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Using university-industry integration for modernising university education in Shenzhen and the Greater Bay Area – a case study

(June, 2025)

DRAFT

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Introduction

This case study has been prepared in the framework of the project titled "*University-industry integration policies and practices in China - potential applications in Hungary*".[1] It is based on two fact-finding mission conducted in Shenzhen between the 7th and the 18th of April, 2025 and in Hong Kong between the 13th and the 22nd of June, 2025 by the authors.[2] The aim of this case

[1] This project, funded by the Hungarian government, is hosted and implemented by Wekerle Business School (WBS) in cooperation with Mathias Corvinus College (MCC). See for the project concept the document titled "*University-industry integration policies and practices in China - potential applications in Hungary - Project proposal - (2024. November)*".

[2] See Gábor Halász – Min Huang: „*Report on the first case study fact-finding mission to China (April 7–18, 2025)*" and Halász Gábor – Huang Min: "*Report on the second case study fact-finding mission to China (June*

study is to provide input to the final report that will analyse how skills-development oriented university-industry integration (UII) policy measures and programs enhance the modernisation of university education in China. Similarly to all other documents produced in this project the target audience is the Hungarian (and possibly European) higher education development community, including both national policy-makers and institutional level leaders.

Background

In this section we present some relevant elements of the social, political and economic environment in which China's university-industry integration policies and practices have emerged.

China's UII policy

Policies and practices related with UII in Shenzhen and the Greater Bay Area must be analysed in the broader context of China's UII policy. While it is not the task of this case study to present this policy in detail some of its elements have to be mentioned also here.

Although this policy emerged in the last decade it has deeper roots in the history of education, in general, and university education, in particular, in China. The integration of education and work has been a key element of the Marxist ideology guiding the policies of the Chinese Communist Party (CCP) since the establishment of the People's Republic of China (PRC). Authors analysing the history of UII in China typically describe three main developmental stages: (1) early integration in the fifties, the sixties and the seventies, (2) separation or detachment from the late seventies till the middle of the 2010s, and (3) a new integration phase since the middle of the 2010s (Nan, 2019). Some authors (Ouyang, 2020) distinguish four periods since the middle of the nineties: (1) cooperation in the first period and (2) deep integration since the middle of the 2010.

The main turning point in this history is the shift in the economic development policy of the Chinese government in the 2010s towards what is often described as a move towards *innovation-driven* and *skills-driven* economy or intelligent industry (Outline…, 2016). As an implication of this – with developing high level skills and investing into skills development becoming major national policy priorities – connecting university education with the most advanced industrial sectors became a major goal of China's higher education policy. A key point of the development was the adoption of a policy document on deepening the integration of industry and education in 2017 by the Chinese government (State Council, 2017). This document not only made UII a national policy priority but also introduced a number of conceptual and governance or coordination innovations, fostering, among others, local policy experimentations and the development of a high level diversity of local solutions.

For most Western observers understanding China's UII policy is challenging. This is more than simple "cooperation" or "partnership". The word "integration" does not describe sufficiently well the UII phenomenon: in the original Chinese expression ("产学融合" - *Chăn xué róng hé*) the characters "融合" also mean „fusion," "blending," "melting together" or "merging", which has much stronger connotations than what the word "integration" expresses. A key element of the Chinese UII policy is the emergence of new institutional forms under shared ownership and management covering practically all aspects of teaching and learning or skills development.

13–22, 2025). These two reports contain a full list of people met and institutions visited in Shenzhen, Guangzhou and Hong Kong.

Another key characteristic is of the UII policy of China is the innovative nature of policy design and policy implementation. In the area of UII policy a new, original, decentralised governance model seems to emerge in China, which is based on the pro-active participation of a several local stakeholders and leads to the creation of various innovative original solutions. Policy experimentation, conceptual innovations and policy learning have particularly strong role in shaping policies and practices in this area (Han & Fu, 2022; Li, 2024; Li, 2025). A key element of the implementation of the UII policy has been the launching of a "national pilot implementation plan" in 2019 by the National Development Reform Commission which designated specific cities to create local UII models (National Development and Reform Commission, 2019).

A further element of China's UII policies and practices that should be stressed in the context of this case study is the differences and similarities between the two distinct sectors of higher education, namely research universities and universities of applied sciences or technical universities. UII is implemented differently in these two sectors: the former focusing mostly on research-cooperation while the second mostly on skills-development orientation of cooperation. It is worth being noted that the role and weight of UII might be quite different within the research university sector in case research is conceived rather in the Mode2 than in the Mode1 model.[3]

The Shenzhen context

Shenzhen is one of the symbols of rapid modernisation and development not only in China but also world-wide. The word "miracle" is often used when analysing the development of this city which from a small conglomeration of villages became a megacity hosting many leading high-tech industry companies in four decades. A paper analysing the "Shenzhen miracle" mentions that "*in 1979, the city's GDP was only 196 million yuan. It has grown 14,090 times in the past 40 years, with an average annual growth rate of 21.1 %. The per capita GDP has also increased from 606 yuan to 159,309 yuan, an increase of 262 times*" (Cheng et al., 2023). From among the many factors contributing to this spectacular development (see, for example, Du, 2020; Liu, 2020; Cheng et al., 2023) there are four that should be underlined in the context of this case study:

(1) the special status of the city as the first of the special economic zones created after the launch of the opening up policy which made it possible to experiment with original and unusual institutional solutions
(2) the very strong and proactive role of industrial players with highly entrepreneurial attitudes and strong believe in the role of human resources and skills in boosting competitiveness
(3) a strong commitment of local political leaders towards developing education and skills production and willingness to invest into educations
(4) the embeddedness in the larger economic zone and innovation ecosystem, the Greater Bay Area, including Hong Kong as a window to the global economy

The spectacular and rapid development of Shenzhen is also reflected in the emergence of its advanced city-level higher education system in less than four decades. The city built this system in a "leapfrog" manner from scratch and with virtually unlimited resources (Li & Wu, 2021).

[3] The distinction between Mode1 (traditional, academic form of research) and Mode2 (more interdisciplinary and more oriented towards client needs, problem solving and application) has been widely recognised since the middle of the nineties when it was proposed by Gibbons et al. (1994).

This achievement was made possible by local leaders who not only recognized the strategic importance of investing in human capital for industrial development but were also willing to make significant sacrifices to realize it. To better understand the unique trajectory of higher education in Shenzhen, it is worth quoting at length from a study that documents this history:

> "After the formal establishment of Shenzhen Special Economic Zone, talents from all over the country flocked to this hot land in the South that was in urgent need of development. The decision-makers of the Special Economic Zone at that time were keenly aware that the talent issue was a key issue that needed to be solved urgently in the construction of the Special Economic Zone. 'We must burn our boats and fight to the bitter end, even if it means selling our pants to build a university': this powerful remark by Liang Xiang, then secretary of the Shenzhen Municipal Party Committee, has long been recorded in the history of Shenzhen's higher education, inspiring generations of Shenzhen's higher education builders to continue to overcome difficulties and forge ahead. (…)
>
> In June 2008, the Shenzhen Municipal Party Committee (…) proposed for the first time that 'higher education should be developed in a leapfrog manner'. From the perspective of resource input, whether it is fiscal funds or scarce resources such as land, the Shenzhen Municipal Party Committee and Municipal Government have given great support to higher education. Liang Beihan, former deputy director of the Shenzhen Municipal Education Bureau, once wrote: 'To achieve leapfrog development of local higher education, it is necessary to require local governments to attach great importance to and provide extraordinary support. The so-called attention and extraordinary support mainly refer to the local government's reasonable understanding of higher education, respect for the inherent uniqueness of higher education, and willingness to invest.' (…)
>
> Is it difficult to take out 100 million yuan to run Shenzhen University? Zhou Xiwu said: As long as the municipal party committee and municipal government are determined, I will find a way to dig out the money. (…) Without the reform spirit of daring to take risks, dare to try, and dare to be the first, there would be no leapfrog development of Shenzhen's higher education."

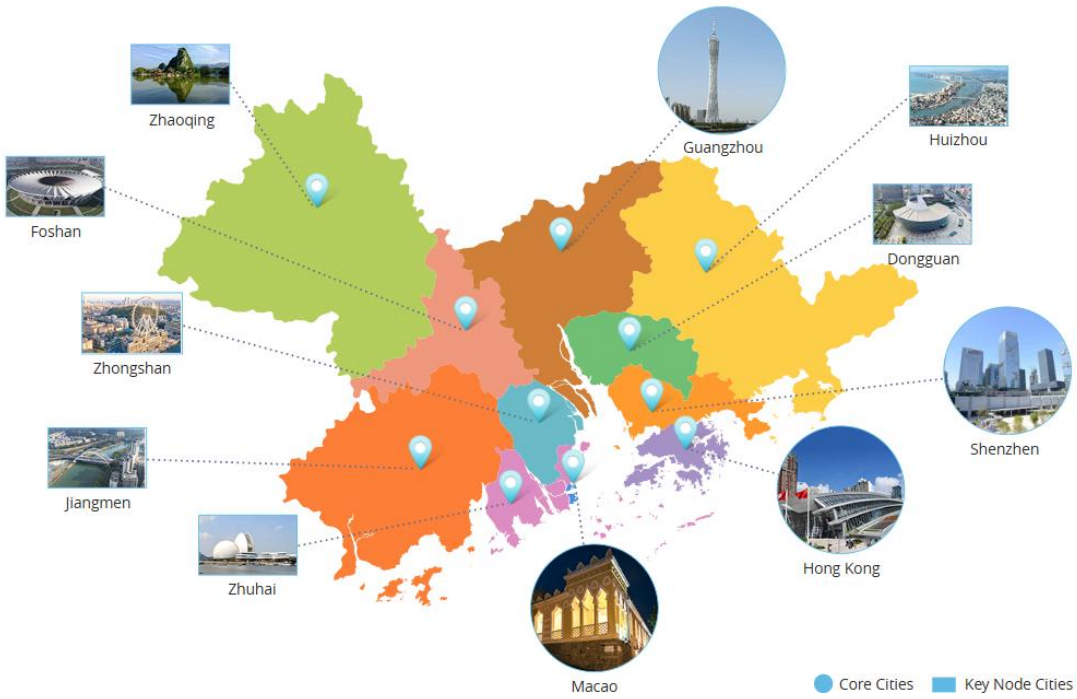
According to the authors of this study almost all new universities established in Shenzhen "were born with the mission of reform and innovation". For example the Shenzhen Vocational and Technical College in 1993, which later became the Shenzhen Polytechnic University (see in more detail later), was not only the first such college in China but also the first to take "skilled craftsmen at the university level" as the training goal, and allowing enterprises to participate in the entire process of training.

The development of higher education in Shenzhen has had two key features: (1) as new institutions, HEIs were open to radically new approaches regarding the organisation of teaching and learning, (2) they were ready to be in intensive interaction with the advanced industrial environment. For these HEIs it has always been natural that the advanced industrial environment (including the human and creative industry sector) is a source of inspiration and energy. In this city, where "*more than 90% of the R&D personnel are concentrated in enterprises, more than 90% of R&D funds come from enterprises, more than 90% of R&D institutions are established in enterprises, and more than 90% of job invention patents are generated in enterprises*" (Li & Wu, 2021) the industrial environment has always provided attractive partnerships, meaning that the reluctance to cooperate with industry, often observed in more traditional academic environments, simply did not appear. This has been strengthened by the emergence of the larger ecosystem of innovation and cultural exchanges called Greater Bay Area, which implies that although this UII case study is focusing on Shenzhen it includes some elements also beyond the city itself.

The Greater Bay Area context

Shenzhen's UII policies and practices are strongly connected to the larger Guangdong–Hong Kong–Macao Greater Bay Area (GBA) envisioned by the Chinese government as an integrated regional economic entity that could take a leading global role by the middle of the 2030s. This region comprises 11 densely populated and highly developed cites of the Pearl River Delta area in South China (see *Figure 1*).

Figure 1.
The GBA and its cities



As the national policy document launching the development program of the GBA stated "the level of economic development is leading in the country, the industrial system is complete, the cluster advantages are obvious, the economic complementarity is strong, the service industry of Hong Kong and Macao is highly developed, and the nine cities of the Pearl River Delta have initially formed an industrial structure with strategic emerging industries as the guide, advanced manufacturing and modern service industries as the main body, and the total economic volume of the Greater Bay Area in 2017 was about 10 trillion yuan" (The Central Committee…, 2019).

The GBA is the most developed and fastest-growing economic region of not only China, but also of the whole World (see city level GDP data from 2019 in *Figure 2*). It covers every aspect of economic life, including skills development. Related policies foster intensive cooperation between universities and industries located in the area through facilitating free movement of people, easy transportation, communication and collaboration based on institutionalised partnerships. The creation of the Institute of Future Technology of Shenzhen Polytechnic University (SZPU),[4] founded by a professor of Hong Kong University of Science and Technology, is one of the many examples.

[4] See the website „Introduction to the Institute of Future Technology" (未来技术学院简介) here: https://www.szpu.edu.cn/info/1006/11277.htm

Figure 2.
China's Guangdong–Hong Kong–Macao Greater Bay Area
the GDP of major cities (2019)

Source: HSBC Research[5]

The Chinese government adopted a development plan for the GBA in 2019, proposing to build a "highland for education and talents" in this area (The Central Committee…, 2019; Guangdong Provincial…, 2019). This plan supports the building of institutional mechanisms for the adaptation of the "dual" model of vocational education, designating Shenzhen as "an exemplary city with the integration of industry and education, and create a new engine for high-quality development". This implies, among others, promoting "the organic connection between the education chain, the talent chain, the industrial chain, and the innovation chain" and promoting "the "joint development of vocational education in Guangdong, Hong Kong and Macao". A policy document issued by the Chinese Ministry of Education and the People's Government of Guangdong Province in 2020 presented the tasks related to UII in this regional cooperation entity this way:

> **"**Integrate into the construction of 'dual zones', connect high-end industries, build major platforms and projects for the deep integration of industry and education, join hands with world-class enterprises or industry leaders, build a number of high-level professional groups and characteristic industry colleges around the 'high-precision and cutting-edge' fields such as integrated circuits, promote the formation of a school-enterprise community with a shared future, and cultivate a first-class team of technical and skilled talents" (People's Government…, 2020).

The GBA strategy has direct implications for the development of higher education in this region (Xie et al., 2021). It provides particularly favourable conditions for innovative solutions not

[5] Quoted in an article by BBC „Greater Bay Area: China's ambitious but vague economic plan" (https://www.bbc.com/news/business-47287387)

only related to the integration of universities and industry but also for developing university education in Shenzhen. Among the many examples one is the creation of a practice oriented doctoral program (DBA) at Southern University of Science and Technology (SUST) in cooperation with a Hong Kong university which would not be possible using only facilities in mainland China where this kind of programme is not yet institutionalised.[6]

One key higher education initiative born from the GBA regional strategy is the creation of the GBA University Alliance (GHMUA) including 45 universities across Guangdong, Hong Kong, and Macao.[7]

UII in Shenzhen and the GBA

As a city of pilot initiatives Shenzhen has played an important role in shaping China's university-industry integration policies and practices. The municipal level administration was encouraging intensive and deep cooperation between education and industry before the emergence of the national UII policy.

City level UII policy in Shenzhen

The city launched various pilot programs to foster collaboration between universities and industries as early as the nineties, focusing particularly on sectors like information technology, biotechnology, and advanced manufacturing which was strongly supported by the industrial leaders representing the most advanced industrial sectors. The national level policy environment became particularly favourable for this orientation in the 2010s when the upgrading of vocational education became a national level policy priority. In 2013 the municipal government adopted a policy document stressing that school-enterprise cooperation should follow "the principles of voluntary consultation, complementary advantages, resource sharing, mutual benefit and win-win", should combine "production, teaching and scientific research" and should cover all areas of education and training, such as defining the "curriculum system and vocational standards". The combination of "teaching process and production process" was conceived in this policy document as the way to "a harmonious Shenzhen, a benefit for Shenzhen, and a quality of Shenzhen" (Shenzhen Municipal People's Government, 2013).

The national policy environment became even more favourable following the adoption of the 2017 national policy document on deepening UII mentioned earlier, as this explicitly encouraged local experimentation with UII various approaches. The same year the Shenzhen Municipal People's Government issued a new policy document on building a "modern vocational education system" (Shenzhen Municipal People's Government, 2017). This document visioned by 2020 ", a modern vocational education system with world-class characteristics, Chinese characteristics and Shenzhen characteristics" stressing not only the need for a "deep integration of industry and education" but also strengthening the connections "between secondary vocational and higher vocational education" and "the integration of vocational education and general education". From the perspectives of UII this is particularly important because it makes it clear that the integration of education and industry cannot be limited to the traditional area of secondary vocational education but it is promoted also at the level of higher education and not only in technical universities or universities of applied

[6] Information based on direct communication with SUST professors.
[7] See the website of GHMUA here: https://eao.sysu.edu.cn/ghmua/.

sciences but also in comprehensive or research universities, including every disciplinary area, not only those directly connected with industrial technology.

China's national policy of UII has explicitly promoted the creation of local level alliances of universities, industry, government agencies and civil (professional) organisations (Han & Ye, 2017; Hardy & Liu, 2022; Li, 2024). Shenzhen has been a pioneer in creating such a city level alliance establishing the Shenzhen Citywide Industry-Education Consortium.[8] aiming at deeply integrate education with regional economic development. This institutionalised community is a coordinating agency comprising three universities (Shenzhen Polytechnic University, Southern University of Science and Technology, and Shenzhen University) more than 50 enterprises (from giants like Huawei and DJI to mid-sized smart tech firms) and the Shenzhen Municipal Education Bureau which provides funding and a shared digital platform for internships and curriculum resources, and perform evaluations aligned with regional development strategies. According to what we heard in our interviews and conversations this cooperation significantly enhanced the education oriented thinking and behaviour of companies, the willingness of universities to design curricula backwards from real jobs and the ecosystem and platform oriented thinking of the municipal government.

UII in the GBA

Within the GBA we find a noteworthy contrast between Hong Kong and the provinces of mainland China. Although Hong Kong shares strategic policy goals with mainland UII – like promoting innovation and employability – the mechanisms and institutional logics diverge significantly. The level and intensity of UIC in Hong Kong is significantly lover than in mainland China, and it is focusing more on research and innovation than on improving education. Several academics interviewed in Hong Kong confirmed that a more advanced UIC/UII dynamics can be observed in mainland China than in Hong Kong.

As Hong Kong is an autonomous administrative area, the UII policy of China is not implemented here. Implementing this policy would be challenging here even if the Hong Kong government had this intention, due to a number of factors, such as (1) the market-driven policy environment, (2) the lower level commitment of local companies, (3) the high level autonomy of universities, (4) their more traditional academic culture and (5) their high level internationalization. The expression "university-industry integration" (UII) is rarely used in Hong Kong, rather the term "university-industry cooperation" (UIC) is used in both policy discourses and in daily communication. Hong Kong is deliberately and systematically exploiting the opportunities provided by the GBA for its own educational development. As the GBA website of the Hong Kong government mentions "the HKSAR Government supports post-secondary institutions of Hong Kong to offer education services in the Greater Bay Area and to give full play to the characteristics of Hong Kong's higher education sector and their strength in terms of internationalisation. This will help develop the Greater Bay Area as an international education base as well as open up collaborative innovation opportunities for students in Hong Kong and Guangdong."[9]

Although the mainland's UII policy have had limited influence in Hong Kong, we can see a dynamic UIC landscape with many bottom-up initiatives. A recent analysis (Cheung, 2025) distinguished five different forms of UIC in Hong Kong, such as (1) Work-Integrated Learning

[8] 深圳市产教融合共同体 (Shēnzhèn shì chǎn jiào rónghé gòngtóngtǐ)

[9] See the education related page of the website here: https://www.bayarea.gov.hk/en/opportunities/education.html.

Programs, (2) Employer Involvement in Curriculum Development, (3) Co-Designed Training Programs, (4) Corporate Sponsorships for Education and (5) Internships as a Mechanism for Skill Development, mentioning several illustrative cases for each of them.

Among the relevant bottom-up initiatives, one of the most notable is the service-learning system at The Hong Kong Polytechnic University (PolyU). While service learning is primarily designed as community-oriented engagement rather than direct industry collaboration, it frequently incorporates industry-relevant components. Examples include student projects involving solar panel installation, water supply system development, or sustainable infrastructure solutions: activities that bridge technical skills with real-world applications. Based on interviews with PolyU's service-learning leadership, this model can be interpreted as a "soft" or indirect form of UIC as it fosters industry-aligned competencies (e.g., project management, entrepreneurship, and problem-solving) while simultaneously enhancing graduate employability. This approach demonstrates how community-focused pedagogy can indirectly support industry skill development, aligning with broader goals of workforce readiness in the GBA.

An important recent initiative is the creation of a new "university town" in the northern part of Hong Kong.[10] As a report published by the Policy Research Centre on Innovation and Technology of Hong Kong Polytechnic University mentioned, in 2017 the Hong Kong government and the Shenzhen Municipal government signed a "Memorandum of Cooperation on Promoting the Joint Development of the Lok Ma Chau Loop Area between Hong Kong and Shenzhen" which launched the process of creating a metropolitan area „that is a good place for people to live, work, and travel" with the „IT industry as its economic engine" (PReCIT, 2023). This new agglomeration will create a particularly favourable environment for UIC, attracting universities and companies from both Hong Kong and the GBA provinces of mainland China.

Regrading relevant initiatives in mainland China a notable example is the establishment of the new Greater Bay Area University (GBAU) by the Guangdong provincial and the Dongguan municipal government in the Songshan Lake area and the Marina Bay New Area of Dongguan city, about 50-60 kilometres to the North from Shenzhen. This city "has developed into a prominent manufacturing centre, focusing on several industries like electronics, textiles, footwear, and machinery" and "has been a favoured choice for local and foreign investments due to its advantageous geographical position, extensive infrastructure, and proficient labour force" (Cheung, 2023).The aim of this new institution, as a "new type of research university" is "to cultivate high-level innovative talents with innovative thinking, global vision, national feelings, lifelong learning ability, and the ability to solve complex problems and innovate in practice" (Guangzhou Municipal People's Government, 2025). It is logical to expect that GBAU will create a particularly favourable environment for UII in the most advanced technological sectors.

As a brand new university GBAU will probably apply the principles that are formulated in various policy documents that focus on the modernisation of teaching and learning in higher education and are already applied in several universities in the GBA. The key elements of this are (1) flatter, domain-based organization, (2) cross disciplinary, application rich curriculum, (3) student-centred, flexible study paths and (4) hybrid evaluation system (see *Box 1*). The application of these principles will probably create an institutional environment that is particularly favourable for the emergence of a positive self-amplifying loop as the application

[10] See the related press release of Hong Kong government on Northern Metropolis University Town here: https://www.info.gov.hk/gia/general/202505/07/P2025050700504.htm

of these principles leads to the deepening of UII, and the deepening of UII is reinforcing the further application of these principles. One can assume that GBAU – similarly, as we will see, to the Shenzhen based Southern University of Science and Technology (SUST) – will follow the advanced, and progressive pedagogical model encouraged by the curriculum innovation initiatives in four disciplinary areas (engineering, medicine, agriculture and liberal arts).

Box 1
Reforming teaching and learning

A key component of higher education reform in China is the transformation of undergraduate education, with a particular focus on four emerging disciplinary areas. These are commonly referred to as the "four new disciplines": New Engineering (新工科 - xīn gōngkē), New Medicine (新医科 - xīn yīkē), New Agriculture (新农科 - xīn nóngkē), and New Liberal Arts (新文科 - xīn wénkē)[11] (MOE, 2018; 2019).

This curriculum reform extends beyond updating course content; it represents a fundamental reconfiguration of how teaching and learning are organized. It can be described as a combination of four interconnected forms of innovation:

Organizational Innovation: Universities are encouraged to adopt flatter, domain-based structures that replace traditional disciplinary silos. These structures promote interdisciplinary domains—such as "smart manufacturing" or "green energy systems"—that integrate engineering, business, and design, often in close collaboration with industry partners.

Curricular Innovation: Institutions are developing cross-disciplinary, application-rich courses that merge technical competencies (e.g., artificial intelligence) with real-world contexts (e.g., supply chain logistics). These courses are frequently co-designed with industry stakeholders to ensure relevance and applicability.

Pedagogical Innovation: Emphasis is placed on student-centred approaches that support flexible, customized study pathways. These may include the integration of disciplines (e.g., robotics and business), modular learning structures, credit transfer systems such as credit banks, and the use of micro-credentials.

Assessment Innovation: Evaluation methods are being reformed through hybrid approaches that combine traditional examinations with project-based assessments. These include industry project reviews – often evaluated by industry professionals – competitions, and e-portfolios. Some pilot programs in the GBA have implemented a "40/30/30" model: 40% of assessment based on industry projects, 30% on e-portfolios, and 30% on exams.

UII is enhancing these interconnected innovations which creates favourable conditions for deepening UII.

A further remarkable example of using UII to promote economic development through skills development, exploiting the advantages of GBA is the development of financial technology education in the Qianhai district of Shenzhen. Qianhai has become a special industry cooperation zone integrating the service industry sector in GBA. A national policy document issued by the National Development and Reform Commission (2023), outlined the development goals of the "Qianhai Shenzhen-Hong Kong Modern Service Industry Cooperation Zone", along with the policy instruments to achieve them. These measures explicitly included the leveraging of UII to promote skills development.. The document suggested the "deepening of the integration of science and education, industry and education, the creation of new "innovation and entrepreneurship colleges that match the industrial chain and innovation chain from a high starting point". It also encouraged "colleges and universities and vocational colleges to set up bases for the integration of industry and education" and to establish "long-

[11]This includes humanities, business and studies related with culture industries.

term mechanisms for school-enterprise joint training", creating a "training bases for high-tech and skilled talents."

In line with this national policy document Shenzhen's local financial authority established a development plan specifying concrete actions (Shenzhen Local…, 2023). This plan suggested, among others, the further advancement of the "Shenzhen-Hong Kong-Macao Fintech Professional Certification Program". This program was created in 2019 by the financial regulators of Shenzhen, Hong Kong, and Macao with the purpose of harmonising finance qualifications with the support of industry associations, universities, and research institutions. The program „has grown from scratch into a key talent development platform supporting the Greater Bay Area fintech ecosystem". After three years of successful operation, it lead to the creation of several new examinations, to the organisation of new several training programs and to the awarding almost two thousand professional certificates (Shenzhen Local…, 2023).

The creation of the Qianhai service industry cooperation zone with its specific priority related to the financial sector and cutting-edge financial technology illustrates well they way of UII is connected with the development of an advanced economic and technological area with exploiting the special advantages offered by the GBA. The development plan of the local financial authority, mentioned above, not only encouraged Shenzhen-based universities „to establish fintech degree programs and strengthen university-enterprise partnerships to jointly develop cutting-edge courses" (in areas, such a big data, blockchain, cloud computing, data mining, machine learning and intelligent risk control), but, at the same time, it also encouraged local fintech institutions to collaborate with universities in creating new UII institutions (such as student internship bases, postdoctoral research stations, innovation practice bases and municipal-level recognized fintech student training centre (Shenzhen Local…, 2023).

University level practices in Shenzhen

The richness of UII practices in Shenzhen can be seen only when one explores university level concrete practices. In this section we present some examples from three very different universities in Shenzhen. The comparison of these three cases shows different realisations of UII in a higher education system where different forms of higher education co-exists, each of them having their specific profile and also specific conditions and opportunities to connect university education with industrial practices.

The case of SZPU

SZPU (Shenzhen Polytechnic University) deserves a special attention in the context of exploring China's UII policies and practices. This institution originally provided "higher vocational education" (高等职业教育 - *Gāoděng zhíyè jiàoyù*) programs, that is, 3 years post-secondary programs below the bachelor's level, but following the creation of "vocational undergraduate education" (职业本科教育 - *Zhíyè běnkē jiàoyù*) programs in 2021[12] it was upgraded and became a university awarding 4 years undergraduate (bachelor level) diplomas. SZPU was one of the first new universities providing vocational undergraduate education in China. This kind of higher education institution can be described as a kind of bride between classical universities and vocational educations (traditionally provided mostly at secondary

[12] See „Circular of the General Office of the Ministry of Education on Printing and Distributing the Administrative Measures for the Establishment of Vocational Education Majors at the Undergraduate Level (for Trial Implementation" (教育部办公厅关于印发《本科层次职业教育专业设置管理办法（试行）》的通知) (online here: http://www.moe.gov.cn/srcsite/A07/zcs_zhgg/202101/t20210129_511682.html)

level). This kind of institution and programs provide a particularly favourable environment for integrating university education with industry.

The president of SZPU, before coming to this university, was a leader of the educational bureau of Shenzhen municipality, strongly committed both to UII and to the upgrading of vocational higher education. In an interview he presented SZPU's "nine common model" a particularly deep form of cooperation between universities and industry covering practically all components of education:

> "after extensive research and in-depth research, we have carried out the innovation of the "nine common" multi-subject education model with the characteristic industry college as the carrier, that is, each professional group unites a Fortune 500 company or industry leader and industry association to jointly build a characteristic industry college, benchmarking the "latest, highest and best", and implementing the "nine commons" (Xu Jianling, 2024).

The "nine common model" comprises the joint action of the university and industry in these areas: "joint governance and culture development, joint development of program syllabi and curricula, joint building of faculty teams, joint research on applied technologies, joint development of industrial standards, joint development of qualifications and certificates, joint provision of innovation and entrepreneurship education, joint engagement in modern apprenticeships and community services, and joint establishment of overseas TVET skill development centres" (Lin & Pang, 2024). "Joint action" means that the representatives of the university and the representatives of the companies are doing everything together, that is, practically any kind of teaching related activity is not done without the direct involvement and participation of industry (e.g. co-creation of curricula, common delivery of training programs etc.).

SZPU has several "industrial colleges" within its campus, which are run together with various companies. Company staff educates students together with the university staff in these schools. One of the many examples is the "School of Digital Media"[13] (see *Figure 3*) where bachelor or other programs are offered in areas like "packaging planning and design", "communication and planning", animation design", „radio, film and television program production", „digital graphic information processing technology", „digital media art and design", „digital publishing", cultural creativity and planning" and " game art design". Each of these programs have strong, area specific industry connections, and they apply the "nine joint action" model. The observer walking in these schools often have the feeling that what he/she sees resembles more to an advanced technology industrial environment than a school in the classical sense of the word (see *Figure 3*).

Figure 3.
The digital printing "classroom" of the School of Digital Media of SZPU

[13] See thre website of the school here: https://szcm.szpu.edu.cn/xygk1/xyjs.htm

Source: photo taken on the spot by the authors.

Another remarkable example of deep university-industry integration is the Huaway ICT Academy of SZPU. This illustrates well how an advanced technology company can create a university based programs in a specific area, that is, instead of creating an internal learning system it uses the university to train its labour force. Huawei's company based qualifications system make it possible in this case the realisation of a key element of the China's UII policies and practices, called "job-course-competition-certificate" (岗课赛证 - *găng kè sài zhèng*). This means transforming job requirements into curricula and learning outcomes, promoting the acquisition of competences through competitions which also plays the role of assessment leading to formal qualifications. Huawei plays a central role in co-shaping standards and training pathways, which reflects a shift from the traditional university model of "teaching → testing→graduation" toward a "co-design→co-deliver→co-validate" logic. The co-delivering means that the engineers of Huawei are also teaching students, together with university teacher who also often attend the lessons held by these engineers. In this model the company is not only a technological standard-setter and recruiter, but also plays an embedded role shaping how the skills of the people it will recruit are produced.

All industrial colleges of SZPU are equipped with advanced technological tools, some of them capable to produce high quality innovative products. Perhaps the most outstanding example is is the Institute of Future Technology co-founded by Shenzhen Polytechnic University (SZPU), the local government and educational and incubation platform institution created by an entrepreneurial technology professor (Li Ze Xiang) in 2021.[14] This advanced "teaching laboratory" focuses on advanced robotics and automation, with instructors bringing experiences from leading high-tech companies, such as Huawei or DJI, and the China Academy of Space Technology (SZPU, 2024). This institute educates students to work as entrepreneurs/innovators, makers and discoverers, and future leaders through learning and practicing cross-disciplinary thinking. It has adopted cutting-edge, interdisciplinary approaches to teaching and learning, using project-based learning and customized individual learning paths, and encourages learning through playing. The student project teams of the school identify real-world problems through market research, they propose design solutions and create prototypes. They can also validate the commercialization potential of their products through creating start-ups.

[14] See the institute's website here: https://www.szpu.edu.cn/info/1006/11277.htm

The case of SZU

SZU (Shenzhen University) is the oldest university of the city: it was established in 1983, ten years before the establishment of SZPU, as an „experimental university", with the support of leading Chinese research universities. Similarly to SZPU it collaborates intensively with leading high-technology companies, although the impact of this collaboration is stronger in the area of research and development (related with cutting-edge technologies) than on in the area of skills development. This university, with a clear interdisciplinary mission, presents a rich, evolving case of UII, influenced directly by the city's extraordinary reform-dynamism. Its development has been marked by (1) openness to institutional innovations, (2) very strong regional embeddedness, and (3) deep collaboration with industry stakeholders. It illustrates well the dynamic integration of teaching, research, and production (产学研一体化 - *Chǎn xuéyán yītǐ huà*).

Shenzhen University has played a key role in educating those entrepreneurs who after graduation created powerful high tech companies, such as Tencent or BYD.[15] One of the strength of SZU is having a large network of alumni in key positions in such companies which creates an important informal channel of university-industry cooperation, often leading to receiving significant donations from these alumni and the creation of new institutions based on cooperation agreements with their companies.

Although cooperation with industry in the case of research universities, like SZU, is less frequently called "integration" than in the case of vocational universities, such as PSZU, its level is often similarly high, and the use of the word "integration" also often appears. One example is the presentation of cooperative actions in a recent agreement between SZU and Tencent focusing of skills development ("talent development"). The "China Education Online" education portal presented the signing of this agreement (see *Figure 4*) as aiming at "integrating industry and academia to facilitate scientific research and talent training", using the term "*chǎn xué rónghé*" (产学融合) Besides other elements (such as university infrastructure development and research cooperation) this agreement included also several skills development elements , such us „jointly building teaching resources and practice bases, continuing to promote the construction of Shenzhen University-Tencent Cloud School of Artificial Intelligence undergraduate innovation characteristic class (Tengban), promoting joint training from undergraduate to master's and doctoral degrees, increasing the depth of AI talent training, and providing technical support, resource support and expert support for high-level talent training".[16]

Figure 4.
The signing of an agreement on university-industry integration between SZU and Tencent (2022)

[15] A frequently mentioned case is that of Ma Huateng or "Pony Ma" who created Tencent together with his classmates, all graduating at SZU.

[16] See the webpage entitled „Tencent signed a strategic agreement with Shenzhen University to integrate industry and academia to facilitate scientific research and talent training" (腾讯与深圳大学签署战略协议 产学融合助力科研探索、人才培养等五大领域) here: https://news.eol.cn/hot/hangye/202206/t20220630_2235123.shtml.

Source: China Education Online

The implementation of this agreement can be illustrated by the inauguration of SZU's School of Artificial Intelligence. Besides Tencent, other leading IT and communication technology companies (such as Huawei and others) also supported the creation of this school which will offer comprehensive programs at the bachelor's, master's, and doctoral levels, aiming to integrate cutting-edge technologies with industry needs. At the inauguration ceremony the president of SZU stressed the intention of SZU to combine "academic rigor and practical expertise", demonstrating the typical attitude of research universities, trying to promote UII without making concession of classical academic values.[17]

There are many other examples of creating various institutional forms (schools, centres) promoting UII within the university in cooperation with different high tech companies. Another illustration is the creation of a SZU "internship centre" in 2020 as part the common "University-Enterprise Coordination and Industry-Education Integration Cooperation Strategy" of SZU and Tencent. The aim of this centre is to be "a platform for SZU and Tencent to explore the cultivation of a new-type of talented people and to cooperate in Tencent's overseas-related businesses".[18]

Although SZU defines itself as a high-ranking comprehensive research university with a strong emphasis on cutting-edge research, its cooperation with industry is not limited to the research domain. Industrial partners also have a relatively strong influence on its study programs, tailored to the specific needs of different disciplinary areas. Various narratives about SZU (e.g. (Meng, 2024; Xu, 2024) show that UII at this university has not been based on a top-down imposed model but can rather be described as an evolutionary process, rooted in local conditions and initiatives of faculty and student. SZU seems to present a unique constellation of UII practices, each tailored to the disciplinary logic and the industry environment it serves.

The case of SUST

SUST or SUSTech (Southern University of Science and Technology) is sometimes mentioned as institutional miracle, symbolising the astonishing rapid development of higher education in Shenzhen (one example of the "Shenzhen speed" in the education sector). This is one of the

[17] See the webpage „*SZU launches new AI school*" of SZU here: https://en.szu.edu.cn/info/1013/1793.htm?utm_source=chatgpt.com.
[18] See the webpage „*SZU, Tencent inaugurate internship base*" of the internet portal of the Shenzhen Municipal Government here: https://www.eyeshenzhen.com/content/2020-10/12/content_23627085.htm?utm_source=chatgpt.com.

youngest universities of the city which in less than one and a half decade became a leading global university. This university was also conceived as an experimental institution promoting advanced, unconventional forms of learning. As a case study presenting SUST stated this university, since its establishment, has tried "breaking free from the constraints of established Chinese universities" (Li & Li, 2023). A public document presenting the university mentions that SUST was founded in 2010 as an „experiment in higher education reform"[19]. This document, published by SUST, stresses that the university „rather than teach by rote memorization using a standardized curriculum along the traditional and separate tracks of science and the arts" borrowing „ideas and methods from the world's best universities in the United States, Europe and elsewhere", promoting „innovation, collaboration and project-based learning" through, among others, requiring students to combine „classes in both science and the humanities".

Similarly to SZU, this research university also combines the strive for academic rigour and openness towards industrial practice. The commitment of SUST to integrating university education with industrial practice, going beyond traditional cooperation or partnerships and embedding industry collaboration into its core educational and research missions can be illustrated by several examples. As the public document quoted above mentions SUSTech operates over 55 research labs "jointly with local companies", providing students with real-world experiences. Faculty members at SUST encouraged to engage in entrepreneurial activities, the university allowing them to retain a significant share of their intellectual property from their startups, which has resulted in the creation of many faculty-led companies. As the public document quoted above says: "company executives and chief scientists regularly visit campus to lead seminars and give lectures, and students get to tour their manufacturing plants."

One example of SUST's commitment to connecting education with real-world practice is its recent initiative to establish a practice-oriented doctoral program in business studies, in collaboration with a Hong Kong–based university. To lead this effort, SUST invited a prominent physicist—who not only has a strong interest in advanced IT engineering but is also the founder of several AI-focused technology companies—to design a program that integrates business and engineering, specifically targeting technology-oriented entrepreneurs and innovation-driven business leaders..[20] As a slide of a PowerPoint presentation about this program shows this new program will connect the technology oriented schools of SUST with industry in the Greater Bay Area (see *Figure 5*).

Figure 5.
The strategy of SUST to create a practice oriented doctoral program in business studies (DBA) (2025)

[19] See the webpage "*Full Speed Ahead. SUSTech's higher education reform poised to make China's high-tech sector better and smarter*" of the UK HE portal „Inside HE" here: https://narratives.insidehighered.com/sustech-full-speed-ahead/index.html?utm_source=chatgpt.com
[20] Source: Interview with professor Ma Zhaoyuan (SUST) (April, 2025).

Source: A PowerPoint presentation of professor Ma Zhaoyuan

The advanced (active) forms of organising teaching and learning in SUST – for example the use project based learning where students work on real-life problems – makes it necessary to have intensive and deep cooperation with industry as the major source of these real-life problems. At SUST, there is not only a strong belief that students' highest-level cognitive skills can be developed only when they are placed in highly complex and open-ended problem situations, but also a commitment to systematically studying how such situations impact skill development.[21] A further illustration of SUST's commitment to build deep connections with industry is the practice of its School of Design which strongly emphasizes hands-on learning, interdisciplinary collaboration, and direct engagement with industry partners.

Although collaboration with industry is strongly emphasized in documents presenting SUST, corporate influence and the deep and direct involvement of companies in the university's daily teaching practices appears to be less extensive than at SZU. Like many other universities, SUST has signed numerous agreements with leading Chinese enterprises (e.g., Tencent, Huawei, DJI, BYD, ZTE), which have enabled case-study development, internships, and even industry-certified training programs. However, the extent to which these companies influence the content and form of teaching remains more limited compared to the two other universities. This may be related to SUST's particularly progressive pedagogical model, which fosters high openness to practical and real-life learning within a liberal education paradigm even without strong external (industrial) pressure.

Comparison of three Shenzhen universities

The comparison of the three Shenzhen universities provide valuable insights for understanding better UII practices: it illustrates the diversity of realising diverse models in the framework of China's national policy. As mentioned earlier national policies have explicitly encouraged diversity through the creation of local UII models. This led not only of different provincial or city level solutions but also various solutions in different universities. Not only each university has its own approach related to UII but also within the universities different disciplinary areas realise different forms of UII.

On the basis of the analysis of resources collected prior to, during and after the visits to the three universities we can conclude that while SZPU as a clearly vocationally oriented university has developed a model tying teaching directly to industry demands, SZU, as a comprehensive research university, has developed a hybrid model where the curriculum remains under

[21] Source: A PowerPoint presentation by professor Ma Yongsheng (SUST) (April, 2025)

academic control but companies are often allowed to have strong or deep influence in various disciplinary areas on the basis of specific agreements. In SZPU the level of alignment between university curricula and industry-based qualifications requirements might be very high (for example companies might train students on-site, and certifications for graduation might be non-negotiable). In the case of SZU special agreements with companies (such as Tencent or Huawei) might similarly lead to deep integration, such as the creation of programs leading to company specific qualifications but this does not question academic control and does not reduce the basic theoretical orientation of most programs.

SUST, as another comprehensive research university is unique because of its strong commitment to progressive, practice oriented pedagogy which makes it possible to develop high level industry relevant skills without direct corporate intervention in the organisation of teaching and learning. In this university the collaboration with industry collaboration enhances not only research and innovation but also and creates favourable condition for teaching and learning based of real-life projects, however, it does not lead to significant corporate control of the content and form or teaching.

The differences between the three universities appear in several dimensions, such as the level of industry involvement in teaching design, the level of control over curriculum by industry, the integration of industry-certified training into university programs or the emphasis on practical learning. As the case of SUST shows, the higher level of institutional autonomy and the stronger focus of liberal/general education can also influence the concrete way UII is realised. A summary of the differences in these dimensions is presented in Table 1.

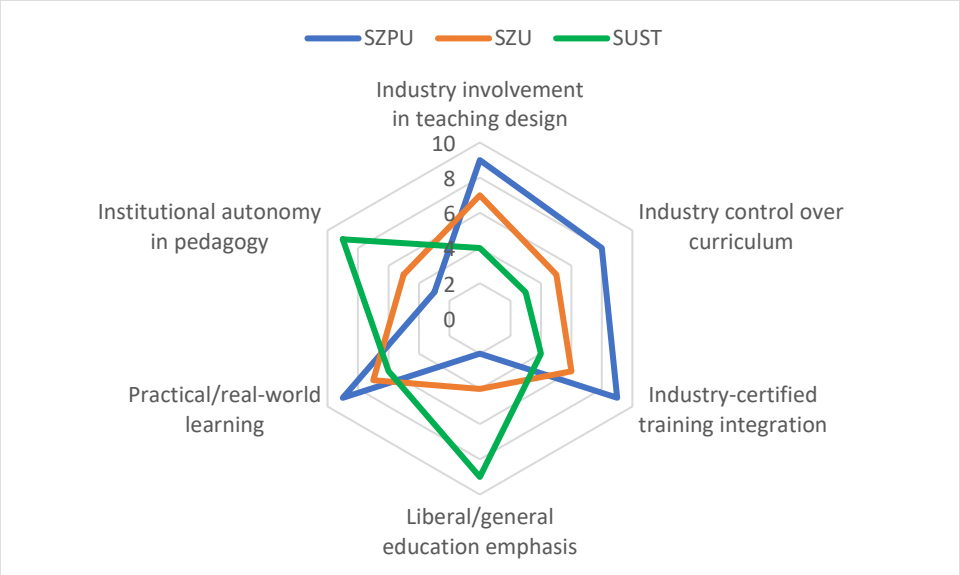
Table 1
The comparison of the three Shenzhen universities in six dimensions

	SZPU	SZU	SUST
Industry involvement in teaching design	Strong co-development with employers (e.g. factory module design)	Industry co-design in applied programs (e.g. Huawei ICT courses)	Industry guests and labs; less involvement in course structure
Industry control over curriculum	Industry-led training paths; skills dictated by employers	Joint governance through advisory boards	Minimal in curriculum; limited to research partnerships
Industry-certified training integration	Widespread certification embedded in degrees (e.g. Foxconn/Huawei)	Common in digital/media fields (e.g. Tencent-certified programs)	Selective certifications (e.g. Huawei Cloud)
Liberal/general education emphasis	Minimal; curriculum focused on job readiness	Present but secondary to employability	Core to academic model (liberal arts, interdisciplinary foundations)
Practical/real-world learning	Integral to all programs (on-site training, apprenticeships)	Internship-heavy programs (e.g. ZTE placements, fintech labs)	Strong in engineering/AI, but less formalized than SZU/SZPU
Institutional autonomy in pedagogy	Low autonomy; programs shaped by vocational mandates	Moderate; mix of academic and industry-driven structures	High; faculty lead core design and curricular content

Note: This table was created with AI assistance. (for a mode detailed description of the procedure of using AI see the "Methodological notes" in Annex 2

Taking into account these six dimensions it is possible to create specific institutional profiles for better comparison. *Figure 6* shows the outco me of an AI generated comparison based on the evaluation of these dimensions. This AI generated figure not only illustrates well the differences between the three universities and but also allows the identification of three typical education-oriented UII models. The first model, represented by SZPU, shows strong and deep alignment between university teaching and industrial needs. The second model, represented by SZU, shows a hybrid solution where the academic control is maintained but does not exclude deep integration based on specific agreements in specific disciplinary areas. The third model, represented by SUST, realises integration within the framework of a progressive, practice oriented pedagogy that remains under full academic control.

Figure 6.
The skills-development related UII profiles of the three Shenzhen universities



Notes: This figure was created with AI assistance. (for a mode detailed description of the procedure of using AI see the "Methodological notes" in Annex 2.

This comparison exercise demonstrates that China's UII policy allows for the emergence of highly diverse university-level patterns. When one zooms in on specific institutions, even greater variation can be observed at the level of individual disciplines or industrial sectors. Various publications on SZU, for example, reveal that distinct models of integration have developed in fields such as architecture and urban design, engineering, journalism and communication, digital media, and fashion design (Li, 2024; Yang, 2023; Wang, 2024; Zhang et al., 2024).

Conclusions

Shenzhen, as one of the 11 cities of the GBA area, represents a highly specific case due to the extraordinary dynamism of its industrial and social development. Influential industrial stakeholders – working closely with municipal leaders—recognized early on the strategic importance of human resources for driving industrial growth. Another key specificity of Shenzhen, especially relevant from the perspective of UII policies and practices, is its integration into the GBA. This regional context offers additional opportunities for the development of a globalized, high-tech, knowledge-based, and service-oriented economy. In this environment, UII is not only a major driver of development but is also shaped by it. The

advanced industrial landscape serves as a modernizing force for the higher education sector, providing numerous opportunities for universities to learn from industry.

An important conclusion of this case study is that the UII phenomenon can be understood well only using a multilevel perspective, comprising the national, the provincial/city, the institutional and the program levels. There are many patterns of UII: not only provinces and cities are different, but also every university and withing the universities every disciplinary area. Applying a multilevel perspective a high level diversity appears, which is a logical consequence of China's UII policy encouraging local initiatives and experimentation.

Shenzhen has been playing a pioneer role in promoting UII, including the building of new institutional mechanisms assuring city level coordination and monitoring of UII activities and also assuring their sustainability. The creation of the Shenzhen Citywide Industry-Education Consortium has been a powerful model of building institutional mechanisms bringing together education (both universities and vocational schools) and industry.

A further conclusion is that the UII phenomenon can – and should –be decomposed into distinct elements, requiring a multidimensional approach. This enables the creation of university-specific or program-specific (by discipline or sector) profiles that can be compared and used as models. The six dimensions identified in this case study may serve as a useful analytical tool for future case studies.

The final conclusion is that university education can become more industry-relevant not only by connecting institutions directly with external industry partners, but also through internal pedagogical reforms that transform teaching and learning practices. The case of SUST demonstrates that universities can develop the high-level practical skills demanded by advanced industry through modernized educational methods also without ceding control of the curriculum to corporate partners.

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Annexes

Annex 1: The Shenzhen/Guangzhou/Hong Kong field visits

The authors conducted two fact-finding missions in China (the first in Shenzhen/Guangzhou between April 8 and April 18, 2025; and the second in Hong Kong, between 12nd and 22nd of June) to support the preparation of a case study, as outlined in the work plan of the project titled *"University–Industry Integration Policies and Practices in China: Potential Applications in Hungary."* The primary goal of the mission was to collect data on university–industry integration (UII) policies and practices in Shenzhen and the Greater Bay Area (GBA).

During the mission, the authors had the opportunity to meet visit 9, and meet the representatives of 11 universities: (1) Shenzhen Polytechnic University (SZPU), (2) Southern University of Science and Technology (SUST), (3) Shenzhen University (SZU), (4) South China Normal University (SCNU), (5) South China University of Technology (SCUST); (6) Hong Kong University (HKU), (7) Education University of Hong Kong (EdUHK), (8) Hongkong University of Science and Technology (HKUST), (9) Hong Kong Polytechnic University (PolyU); (10) Chinese University of Hong Kong (CUHK), (11) Hong Kong Metropolitan University (HKMU). They also visited several specialized research institutes and one university funding agency (UGC Hong Kong). They engaged in discussions with a large number of researchers and local experts, and participated in three academic events: a major conference organized by Shenzhen University, a seminar hosted by Southern University of Science and Technology, and a conference hosted by the Education University of Hongkong. At these events, they delivered presentations on UII and exchanged insights with local scholars.

Shenzhen was selected as the primary focus of the first UII case study due to its unique context. The city's universities – most of which are relatively young – maintain strong ties with

companies operating at the cutting edge of global technological innovation. These firms require highly advanced and specialized skills, which can only be developed through deep and sustained collaboration between academia and industry. Such collaboration enables the creation of learning environments that are capable of cultivating the necessary competencies. The openness of these new universities to novel teaching and learning practices provides fertile ground for the pedagogical and institutional innovations essential to UII.

The mission was preceded by an intensive desk-based exploration of higher education development in Shenzhen, Guangzhou (the capital of Guangdong province), and the wider GBA, especially Hong Kong. A significant body of policy documents and related literature was collected and reviewed in advance. Key universities and experts were contacted prior to the visit, and the detailed itinerary was coordinated through online consultations.

The schedule/program of the Shenzhen/Guangzhou field visit

April 7	Monday	Budapest	Departure
April 8	Tuesday	Shenzhen	Program coordination, preparing meetings
April 9	Wednesday	Shenzhen	Visiting SZPU and UNESCO TVET research centre
April 10	Thursday	Shenzhen	Visiting SUSTech, attending seminar on UII (with lecturing on EU UIC policies), meeting with local entrepreneur and expert
April 11	Friday	Shenzhen	Visiting workshops in SZU, meeting SZU leaders at welcome dinner
April 12	Saturday	Shenzhen	Conference participation at SZU, conversations with SZU researchers
April 13	Sunday	Shenzhen	Conference participation at SZU (lecturing on UIC), data analysis, visiting Shenzhen districts
April 14	Monday	Shenzhen	Data analysis, program coordination, online interview with SCNU researcher
April 15	Tuesday	Guangzhou	Travel to Guangzhou, lecture at SCNU, dinner with SCNU researchers
April 16	Wednesday	Guangzhou	Meeting with SCNU leaders, meeting with SCNU UIC research centre leader, visiting SCUT
April 17	Thursday	Shenzhen	Lecturing at SZU (EU education policies) and departure to airport
April 18	Friday	Shenzhen/Budapest	Arrival to Budapest

The schedule/program of the Shenzhen/Guangzhou field visit

June 12	Thursday	Budapest	Departure
June 13	Friday	Hong Kong	Visiting Hong Kong University International China Business School
June 14-15	Saturday/ Sunday	Hong Kong	Rest and preparation for the GRIFE conference and subsequent meetings; establishing contact with the leader of iTec Forward Ltd
June 16	Monday	Hong Kong	Attending the GRIFE conference; panel discussion; meeting ZOU Xiaoping Tracy

			(CUHK); HO Chun Sing (EdUHK); CAI Yuzhuo (EdUHK); LAM Lai-Ling (LCC International University); CHAN Tak-Yuan (Hong Kong Metropolitan University)
June 17	Tuesday	Hong Kong	Attending the GRIFE conference; presenting our UIC/UII research; meeting XING Xin (Yan'an University); ZHU Yuefeng (EdUHK Business School); TSANG Zhian (HKUST Business School)
June 18	Wednesday	Hong Kong	Attending the GRIFE SIG HE research meeting; Meeting CHAN K. K. (University of Hong Kong)
June 19	Thursday		Visiting Hong Kong Polytechnic University (two relevant units)
June 20	Friday		Meeting the leading administrators of the Hong Kong University Grants Committee
June 21	Saturday	Hong Kong	Analysing the information collected during the mission, preparing the report about it, working on the revision of the first case study.
June 22	Sunday	Hong Kong	Departure back to Hungary

Annex 2: Methodological notes

Methodological notes on the procedure of AI-assisted creation of analytical dimensions and scores for visualisation

Data input and contextual foundation

The comparative framework was developed through an interactive conversation with AI systems (ChatGPT and DeepSeek) focusing on university–industry integration (UII) in the domain of teaching and learning, particularly with regard to talent development (i.e. skill formation in students). The conversation allowed the authors to ask question based on their visits to the three universities during their field study in Shenzhen. As part of this process, the AI systems also gathered publicly available information, including:

- University websites and institutional self-descriptions
- Local and national policy documents related to UII
- Media coverage concerning university–industry collaboration
- Reports issued by universities and public/local authorities.

These content of the conversations and the sources were used as an input by the AI systems to form a descriptive, interpretive model of UII characteristics related to education and skills development.

Dimension development and qualitative mapping

Based on the inputs (the conversations and the collected material), six key dimensions (axes) were inductively defined by one of the AI systems to capture different aspects of UII in teaching and learning:

- Industry involvement in teaching design
- Industry control over curriculum
- Industry-certified training integration
- Liberal/general education emphasis
- Practical/real-world learning
- Institutional autonomy in pedagogy.

These dimensions were created by AI in the process of our communication with AI with multiple refinements through iterative steps. The AI systems were instructed to describe the key characteristics of the three universities (SZPU, SZU, SUST) according to these dimensions. This resulted in the creation of a comparative tables. Tables created by ChatGPT were refined through asking DeepSeek to verify them based on the identified resources.

Scoring and Visualization

Recognizing the potential of the six dimensions as scales, the authors requested the AI to assign indicative scores to each university along the six axes based on the analysis behind the qualitative table. These scores were not measured through empirical instruments but rather represent a qualitative synthesis and interpretive judgment based on the earlier descriptions. This scoring enabled the creation of the radar chart (spider diagram) for visual comparison.

Validation and feedback

The preliminary model has been shared and discussed with local experts and individuals familiar with the institutional contexts. Feedback from these exchanges is being used to refine the understanding of each university's position, providing a basic validation through expert reflection rather than empirical triangulation.

Advantages and Limitations

Using AI-assisted dimension generation and scoring for visualization leverages the potential of what some scholars refer to as the emerging "*AI-driven research ecosystem*".[22] This approach offers significant advantages, but also comes with inherent limitations. Among its key strengths, the AI-assisted method is resource-efficient and enhances conceptual clarity in cross-institutional comparisons. It also helps to illustrate nuanced patterns of university–industry integration in teaching. Furthermore, the dimensions generated through this process can inform the design of subsequent case studies.

However, important limitations must be acknowledged. The process by which AI generates dimensions from diverse inputs is not fully transparent, raising questions about interpretability. Moreover, the scores produced are not derived from direct measurement or standardized indicators. Rather, they are intended to serve illustrative and interpretive

[22] See Xiong, F., Yu, X., Leong, H. W., & Ma, A. (2025). AI-Driven Research Ecosystem: Unifying Human-AI Collaboration Models and New Research Thinking Paradigms. Journal of Educational Technology and Innovation, 7(1), 39–53. https://doi.org/10.61414/n0n76c97

purposes only and should not be regarded as precise or quantitative representations of institutional performance.