1016/j.jclepro.2020.120861.
[24] VentureWell. "Industry and University Collaboration: How Partnership Drives Innovation," 2019. https://venturewell.org/industry-and-university-collaboration/.
[25] AL-Tabbaa, Omar, and Samuel Ankrah. "Universities—Industry Collaboration: A Systematic Review." *Scandinavian Journal of Management*, 31, no. 3 (2015): 387-408. http://dx.doi.org/10.1016/j.scaman.2015.02.003.
[26] Crespo, Manuel, and Houssine Dridi. "Intensification of University–Industry Relationships and its Impact on Academic Research." Higher Education, 54 (2006): 61-84. https://doi.org/10.1007/s10734-006-9046-0.
[27] Song, Michael, Hans Berends, Hans Van Der Bij, and Mathieu Weggeman. "The Effect of IT and Co-Location on Knowledge Dissemination." *Journal of Product Innovation Management*, 24, no. 1 (2006): 52-68. 10.1111/j.1540-5885.2006.00232.x.
[28] Edmonson, Gail, Lori Valigra, Michael Kenward, Richard L. Hudson, Haydn Belfield, and Peter Koekoek. "Making Industry-University Partnerships Work: Lessons from Successful Collaborations." Science|Business Innovation Board AISBL, 2012. https://sciencebusiness.net/sites/default/files/archive/Assets/94fe6d15-5432-4cf9-a656-633248e63541.pdf.

Research-related collaborations can include activities focused on different audiences or outputs, including:

- **Research-focused:** New scientific discoveries, publications, or research projects
- **Student-focused:** Theses/dissertations, training, or research stints
- **Business-focused:** Patents, spin-off firms, new business design, or products

2. **Academic-Entrepreneurship HEICs** involve HEIs and private sector partners collaborating to foster entrepreneurship and drive joint business creation.

   Findings across developed and developing countries show that, as part of an HEIC, the activities below can help build an ecosystem for entrepreneurship[29]:

   1. Invite startups to lecture at the HEI in a course or an entrepreneurship speaker series
   2. Provide startups access to campus resources and provide students access to entrepreneurs
   3. Provide marketing, HR, legal support, and access to networks to student entrepreneurs
   4. Establish "collaboration support centers," like research labs, incubators, accelerators, or entrepreneurship centers, for faculty, students, and entrepreneurs to collaborate
      - Launch business competitions for students and faculty to pitch startup ideas to industry
      - Offer formal education on entrepreneurship and technology commercialization to students and faculty to facilitate the process of creating and pitching business plans
      - Offer mentorship and skills training in partnership with cross-industry firms

TABLE 4. Examples of Academic-Entrepreneurship Collaborations in Kenya and Burkina Faso

CAP YOUTH EMPOWERMENT INSTITUTE (CAP-YEI)	
CAP Youth Empowerment Institute Linking Learning and Livelihood Kenya	The CAP Youth Empowerment Institute (CAP-YEI), a non-governmental organization and learning institute, was established in 2011 with the goal of reducing youth unemployment in Kenya.[30] CAP-YEI **connects private sector mentors with students, who learn technical, business, and entrepreneurship skills to start businesses.** In addition to mentorship, many of CAP-YEI's industry partners offer internships, employment, and curriculum development support.[31] CAP-YEI also partnered with Algonquin College, Durham College, Camosun College, and the Training and Vocational Education & Training (TVET) Authority of Kenya to **integrate entrepreneurship training and**

[29] Nsanzumuhire, Silas, and Wim Groot. "Context Perspective on University-Industry Collaboration Processes: A Systematic Review of Literature." *Journal of Cleaner Production*. 2020. https://doi.org/10.1016/j.jclepro.2020.120861.
[30] Busson, Svenia. "Skills Development and Youth Employability in West Africa." Association for the Development of Education in Africa, 2020, http://www.adeanet.org/en/knowledge-and-resources/skills-development-youth-employability-west-africa-senegal-ghana-ivory-coast.
[31] CAP Youth Empowerment Institute. "CAP-YEI Presence in Kenya: County Briefs and Market Scans." CAP-YEI Wordpress, 2021. https://capyei747237259.wordpress.com/.

	capacity building into the curriculum of vocational training centers and technical training institutions.[32] To date, CAP-YEI has trained over 61,346 youth, 78 percent of which were placed in jobs, and 10 percent of which created micro-and-small enterprises.
THE INTERNATIONAL INSTITUTE FOR WATER AND ENVIRONMENTAL ENGINEERING (2IE)	
2iE Institut International d'Ingénierie de l'Eau et de l'Environnement	The International Institute for Water and Environmental Engineering (2iE) is a private, research-focused, HEI in Burkina Faso. 2iE was founded in 2006 after the Rural Equipment Engineering School (EIER) and the Rural Equipment and Hydraulic Technicians School (ETSHER) merged. Today, 2iE operates as an international public-private partnership involving 16 African states, private firms, academic and scientific bodies, and technical institutions. **2iE partnered with 27 industry partners to establish the Technopôle Business Incubator to connect aspiring student entrepreneurs to business mentors; provide professional support for launching businesses in the fields of water, energy, environment, and civil engineering; and bring together students and industry with entrepreneurship competitions**.[33] The Incubator consists of 16 staff from engineering, legal, management, and communication backgrounds, and is supported by 100 engineers and researchers. In addition, 2iE established collaborations with HEIs across Africa, Europe, North America, and Asia to offer joint thesis advising, joint degrees, and joint organization of scientific conferences. Ninety percent of 2iE students are recruited within six months of graduation with 98 percent of them working in Africa.

Teaching & Learning

Historically, the focus of HEICs has been joint research and, in many cases, this has impacted teaching and learning organically—such as when a faculty member joins a short-term project inside the industry partner or a researcher lectures at an HEI, indirectly modernizing curricula. However, a growing skills gap and competition for global talent has driven industry and HEIs to develop HEICs to proactively modernize teaching and learning to prepare students for the workforce and build a pipeline for recruitment of talent.[35]

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[32] Youth Business International. "CAP Youth Empowerment Institute (CAP-YEI)." Youth Business International Member, n.d. https://www.youthbusiness.org/member/cap-yei.
[33] Tufts University. "The International Institute for Water and Environmental Engineering, Ouagadougou, Burkina Faso, West Africa." Talloires Network of Engaged University, n.d. https://talloiresnetwork.tufts.edu/institut-international-dingenierie-de-leau-et-de-lenvironnement-2ie-burkina-faso/.
[34] Hoyt, Lorlene, and Amy Newcomb Rowe. "Leaders in the Civic Engagement Movement: Burkina Faso." Tufts University, Talloires Network of Engaged University, 2014. https://talloiresnetwork.tufts.edu/wp-content/uploads/NOV2014-Burkina-Faso-Final.pdf.
[35] Edmonson, Gail, Lori Valigra, Michael Kenward, Richard L. Hudson, Haydn Belfield, and Peter Koekoek. "Making Industry-University Partnerships Work: Lessons from Successful Collaborations." Science|Business Innovation Board AISBL, 2012. https://sciencebusiness.net/sites/default/files/archive/Assets/94fe6d15-5432-4cf9-a656-633248e63541.pdf.

The evidence on teaching and learning reveals two focus areas: **developing human capital** (through workplace-based learning experiences) **and teaching for employability** (through curriculum reform by jointly identifying relevant knowledge and skills and ways in which they can be taught and learned).[36]

1. **Collaborations focused on developing human capital** include activities that help develop the skills, experiences, and knowledge bases of students, faculty, and, in some cases, HEI administrators.

   For students, activities include workplace-based learning opportunities (internships, apprenticeships, shadowing) hosted by industry partners that prepare students for the workforce. Additionally, HEIs can mimic those experiences through active teaching-learning methodologies like problem-based learning activities, active discussion, student presentations, and group exercises in which students can share different competencies with each other and enhance their own learning.[37] **For faculty, activities include short-term research stints, longer-term industry-based sabbaticals, or industry consulting opportunities,** which can update faculty members' knowledge and experience, advance research agendas, and provide new insights for teaching. Faculty members' closer ties to industry can benefit students, other faculty, and HEIs.[38]

2. **Collaborations focused on teaching for employability** include partnering with industry to design courses, resources, facilities, or experiences aligned to skills that meet market demands.

   Often, these HEICs contribute to the creation of joint knowledge and learning through tailored **joint degree programs, courses, and other collaborative academic supports, such as advising of student theses or projects.**[39] Joint course development may emerge from a practical need for certain skills that industry partners lack. Industry may contribute by providing content, teaching materials, tools, or faculty to support university education in the selected field. Such arrangements can result in further strengthened collaborations as students who pass these courses are poised for employment with the sponsoring companies.

   HEICs can also create facilities to equip students with relevant skills. In the engineering fields, for example, adding to the curriculum hands-on interaction with field instruments and other technologies is key. Industry partners can provide funding for state-of-the art technology, help HEIs integrate technology into curricula as industries evolve, and participate in **joint laboratory teaching** that enables students to learn theoretical and practical uses of the most advanced equipment. Finally, industry partners can create **short videos on specific technical topics to be incorporated into classroom lessons** (or shared with students before class to devote class time to the application of knowledge or more challenging assignments), and host **on-site field days at industrial sites** or research facilities to add an experiential dimension

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[36] Kraybill, David. "USAID Higher Education Learning Agenda: Summary and Recommendations for Implementation." USAID, 2020. https://pdf.usaid.gov/pdf_docs/PA00X71W.pdf.
[37] Wood, Leigh, Jim Psaros, Erica French, and Jennifer Lai. "Learning Experiences for the Transition to Professional Work." *Cogent Business & Management*, 2, no. 1 (2015). https://doi.org/10.1080/23311975.2015.1042099.
[38] Baker, Gregory A., Allen Wysocki, Lisa House, and Juan C. Batista. "Industry-Academic Partnerships: Benefit or Burden?" *The International Food and Agribusiness Management Review*, 11, no. 1 (2008). https://www.researchgate.net/publication/46534655_Industry-Academic_Partnerships_a_Benefit_or_Burden.
[39] Kunttu, Leena. "Educational Involvement in Innovative University–Industry Collaboration." *Technology Innovation Management Review*, 7, no. 12 (2017): 14-23. https://pdfs.semanticscholar.org/5193/f19f7dc9f24c08150304f65b6b187d388901.pdf.

to student learning, allowing students to meet industry leaders, tour industrial facilities, and potentially engage in hands-on activities that can later be practiced at the HEI.[40]

TABLE 5. Examples of Teaching and Learning Collaborations in Ireland and the United States

Limerick for IT	
UNIVERSITY OF LIMERICK OLLSCOIL LUIMNIGH LIT LIMERICK INSTITUTE OF TECHNOLOGY	The Limerick for IT Initiative, an IT skills partnership, started in 2014 when the University of Limerick and the Limerick Institute of Technology partnered with General Motors, Johnson & Johnson, and Kerry Group. The initiative, which is aligned to and supported by the strategic development plan of Limerick city and the wider region, is focused on building a pipeline of job-ready IT graduates to meet the growing needs of the IT sector in the region,[41] Through the HEIC, **industry partners and HEIs set out to identify emerging IT skills and develop tailored education and reskilling programs that were delivered through the University of Limerick and the Limerick Institute of Technology.** As of 2015, the initiative led to the creation of over 200 jobs with the potential of 1,000 new jobs over the next three years.
Apprenticeship Charlotte	
CENTRAL PIEDMONT COMMUNITY COLLEGE NC COMMUNITY COLLEGES | APPRENTICESHIPNC	In 2012, Central Piedmont Community College (CPCC) announced the launch of Apprenticeship Charlotte, a **new career-training program that connects students to local employers to receive intensive, company-specific technical training while earning college credit.**[42] Apprenticeships combine coursework with paid, on-the-job training at one company over a 12–48 month period. As an added benefit of the partnership, employers often cover the cost of tuition, fees, and books for apprentices, and many times offer full-time employment upon successful completion of the program. Since its launch, CPCC's apprenticeship program has grown to 13 employer partners, including Amazon, Tesla, Bank of America, PwC, Siemens, and others, and boasts 100+ active apprentices.[43]

[40] Serbezov, Atanas and Don Cummings, "University-Industry Co-Operation to Promote Industrial Relevance in the Field Instrumentation Component of Control Education." *IFAC-PapersOnLine*, 49, no. 6 (2016): 309-313. http://dx.doi.org/10.1016/j.ifacol.2016.07.195.

[41] Organisation for Economic Co-operation and Development (OECD). "Supporting Entrepreneurship and Innovation in Higher Education in Ireland." Paris: OECD Publishing, 2017. https://www.oecd.org/education/supporting-entrepreneurship-and-innovation-in-higher-education-in-ireland-9789264270893-en.htm.

[42] U.S. Chamber of Commerce Foundation, Mallory Benz, and Jaimie Francis. "How One Community College is Making Partnerships with Business Work." Center for Education and Workforce, 2018. https://www.uschamberfoundation.org/blog/post/how-one-community-college-making-partnerships-business-work.

[43] Central Piedmont Community College. "Apprenticeships, Internships, and Work-Based Learning." Workplace Learning, n.d. https://www.cpcc.edu/student-experience/apprenticeships-internships-work-based-learning.

7. USAID PROGRAMMING EXAMPLE: BRINGING TOGETHER THE PUBLIC, PRIVATE, AND HIGHER EDUCATION SECTORS IN EL SALVADOR

Region: El Salvador; Latin America

Activity Name: USAID Higher Education for Economic Growth Activity (HEA)

Implementation Period: Five-year activity (June 2014 - June 2019)

Partners: Ministry of Education & Ministry of Economy, industry partners, and the higher education sector

Description

USAID's Higher Education for Economic Growth Activity (HEA), managed by RTI International, is an example of a **collaborative effort using a triple helix approach that brought together the public, private, and educational sectors to transform El Salvador's higher education system to stimulate economic growth and social development, and respond to the needs of the country's productive sector.**[44] Specifically, HEA aimed to build partnerships—known as industry-university clusters (IUC)—between industry sectors and HEIs, with the support of government agencies, to develop demand-driven educational programs and research informed by industry needs.

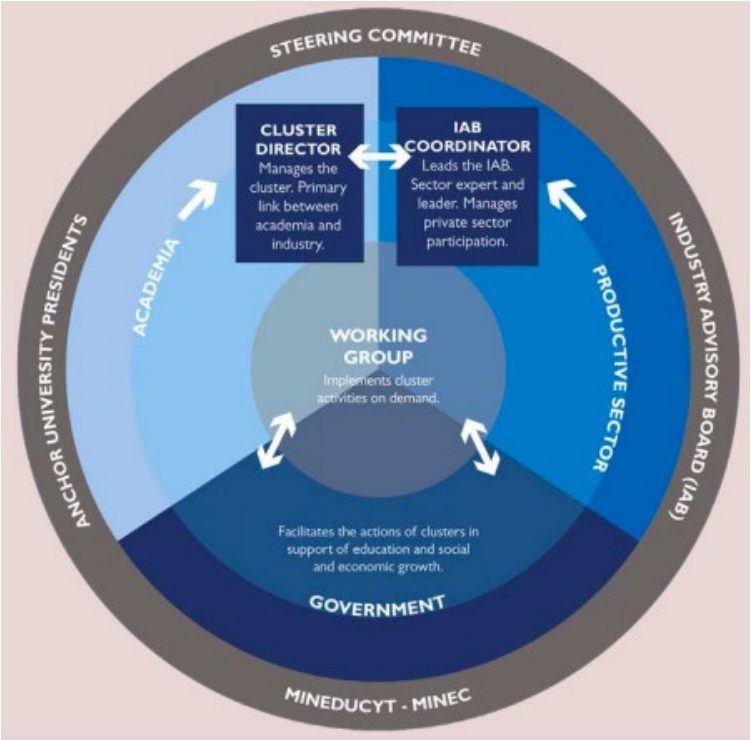
Model

HEA's innovative model for improving economic growth through higher education paired four industry sectors with four higher education clusters. Their shared goals were to:

1. Adapt curricula to meet industry needs
2. Conduct joint applied research
3. Define faculty training needs
4. Build capacity for universities and the enterprises associated with them

[44] RTI International, "USAID Higher Education for Economic Growth Activity: A Path Towards the Fourth Industrial Revolution. Achievements and Sustainability," El Salvador, 2019. https://pdf.usaid.gov/pdf_docs/PA00TQHC.pdf.

Cluster Design



In line with El Salvador's private sector needs, HEA selected four key growth sectors: Information and Communication Technologies, Energy and Energy Efficiency, Light Manufacturing, and Agro-Industry and Food Processing. HEA then formulated four university clusters, engaging a total of 11 HEIs and one two-year technical institute, with each cluster anchored by a lead university. HEA also established an Industry Advisory Board, which included members of the professional unions of the four key sectors, to gain information on the labor market, curriculum planning, internship opportunities, research needs, and practical training. Finally, HEA gained support from the Ministry of Education, Science, and Technology (MINEDUCYT) and the Ministry of Economy (MINEC) to enable policies to improve the approval of new curricula, and connected the HEI clusters to industry partners.

Cluster Participants: HEIs, Business Unions, and Governments

CLUSTER	PROFESSIONAL UNION	HEI LEADER	ASSOCIATED HEI	GOVERNMENT
INFORMATION AND COMMUNICATION TECHNOLOGIES	CASATIC	UFG	UDB, UNICAES, UES, UTEC, UGB, ITCA-FEPADE, UNIVO	MINEDUCYT MINEC
ENERGY AND ENERGY EFFICIENCY	ASER AND ASI	UDB	UCA, ITCA-FEPADE, UAE, UFG, UES, UNIVO	
LIGHT MANUFACTURING	ASI	UCA	UES, UJMD, UNICAES, UFG, UGB, USAM, ESFE/AGAPE, UDB, UNIVO, ITCA-FEPADE	
AGRO-INDUSTRY AND FOOD PROCESSING	CAMAGRO AND ASI	UNICAES	UJMD, UES, UCA,UNIVO	

Each IUC communicated with multiple employers in one of the sectors, led by the lead university and associate universities in the cluster. The two-way communication between industry and HEIs (coordinated by each of the four Salvadoran anchor universities and industry leaders) created mutual value by:

1. Determining what each needed to be more productive

2. Developing packages that met mutual needs, such as redesigning curricula, training faculty, and conducting applied research[45]

Activity Highlights[46]

With HEIs	With Industry	With Government
• 647 students received one-year scholarships in STEM programs • 17 new or improved research laboratories built • Trained 1,000 faculty members on learner-centered methods (hands-on projects, debate, role play, and problem-based learning) • 1,403 teachers, researchers, and staff from HEIs trained in education, high-demand fields, English, and applied research • 5 Career Development Centers (CDC) established at five HEIs, reaching over 26,000 students • 26 applied research studies in collaboration with industry and the government	• Developed 33 new or updated degrees in response to industry needs (3,900 students enrolled) • Created the Leadership in Energy and Environmental Design (LEED) Lab, where youth are trained on energy efficiency • 478 students employed and 1,395 in internships • 26 applied research studies in collaboration with industry and the government	• Sped up approvals for new or revised curriculum, which now requires six to 12 months (down from two to three years) • Worked with MINEC, MINEDUCYT, and the National Director of Higher Education to develop a draft of the nation's first Higher Education Strategy • 26 applied research studies in collaboration with industry and the government

[45] Aring, Monika, and FHI 360. "Better Education, Better Skills, Better Economy, and a Better Future for El Salvador's Youth: Analysis and Best Practices of the USAID Higher Education for Economic Growth Activity (HEA)." 2019. https://www.edu-links.org/sites/default/files/media/file/LAC-Higher-Edu_508%20passed.pdf.

[46] RTI International, "USAID Higher Education for Economic Growth Activity: A Path Towards the Fourth Industrial Revolution. Achievements and Sustainability," El Salvador, 2019. https://pdf.usaid.gov/pdf_docs/PA00TQHC.pdf.

8. CONCLUSION

HEIs, industry, and in many cases, governments have a long history of collaboration, and evidence shows that there are many benefits in forming collaborations to enhance the relevance and quality of teaching and learning, and research and innovation. According to the triple helix model and the national innovation system approach, in today's global economy, HEICs are key to a country's development because they drive the production and flow of knowledge, technology, information, and skills through the interaction of the public, private, and education sectors. For HEIs, HEICs can provide financial support for educational, research, and service missions; enhance the experience and expertise of their students and faculty; increase employment opportunities for students; and boost regional economic development. And, although implementing HEICs may present challenges, collaborations can be successful if proactive steps are taken to mitigate the risks.

For more information on USAID HEI collaborations, please visit https://www.edu-links.org/, or to contribute to or learn more about the USAID Higher Education Learning Agenda, please contact us at helearning@usaid.gov.

BIBLIOGRAPHY

AL-Tabbaa, Omar, and Samuel Ankrah. "Universities—Industry Collaboration: A Systematic Review." *Scandinavian Journal of Management*, 31, no. 3 (2015): 387-408. http://dx.doi.org/10.1016/j.scaman.2015.02.003.

Al-Youbi, Abdulrahman, Adnan H. Zahed, and William G. Tierney, eds. "Successful Global Collaborations in Higher Education Institutions." N.p.: Springer Open, 2020. https://doi.org/10.1007/978-3-030-25525-1.

Aring, Monika, and FHI 360. "Better Education, Better Skills, Better Economy, and a Better Future for El Salvador's Youth: Analysis and Best Practices of the USAID Higher Education for Economic Growth Activity (HEA)." 2019. https://www.edu-links.org/sites/default/files/media/file/LAC-Higher-Edu_508%20passed.pdf.

Baker, Gregory A., Allen Wysocki, Lisa House, and Juan C. Batista. "Industry-Academic Partnerships: Benefit or Burden?" *The International Food and Agribusiness Management Review*, 11, no. 1 (2008). https://www.researchgate.net/publication/46534655_Industry-Academic_Partnerships_a_Benefit_or_Burden.

Busson, Svenia. "Skills Development and Youth Employability In West Africa." Association for the Development of Education in Africa, 2020, http://www.adeanet.org/en/knowledge-and-resources/skills-development-youth-employability-west-africa-senegal-ghana-ivory-coast.

CAP Youth Empowerment Institute. "CAP-YEI Presence in Kenya: County Briefs and Market Scans." CAP-YEI Wordpress, 2021. https://capyei747237259.wordpress.com/.

Central Piedmont Community College. "Apprenticeships, Internships, and Work-Based Learning." Workplace Learning, n.d. https://www.cpcc.edu/student-experience/apprenticeships-internships-work-based-learning.

Crespo, Manuel, and Houssine Dridi. "Intensification of University–Industry Relationships and its Impact on Academic Research." Higher Education, 54 (2006): 61-84. https://doi.org/10.1007/s10734-006-9046-0.

Edmonson, Gail, Lori Valigra, Michael Kenward, Richard L. Hudson, Haydn Belfield, and Peter Koekoek. "Making Industry-University Partnerships Work: Lessons from Successful Collaborations." Science|Business Innovation Board AISBL, 2012. https://sciencebusiness.net/sites/default/files/archive/Assets/94fe6d15-5432-4cf9-a656-633248e63541.pdf.

Freitas, Isabel Maria Bodas, Rosane Argou Marques, and Evando Mirra de Paula e Silva. "University–Industry Collaboration and Innovation in Emergent and Mature Industries in New Industrialized Countries," *Research Policy*, 42, no. 2 (2013): 443-453. http://dx.doi.org/10.1016/j.respol.2012.06.006.

Harman, Grant, and Val Sherwell. "Risks in University-Industry Research Links and the Implications for University Management." *Journal of Higher Education Policy and Management,* 24, no. 1 (2002): 37-51. https://doi.org/10.1080/13600800220130752.

Hoyt, Lorlene, and Amy Newcomb Rowe. "Leaders in the Civic Engagement Movement: Burkina Faso." Tufts University, Talloires Network of Engaged University, 2014. https://talloiresnetwork.tufts.edu/wp-content/uploads/NOV2014-Burkina-Faso-Final.pdf.

Kraybill, David. "USAID Higher Education Learning Agenda: Summary and Recommendations for Implementation." USAID, 2020. https://pdf.usaid.gov/pdf_docs/PA00X71W.pdf.

Kunttu, Leena. "Educational Involvement in Innovative University–Industry Collaboration." *Technology Innovation Management Review*, 7, no. 12 (2017): 14-23. https://pdfs.semanticscholar.org/5193/f19f7dc9f24c08150304f65b6b187d388901.pdf.

Leydesdorff, Loet, and Henry Etzkowitz. "The Dynamics of Innovation: From National Systems and "Mode 2" to a Triple Helix of University—Industry—Government Relations." *Research Policy*, 29, no. 2 (2000):109-123. https://doi.org/10.1016/S0048-7333(99)00055-4.

Malairaja, Chandra, and Girma Zawdie. "Science Parks and University-Industry Collaboration in Malaysia." *Technology Analysis and Strategic Management*, 20 (2008): 727-739. https://doi.org/10.1080/09537320802426432.

Mastercard Foundation. "Harnessing the Potential of Hospitality and Tourism for Young People's Employment, 2018. https://mastercardfdn.org/wp-content/uploads/2018/08/MCF14003-Youth-Think-Tank-2018-Report-vFA-AODA.pdf.

Nsanzumuhire, Silas, and Wim Groot. "Context Perspective on University-Industry Collaboration Processes: A Systematic Review of Literature." *Journal of Cleaner Production*. 2020. https://doi.org/10.1016/j.jclepro.2020.120861.

Organisation for Economic Co-operation and Development (OECD). "National Innovation Systems." 1997. https://www.oecd.org/science/inno/2101733.pdf.

Organisation for Economic Co-operation and Development (OECD). "Supporting Entrepreneurship and Innovation in Higher Education in Ireland." Paris: OECD Publishing, 2017. https://www.oecd.org/education/supporting-entrepreneurship-and-innovation-in-higher-education-in-ireland-9789264270893-en.htm.

Plewa, Carolin, and Pascale G. Quester. "Key Drivers of University-Industry Relationships: The Role of Organisational Compatibility and Personal Experience." *Journal of Services Marketing,* 21, no. 5 (2007): 370-382. 10.1108/08876040710773679.

RTI International. "USAID Higher Education for Economic Growth Activity: A Path Towards the Fourth Industrial Revolution. Achievements and Sustainability," El Salvador, 2019. https://pdf.usaid.gov/pdf_docs/PA00TQHC.pdf.

Safrit, Lynne Scott. "The Intersection of Academia and Industry: Avoiding Pitfalls and Navigating Successful Partnerships." *Carolina Digital Repository*, 2014. https://cdr.lib.unc.edu/concern/dissertations/6m311q29c.

Serbezov, Atanas and Don Cummings. "University-Industry Co-Operation to Promote Industrial Relevance in the Field Instrumentation Component of Control Education." *IFAC-PapersOnLine*, 49, no. 6 (2016): 309-313. http://dx.doi.org/10.1016/j.ifacol.2016.07.195.

Song, Michael, Hans Berends, Hans Van Der Bij, and Mathieu Weggeman. "The Effect of IT and Co-Location on Knowledge Dissemination." *Journal of Product Innovation Management*, 24, no. 1 (2006): 52-68. 10.1111/j.1540-5885.2006.00232.x.

Ssebuwufu, John, Teralynn Ludwick, and Margaux Béland. "Strengthening University-Industry Linkages in Africa." Ghana: Association of African Universities (AAU), 2012. http://www.heart-resources.org/wp-content/uploads/2015/09/strengthening-university-industry-linkages-in-africa-report-2012.pdf?x30250.

Tufts University. "The International Institute for Water and Environmental Engineering, Ouagadougou, Burkina Faso, West Africa." Talloires Network of Engaged University, n.d. https://talloiresnetwork.tufts.edu/institut-international-dingenierie-de-leau-et-de-lenvironnement-2ie-burkina-faso/.

U.S. Chamber of Commerce Foundation, Mallory Benz, and Jaimie Francis. "How One Community College is Making Partnerships with Business Work." Center for Education and Workforce, 2018. https://www.uschamberfoundation.org/blog/post/how-one-community-college-making-partnerships-business-work.

VentureWell. "Industry and University Collaboration: How Partnership Drives Innovation," 2019. https://venturewell.org/industry-and-university-collaboration/.

Wood, Leigh, Jim Psaros, Erica French, and Jennifer Lai. "Learning Experiences for the Transition to Professional Work." *Cogent Business & Management*, 2, no. 1 (2015). https://doi.org/10.1080/23311975.2015.1042099.

World Economic Forum, The World Bank, and The African Development Bank. "The African Competitiveness Report 2011." Geneva: World Economic Forum, 2011. https://www.weforum.org/reports/africa-competitiveness-report-2011.

Youth Business International. "CAP Youth Empowerment Institute (CAP-YEI)." Youth Business International Member, n.d. https://www.youthbusiness.org/member/cap-yei.

Zanello, Giacomo, Xiaolan Fu, Pierre Mohnen, and Marc Ventresca. "The Creation and Diffusion of Innovation in Developing Countries: A Systematic Literature Review." *Journal of Economic Surveys,* 30, no. 5 (2015): 884-912. https://doi.org/10.1111/joes.12126.