

inspiring them to develop and commercialize new technologies. In addition, the introduction of pro-business legislation and regulation mechanisms has eased the process of business formalization, resulting in a greater influx of new start-ups and businesses, investment and financial capital. To enable prosperous economic development, municipal governments should integrate processes that foster an ease of doing business, nurturing entrepreneurs and businesses through the development process by minimizing red tape, ensuring consistent policymaking, and offering accessible and approachable government agencies.

2. Promote innovation-based entrepreneurship

Curitiba's focus on entrepreneurship has helped catalyze a shift towards an innovative, creative urban economy. Driving the smart city shift, entrepreneurship helps to locate and exploit opportunities in the market; generating innovative solutions to emerging challenges whilst boosting capital formation and investments as well as per capita income. Where technological interventions and innovations are largely driven by entrepreneurs in the city, they also help cities to undergo economic and socio-technical transitions, changing the relationship between workers and the workplace, and realizing new modes of economic development. Converting latent and idle resources into ideas, and goods and services, entrepreneurs and start-ups spark collaboration and cooperation, and open up diverse employment opportunities which help to produce a more productive workforce and improved economy. Cities therefore contain untapped potential to actively encourage entrepreneurs and start-ups as a means to foster growth.

3. Understand the role of urban innovation ecosystems in driving economic growth

Innovation-based start-up ecosystems are emerging in urban areas across the world with cities best placed to meet the needs of entrepreneurs via their high concentrations of capital, diversity and interaction. As exemplified by the Pinhão Valley Plan, urban ecosystems can unlock new jobs and economic opportunities emerging from new business models propelled by start-ups and innovation. In addition, they help pool resources for local innovation in areas such as R&D and out-of-city 'innovation leaders' which serve to further diversify local economies and

boost competitiveness between cities and regions. They therefore play a vital role in facilitating new urban business environments, altering the economic dynamics of the city and stimulating greater levels of innovation compared to traditional industry, driving economic growth. Understanding the benefits of local innovation ecosystems is thus of great significance through which cities can foster entrepreneurship that creates new sectors and businesses, and which strengthens local and regional economies.

Monterrey, Mexico: Sparking the Potential of Universities to Drive Innovation and Entrepreneurship via Industry and Community Partnerships

Case background

Globally, cities and universities are cooperating to create new dynamic economies and rejuvenate societies. Mexico has long valued the development of its internal education, and in the early 1990s initiated educational reforms and established a new educational model –Modelo Pedagógico. The model not only focused on school teaching reform but also the relationship between school and society, and the education of society which has since led to an initial modern educational concept. Mexico is at the core of the technological revolution in Latin America and embraces new technological achievements. And as an emerging economy, the country possesses a rapidly growing education centre and a soaring entrepreneurial ecosystem that cooperates with regions across the Gulf of Mexico.

Situated in northern Mexico, Monterrey is one of the major cities in the Gulf of Mexico bordering the United States of America, affording it advantages in terms of an entrepreneurial ecosystem. It is one of the wealthiest cities and the third largest metropolitan area in the country, ranking first in per capita income and offering many convenient facilities. The revitalization of areas such as Barrio Antiguo in recent years has created a thriving and safe atmosphere in the city with a vibrant culture and educational system, which along with its dynamic academic facilities and enriched academic capacity, promotes an influx of

skilled professionals.¹² At the forefront, the Monterrey Institute of Technology and Higher Education (ITESM) is pioneering development and positioned to be a leader in catalyzing national urban and economic regeneration, highlighting the power for Latin American universities to serve as engines of innovation and entrepreneurship.

Established in July 1943, ITESM is the most authoritative institute in the country. The faculty was set up following a proposal from entrepreneurs who aimed to create a private university offering the highest academic standards, learning from the MIT model in the United States of America, and promoting scientific and technological development across Mexico. As the urban environment of core areas in Monterrey deteriorated, the board of directors at ITESM agreed on a plan to revitalize neighbouring campus blocks,¹³ increasing traction of the close cooperation between cities and major universities to develop innovative economy and social revitalization. ITESM has ambitions to become one of the top 100 universities in the world and the best in Latin America, and aims to play a leading role in promoting the revitalization of Monterrey's economic and social fabric to showcase the strength of Latin American universities in fostering entrepreneurship and innovation. To realize this goal, Sasaki (an interdisciplinary design firm) collaborated with ITESM to develop a masterplan to renew the site, providing a framework for the long-term development of the campus and its surrounding communities. At its core, the plan seeks to reinvigorate the relationship between the university and the city to create a campus environment that will attract R&D investment and build vibrant, attractive and dynamic communities in the region. The plan also seeks to promote integrated and connected public development space, supporting clusters that will contribute to the new economic development and facilitate revitalization of neighbouring blocks.

Implementation process

Redesigning the pedagogical structure of the Monterrey Institute of Technology and Higher Education

In 2015, ITESM launched a forward-oriented plan entitled Tec 21 Education Model, an ambitious proposal aiming to reshape the comprehensive pedagogical structure. Critically, it will encourage students to communicate with relevant industries and surrounding communities for space exploration and promote collaboration between interdisciplinary departments. Following an assessment of ITESM's 29 campuses, the Querétaro and Puebla campuses were selected to be part of the pilot renovation and were completed in January 2016 and February 2017 respectively (see Figure 3.6 and 3.7). As a key step this renovation laid a foundation for the subsequent Tec 21 Education Model.

In August 2017, the interior design of La Carreta Pavilion was completed. An essential landmark in the Tech 21 Education Model, La Carreta Pavilion, as shown in Figure 3.8, is located at the core of the campus. Designed to host exhibitions, research, inventions, competitions and collaboration summits, it also serves as a space to encourage connections and exchange ideas between students, faculty and staff, and communities. Construction of the New Main Library was also completed with the previous structure transformed into a highly innovative and dynamic learning environment. The library sits at the heart of the campus – an information database and learning arena to encourage transparent participation and cooperation between students and faculty, staff and regional industry leaders (see Figure 3.9). As core elements in the large-scale strategic planning of ITESM, the New Main Library together with the La Carreta Pavilion complete the first steps of the masterplan for the campus and the region.

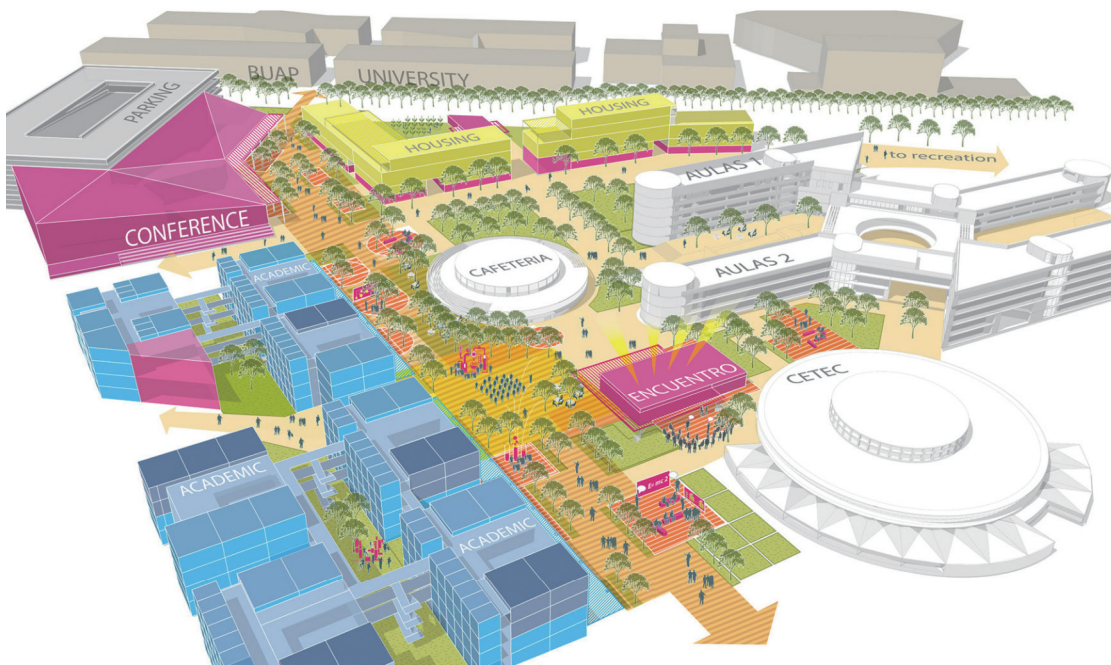
12 Case Study: AIA Urban Design Honourary Award 2017 – The Revitalization Plan of the Monterrey Institute of Technology and Higher Education, Mexico.

13 Tetakawi. URL: <https://tetakawi.com/zh-hans/%e5%af%bb%e6%89%be%e9%80%82%e5%90%88%e8%b4%b5%e5%85%ac%e5%8f%b8%e7%9a%84%e5%9c%b0%e7%82%b9%ef%bc%81/manufacturing-in-monterrey-nuevo-leon/> (Accessed: 03/08/2022).



Source: Sasaki. URL: <https://www.sasaki.com/zh/projects/campus-queretaro/> (Accessed: 30/07/2022)

Figure 3.6 Illustration of the Querétaro campus plan



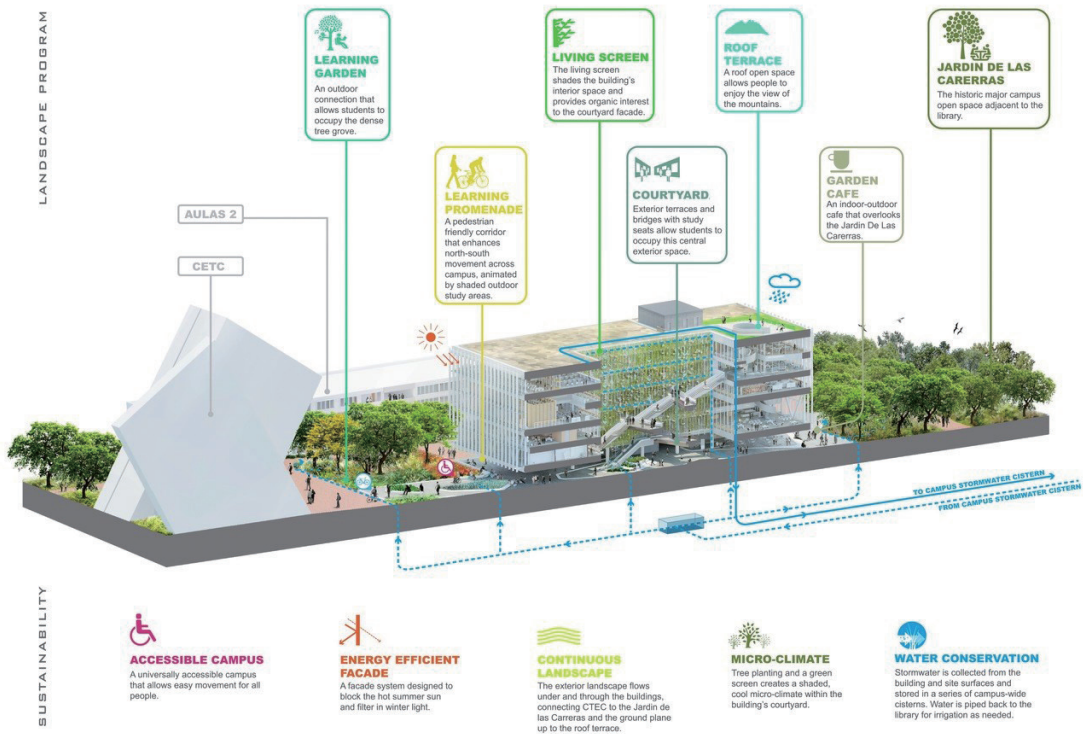
Source: Sasaki. URL: <https://www.sasaki.com/zh/projects/campus-puebla/> (Accessed: 30/07/2022)

Figure 3.7 A 3D overview of the Puebla campus plan



Source: Sasaki. URL: <https://www.sasaki.com/zh/projects/tecnologico-de-monterrey-la-carreta-pavilion/> (Accessed: 30/07/2022)

Figure 3.8 The enclosure of La Carreta Pavilion



Source: Zhuohan Suwen Architects. URL: <https://www.zshid.com/?c=building&a=view&id=2220> (2018) (Accessed: 30/07/2022)

Figure 3.9 Key elements of the New Main Library

The masterplan is based around a new development axis, the Avenida del Estado as shown in Figure 3.10. It covers previous core areas of the campus and directly connects the recreational area in the north. Inspired by the Tech 21 Education Model, the two key points at each end of the core area (the New Main Library and La Carreta Pavilion) will offer opportunities for interdisciplinary learning. According to the masterplan,

current underutilized spaces will be transformed into hubs for collaboration and entrepreneurship. The new development layout illustrated by the masterplan not only broadens the existing boundaries of the campus but also connects to external spaces, new planning areas and surrounding communities to contribute to ecological, social and economic sustainability goals (see Figure 3.11 and Table 3.1).

Table 3.1 Programme components

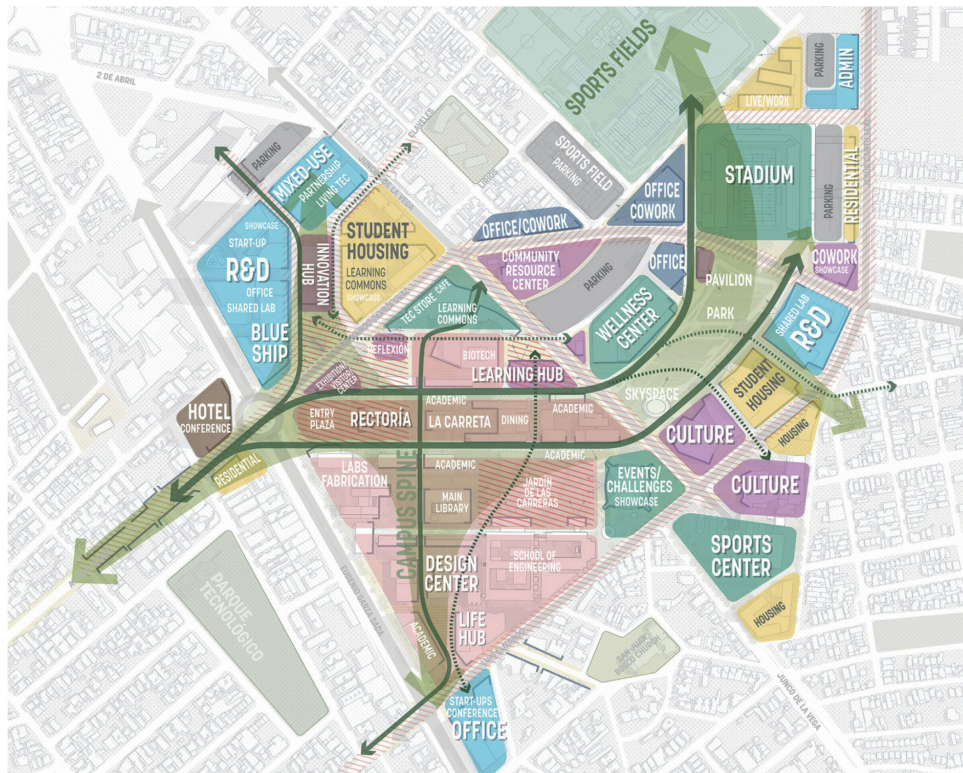
Source: Sasaki. URL: <https://www.sasaki.com/zh/projects/tecnologico-de-monterrey-urban-regeneration-plan/> (Accessed: 01/08/2022)

Entrepreneurship and Research Expansion	<p>Research and Development Cluster: <i>allies industries, synergies with Tec applied research activities</i></p> <p>Innovation, Entrepreneurship and Alumni Centre: <i>Incubators, collaboration spaces, showcase, events, meeting areas</i></p>
Collaboration Spaces	<p>Library: <i>student life environments, library, integrated study, dining and café</i></p> <p>Student and Faculty Commons: <i>co-working spaces, faculty lounge</i></p> <p>Tec X Pavilion: <i>showcase, events, flexible spaces, information hub</i></p> <p>New Dining Experience: <i>enhance and expand food services on campus and district</i></p>
Learning Nodes	<p>Design Centre: <i>Engineering, art, architecture, industrial design, industry gateway</i></p> <p>Biotech Plaza: <i>Programme expansion, industry gateway</i></p>
Mind, Body and Spirit Integration	<p>Recreation Centre: <i>indoor facilities, connected to campus</i></p> <p>Borregos Stadium: <i>viewing area, integrated with amenities</i></p> <p>Cultural Expansion: <i>expansion of cultural programmes on campus and district</i></p>
Neighbourhood Regeneration and Community Development	<p>New Student and Faculty Housing: <i>new modes of living, neighbourhood integration</i></p> <p>Community Resource Centre: <i>job training, community spaces, outreach, social incubators</i></p> <p>Public Realm Improvements: <i>parks, sidewalks, bike lanes, sustainability strategies, safety</i></p>



Source: Sasaki. URL: <https://www.sasaki.com/zh/projects/tecnologico-de-monterrey-urban-regeneration-plan/> (Accessed: 01/08/2022)

Figure 3.10 The integrated framework of the urban renewal plan for ITESM

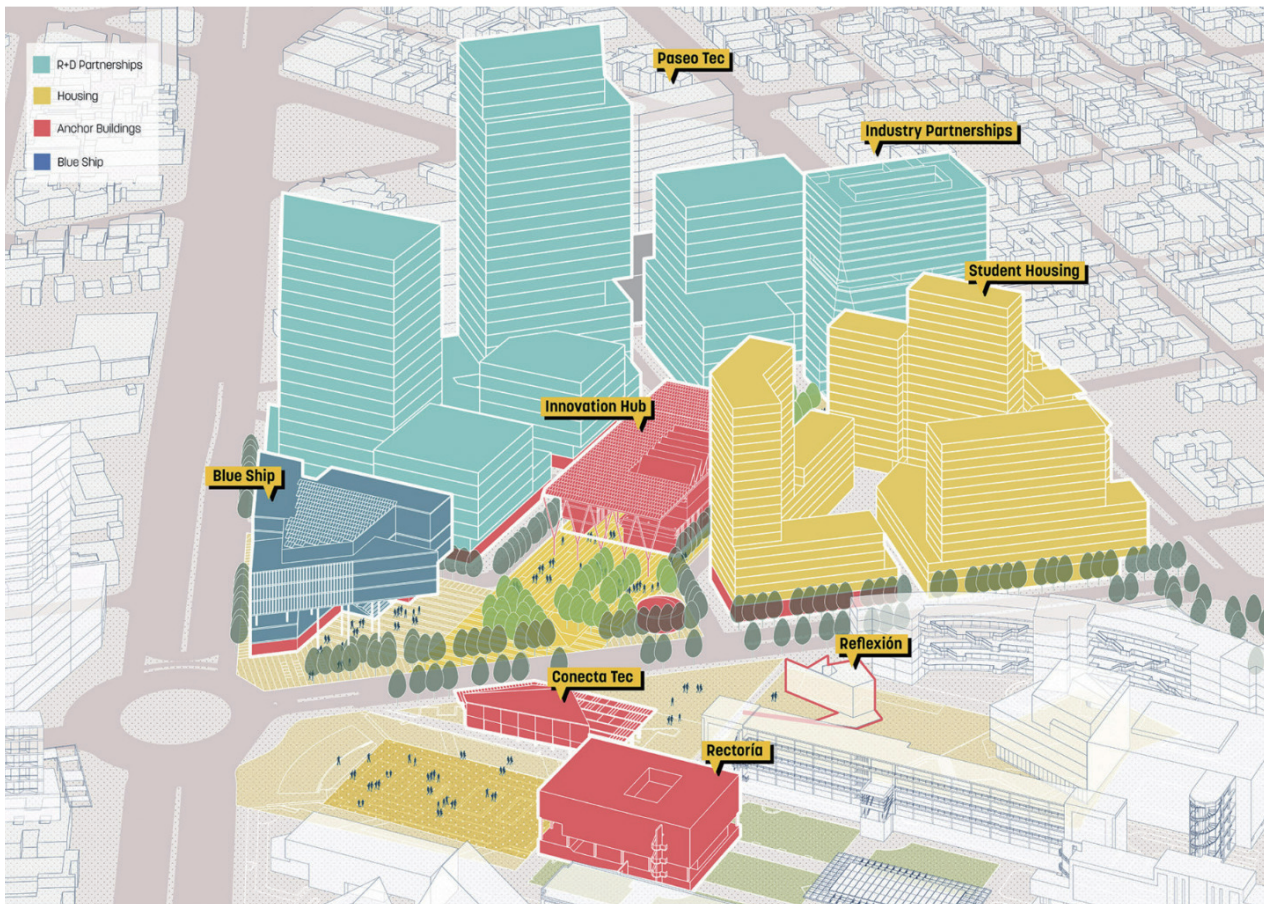


Source: Sasaki. URL: <https://www.sasaki.com/zh/projects/tecnologico-de-monterrey-urban-regeneration-plan/> (Accessed: 01/08/2022)

Figure 3.11 New mixed-use districts adjacent to the university are designed to attract investment from allied industries

An additional area has been integrated north-west of the campus comprising multifunctional space, student housing and academic research space (see Figure 3.12). The innovation hub is located in the heart of this area, and provides a platform for general activities, promoting collaboration among enterprises, students and faculties. The new multifunctional space is situated in close proximity to core academic areas to connect the campus with surrounding communities. This facilitates a strong and direct relationship between the academic community, knowledge-based industries and the city's community, and establishes close partnerships for potential high-end research and product innovation. Due to its strategic location, the plan aims to use the multifunctional space to attract investment from related industries and leverage technology to stimulate a major impetus for urban transformation.

To advance campus regeneration and connect with neighbouring communities, Sasaki has conducted detailed architectural and landscape research into the key areas laid out in the masterplan. For example, landscape planning is currently being drafted for the Science and Technology Park situated in the technological district beside the campus. The park is also near transport hubs and shopping streets, and is surrounded by residential areas including student housing. Feedback on the previous site was collected from communities, students, professors and staff through questionnaires and interviews. Preliminary research reported the previous site for the park lacked any management of trees, facilities and maintenance due to a sharp decrease in the local population and investment. The location of the park is important because it plays an integral role in connecting the campus and communities, and serves as an essential



Source: Sasaki. URL: <https://www.sasaki.com/zh/projects/tecnologico-de-monterrey-urban-regeneration-plan/> (Accessed: 01/08/2022)

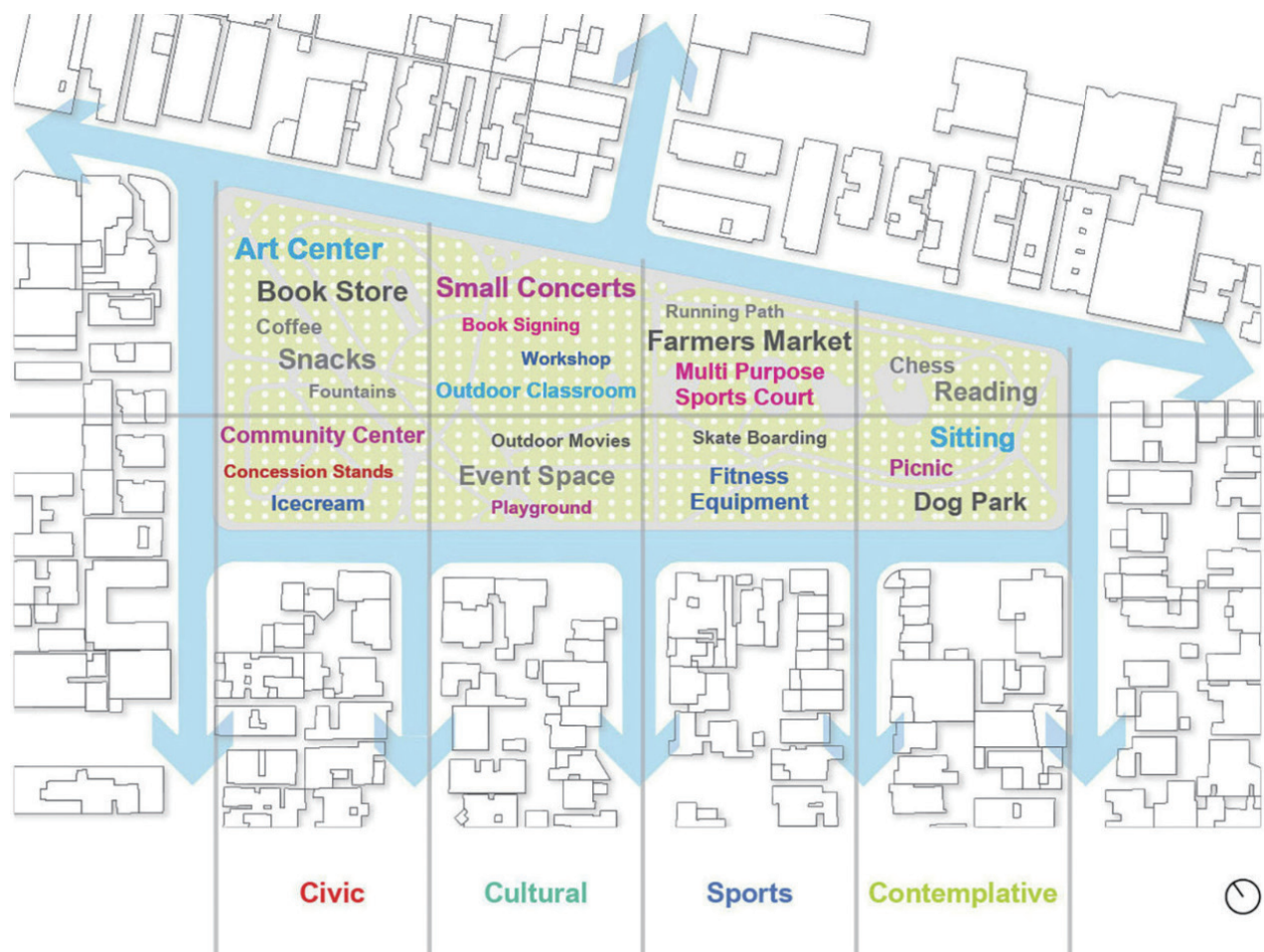
Figure 3.12 The innovation hub north-west of the campus

space for both. According to landscape planning, the park will be a major pedestrian area that connects the ITESM campus with related communities and a central area for tourists and other visitors. Detailed planning of the TecXXI Pavilion, Borregos Stadium and the Recreation Centre is still ongoing. Each structure will play a key role in promoting exchanges between students and faculty members, whilst strengthening the connection between ITESM and neighbouring communities (see Figure 3.13).

The ITESM masterplan is composed of numerous factors including the Tech 21 Education Model which focuses on reshaping the pedagogical structure and environment, and other detailed plans for core blocks, buildings and landscapes. To complete the overall

planning of ITESM, the masterplan relies on expanding research programmes, attracting top professors and students from both home and abroad, and increasing investment to upgrade the learning quality and to integrate spaces for extensive collaboration between disciplines. Different projects in the masterplan are in the planning and construction phases, elevating ITESM as a top university in Latin America when complete. A survey conducted by ITESM reports that the plan has attracted over USD 1 billion in private investment for the regions around the campus, which in addition to subsequent investment has promoted the revitalization and reconstruction of Monterrey's surrounding communities.

To establish diversified teaching models, many colleges



Source: Sasaki. URL: https://www-sasaki-com.translate.goog/zh/projects/parque-tecnologico/?_x_tr_sl=zh-CN&_x_tr_tl=en&_x_tr_hl=en&_x_tr_pto=sc (Accessed: 03/08/2022)

Figure 3.13 Functionality of different areas within the technology park

and universities are redefining traditional learning environments, concentrating on entrepreneurial thinking, interdisciplinary and collaborative learning, and implementing project-based activities based on current social conditions. The leadership at ITESM has assessed the internal needs and demands of the country's emerging workforce, analysing the competition formed by changing economic conditions and globalization challenges. The faculty concluded that the traditional centralized learning model that focuses on a single major was insufficient for the current generation who need to be able to adapt to the different sectors from which the Tech 21 Education Model was initiated. Cooperation between Sasaki and ITESM has resulted in a series of space planning solutions aiming to reform the university's teaching and learning model. The collaboration led to the development of a spatial layout strategy which applies a comprehensive redesign of the entire campus, emphasizing the importance of creating individual learning environments. The layout can be applied to all 29 campuses or buildings in campuses under construction (currently a total of 31 campuses) – a critical element to expanding ITESM's Tech 21 Education Model across the country.

Established under the Tech 21 Education Model, the New Main Library and La Carreta Pavilion provide excellent environments for students to learn team building and problem-solving skills with peers, professors and industry collaboration partners, exchange knowledge and experiences, and prepare themselves for careers after graduation. The model has highlighted that in many instances there is a compelling need to redesign the environment of many universities around the world in order to meet the changing needs of our current society. The administrators at ITESM also launched investment plans to explore the potential of other innovative spaces so as to offer new types of courses in the future.

ITESM's new campus model has built flexibility and resilience into its core. Based on digital manufacturing technology, Sasaki has developed a flexible planning framework that enhances connectivity and facilitates the development of a more extensive system, utilizing computer-based simulations during construction

processes across the various phases of the project. Due to the flexibility of the system, additional functional demands can also be integrated into the ever-changing simulation to ensure practicality and alignment with the long-term objectives. Buildings can be transformed to fulfil various functional needs on demand, creating a more agile educational facility. The masterplan also incorporates different building clusters into the large campus with each sharing a series of interrelated elements such as building typologies and open spaces. The building clusters here work as toolkits that contain all the necessary parts such as academic units, residences and research facilities, located alongside a specific open space. This allows multiple options to combine buildings which creates an emerging innovative relationship between traditional teaching units for a more dynamic model.

A more extensive and looser boundary is formed to promote collaboration in communities. The masterplan extends the development axis of the campus and relocates certain public facilities to the campus boundary for community sharing purposes, thus extending the boundary to better integrate with the city. The internal core areas such as the New Main Library and La Carreta Pavilion provide architectural functions and serve as spaces for collaborative communication, creating opportunities for external communication. As an inclusive design process, ITESM listens to its wider community, and the Science and Technology Park has been upgraded into a vital urban centre for the technology community, becoming a model to improve the surrounding areas and to generate win-win results due to the investment of academic institutions in the surrounding areas. The newly developed multifunctional space is also a popular investment location for related industries connecting the campus with both local and external communities. The campus of ITESM is an attractive and vibrant community where contemporary academic, cultural, social, residential and sports facilities have been designed to create a high-quality environment in which students can come together to promote interdisciplinary learning. In this regard, the entire campus will be designed as one comprehensive classroom, attracting diversified talent to create a unique and integrated experience.

Reference experiences

1. Promote integrated design between campus facilities and external communities to ensure inter-exchange and connection

Outstanding universities are those that coexist with dynamic communities, and dialogue and exchange with external communities are increasingly important to modern universities. Within the conventional independent spaces for teaching, research and residence are transformed into integrated spaces to enable communication and sharing. The development and expansion of ITESM's campus not only facilitates inter-disciplinary and staff collaboration but also encourages students to interact with local industries and neighbouring communities. Campus facilities are shared with communities despite the boundaries between urban and university spaces, aiming to provide a more seamless area avoiding fixed boundaries and the specific delineation of space. The masterplan also proposes future strategies that will have an immediate impact on neighbouring communities. During the continuous community expansion, the masterplan proposed a series of measures to improve public parks, make communities safer, and upgrade streets and public spaces to encourage soft modes of transport such as walking and cycling, in turn transforming the area into a more liveable community to attract both residents and workers. ITESM has thus taken measures to ensure the campus' independence while sharing facilities with the community and realizing its social values with cutting-edge design extending value and experience across boundaries.

2. Facilitate holistic development that connects campuses with communities and urban industrial clusters

In the knowledge economy and era of innovation, the roles and objectives of spatial planning for universities and higher-educational spaces are now changing. Integrated, open, innovative and ecosystem-based campus spaces can be seen to promote enhanced collaboration and foster more dynamic environments. Universities are integral faculties in driving research,

knowledge and innovation, and attracting information and talent, and therefore play a key role in urban and regional economic development. Where situated alongside industrial clusters, universities can leverage the strategic co-location of innovative and productive spaces, promoting local commercialization and also focusing attention on research, investment and entrepreneurship ecosystems formed on the basis of university talent. The ITESM masterplan has attracted significant R&D and investment in the campus context, contributing to innovation and upgrading in local industry and entrepreneurship. In addition, the community has transformed into a vibrant, dynamic area in which the campus is more closely fused with the community and the city's industrial innovation. This project showcases the added value of university campus renovation projects in which key components are details from the functional and technical design of campus layout, technology transformations, facilities design and spatial planning to ensure land-use efficiency.¹⁴

Heidelberg, Germany: Modernizing Heidelberg through Industrial Upgrading and Diversification

Case background

Heidelberg is a dynamic city with a mixture of traditional and contemporary tourism, culture, science and technology, and education. The city has a population of approximately 160,000 of which 56,000 are estimated to have immigrated – many of whom are scientists or students.¹⁵ In combination with Mannheim and Ludwigshafen, the city makes up part of the Rhine-Neckar metropolitan region as shown in Figure 3.14, a polycentric area serving as a key driving force in the German economy aiming to be one of the most attractive and competitive regions in Europe. With a strong scientific presence, Heidelberg is also home to Germany's oldest university and hosts a number of internationally renowned research institutes and research-based companies, thus making it a high-

14 Sohu News. URL: https://www.sohu.com/a/~200202426_716486 (2017) (Accessed: 05/08/2022).

15 City of Heidelberg. URL: <https://www.heidelberg.de/english/Home/Life/The+City.html> (Accessed: 11/08/2022).