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Curvelo Magdaniel, Flavia

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Chapter 10
The Entrepreneurial University Stimulating Innovation Through Campus Development: The MIT Case

Flavia T. J. Curvelo Magdaniel

10.1 Introduction

Universities are considered organizations operating in environments of rapid change. Over the last few decades, a common trend from traditional missions of teaching and research to the third mission of economic development has been observed in universities Europe and America (Sam and Van Der Sijde 2014). The concept of entrepreneurial university positions them as new economic actors emphasizing their collaboration with external stakeholders for socioeconomic development (Etzkowitz 2004). Entrepreneurial universities are leading in education, advancing research, controlling their resources, organizing their own capacity to transfer technologies, and fostering entrepreneurship as culture among their faculty and students (Drucker and Goldstein 2007; Etzkowitz 2008; Vorley and Nelles 2008). Similarly, there are raising concerns about the entrepreneurial roles of universities in the so-called academic capitalism. This phenomenon is defined as a wide variety of market (and market related) activities used by faculty and institutions to secure external funding due to reduced public funding such as patenting, spin-off companies, grants, university-industry partnerships, and tuition fees (Kauppinen 2012). According to Jessop (2017), entrepreneurialism in universities has a longer history than academic capitalism as suggested by Schumpeter's ideas on innovation and discussed in earlier research (Deem 2001; Marginson and Considine 2000). Undoubtedly, the evolutionary role of universities from traditional to entrepreneurial is linked to transformations in the dynamic context in which they operate.

F. T. J. Curvelo Magdaniel (✉)
Department of Management in the Built Environment, Faculty of Architecture, The Built Environment, Delft, The Netherlands

The Built Environment, Delft University of Technology, Delft, The Netherlands
e-mail: f.t.j.curvelomagdaniel@tudelft.nl

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The knowledge-based economy (KBE) has influenced the evolutionary path of universities worldwide. According to (Cooke and Leydesdorff 2006), the KBE is regarded as a system used by governments to frame their perspectives for developing science, technology, and innovation policies. Herein, the basic idea of knowledge as an economic factor attributed to Schumpeter (1934) has developed by changing the composition of the labor force as well as technological and institutional trajectories. In the KBE, the range of technology-based research activities has increased, both in number and related processes, with the advancements of technologies during the ICT industrial revolution and the digital and information revolution (Headrick 2009). Many companies in developed economies invest more on R&D and are increasingly engaged in these activities with universities. Correspondingly, the number of people employed in research is growing steady in many countries (OECD 2013). With globalization and the changing dynamics of mobility patterns, most of the competitive advantage of countries and organizations relies on their ability of attracting and retaining talented people. Universities do compete on this basis.

There are different ways in which universities must sustain their competitive advantage in the KBE. In education and research, competition is understood and measured in nonmonetary terms such as prestige, recognition, or distinction (Schulze-Cleven et al. 2017). Academic reputation becomes a major factor influencing students' university choice (Briggs 2006). Financial competitiveness in universities is shaped by marketization and results from the increased numbers of students and faculty worldwide and the shifting role of academic capitalism where public and private expenditures are intertwined (Schulze-Cleven and Olson 2017). Herein, the cuts in public funding are pressing universities to diversify their external funding sources and raise revenues through tuition fees, donations, business-university cooperation, and returns on their endowments. Conversely, the cost of maintaining research universities is growing since "world-class research" demands adequate facilities and access to appropriate libraries, laboratories, offices, internet, and other resources (Altbach 2004). In a context where obtaining and sustaining financial resources is increasingly competitive, universities must use them efficiently also to embrace their evolutionary roles.

The campus can be seen as one of these strategic resources. Investing in physical infrastructure has already been addressed as a way to strengthen the relationships between universities, industry, and governments (Van Winden 2008). This infrastructure is regarded in early global policies as part of national science systems (OECD 1996). Facilities, transportation networks, and telecommunication systems have been outlined as enablers of economic activities at national level (Porter 1990). In organizations, Joroff (1993) emphasized the view of managing real estate as the fifth resource besides human resources, technology, capital, and information technologies. Existing studies in university campus management outline the enabling function of real estate in attaining competitive advantage in the KBE (Curvelo Magdaniel 2016; Den Heijer 2011). This chapter takes forward this perspective by illustrating how a leading entrepreneurial university has used its campus as strategic resource to react timely and adequately to the dynamic context of the KBE. The first section

links the concepts of dynamic capabilities and real estate strategic management to provide a conceptual framework. The second section describes the methodology used in this chapter. The third and the fourth sections describe and discuss the results, respectively. And the fifth section draws this chapter's main conclusions.

10.2 Dynamic Capabilities and Real Estate Strategic Management

The concepts of "dynamic capability" and "real estate strategic management" are linked through the fundamental question in the field of strategic management, which according to Rumelt et al. (1994) lies on how organizations achieve sustainable competitive advantage. Dynamic capabilities are defined as a company's strategic ability to combine inside and outside competences to address volatile environments and periods of rapid change (Teece et al. 1997). These capabilities involve combinations of organizational, functional, and technological skills used to create, extend, and modify resources. From a resource-based perspective, firm performance depends on the firm's control of unique and difficult-to-imitate resources (Rumelt 1984; Teece 1984). These can be regarded as tangible assets (e.g., plant, equipment, raw materials, etc.) and intangible assets (e.g., tacit knowledge and relationships among actors). Srivastava et al. (1998) argue that the latter can give organizations a more sustainable form of competitive advantage since they are more difficult to imitate. Overall, the emphasis on management capabilities integrates and draws attention upon research in other areas such as management of R&D, product and process development, technology transfer, human resources, organizational learning, etc. (Teece et al. 1997). Similarly, corporate real estate management (CREM) fits in the dynamic capability approach to understand multiple and new sources of competitive advantage.

CREM is understood as "the management of a corporation's real estate portfolio by aligning the portfolio and services to the needs of the core business (processes), in order to obtain maximum added value for the business and to contribute optimally to the overall performance of the corporation" (Dewulf et al. 2000). In this field, corporate real estate (CRE) is regarded as "the fifth resource" (Joroff 1993). Herein, real estate is outlined as a facilitator of the primary processes of a corporation next to capital, human resources, information, and technology. This approach outlined the changing role of CRE in evolutionary stages from a "technical" to a "strategic" focus. Accordingly, the "alignment" between corporate and real estate strategies is central as well as the dynamic environment in which organizations operate. Too et al. (2010) argued that it is reasonable to see CRE as a source of capability to give companies its competitive advantage in a hypercompetitive climate. Although CRE can be considered a tangible asset, its strategic management is rather seen as an intangible asset. Therefore, CRE practices are harder for competitors to observe and imitate (Too et al. 2010). Managing CRE can be linked to the concept of orchestration as one of the means of gaining competitive advantage from

the dynamic capabilities approach. Asset orchestration refers to the "managerial search, selection and configuration of resources and capabilities" (Helfat et al. 2009). In explicating dynamic capabilities, Teece (2007) disaggregates this concept into "the capacity (1) to sense and shape opportunities, (2) to seize opportunities, and (3) to maintain competitiveness trough enhancing, combining, protecting and when necessary, reconfiguring the business enterprise's intangible and tangible assets." From a CREM perspective, these capacities are expected to be deployed in the CRE practice.

The "articulation" between real estate strategy and corporate business strategy is a precondition to make effective real estate decisions favoring an enterprise's business (Nourse and Roulac 1993). This work pointed out that in obtaining such results, CRE managers must explicitly address how real estate strategies support corporate strategies. Furthermore, this study outlines that the driving force(s) of a company (in terms of products/markets, capabilities, and results) determines the business direction of a company, which changes over time with changes in specific environments. Hence, the dynamic environment in which organizations operate is an influential context for alignment between corporate and real estate strategy. This context and the particular culture and value of the organizations determine the appropriate real estate strategies that effectively support the broad business objectives of such organizations.

Today, the concept of dynamic capabilities has achieved a new relevance since the emerging technological landscapes enable firms to put dynamic capabilities into practice easier than even before (Shuen and Sieber 2009). Herein, they discussed the potentials of dynamic capabilities for web-enabled businesses affected by rapid technological change. These companies and other tech-driven organizations like universities have a similar driving force in attaining competitive advantage, i.e., the creation of new knowledge and its application to develop new technologies (Curvelo Magdaniel 2016). However, they have different values and culture influenced by their own distinct profiles. For instance, firms and universities differ because the former advance technologies mainly yield profit while the latter do so to advance science. Simultaneously, traditional and entrepreneurial universities differ in culture since the traditional mission of universities is limited to "educate people and advance research for society," while entrepreneurial universities add to this mission "to advance economic development." This difference in culture is an example of how some universities have changed their operations and their developing resources, including real estate as a reaction to the changing context of the KBE. The transition between traditional and entrepreneurial universities and the use of their real estate as a resource to attain sustainable competitive advantage are the focus of this chapter (Fig. 10.1).

Both dynamic capabilities and CREM emphasize the key role of strategic management in adapting, integrating, and reconfiguring particular competences to match the requirements of the changing environments. Identifying difficult-to-imitate competences is challenging for firms, and choosing domains of competences is sometimes influenced by past choices (Teece et al. 1997). This firms' continuation along a given trajectory is known as path dependency (Simmie 2005).

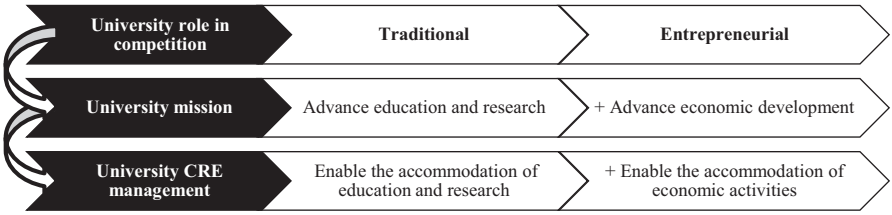

Fig. 10.1 Conceptual framework positioning CRE management as a strategic resource supporting universities' missions according to their changing roles

The companies' long-term commitments to certain domains of competence are quasi-irreversible and can lead to either growth or decline. Thus, dynamic capabilities and CREM are also shaped by the firms' evolutionary paths. This notion recognizes that history matters influencing the current position of the firm and their paths ahead. In this constrained context, the role of the managers in recognizing the available opportunities for their companies and orchestrating their resources to act upon them is crucial. Largely, balancing between short- and long-term decisions becomes critical to attain sustainable competitive advantage. This is especially important for CRE managers since they deal with tangible and static assets, which have long life cycles.

10.3 Methods

This chapter uses single case study as the main strategy (Flyvbjerg 2006) to illustrate how a leading entrepreneurial university has used its campus as strategic resource to react timely and adequately to the dynamic context of the KBE. It will illustrate, with rich and anecdotal descriptions, the CRE practice of an organization in a particular changing context. This chapter refers to some notions of dynamic capabilities addressed in the previous sections to provide an analytical perspective of this university's capacity to sense and seize its opportunities in crucial times while using the campus as strategic resource to maintain competitive advantage. This chapter uses data and information of a doctoral research (Curvelo Magdaniel 2016) carried out at Delft University of Technology.

10.3.1 Case Selection

The CRE practice studied in this chapter is the campus development of the Massachusetts Institute of Technology (MIT), which has become a role model of an entrepreneurial research university and has forged educational and research collaborations with universities, governments, and companies all over the world (Curvelo Magdaniel 2016; Etzkowitz 2008; Simha 2005). The MIT is a private nonprofit

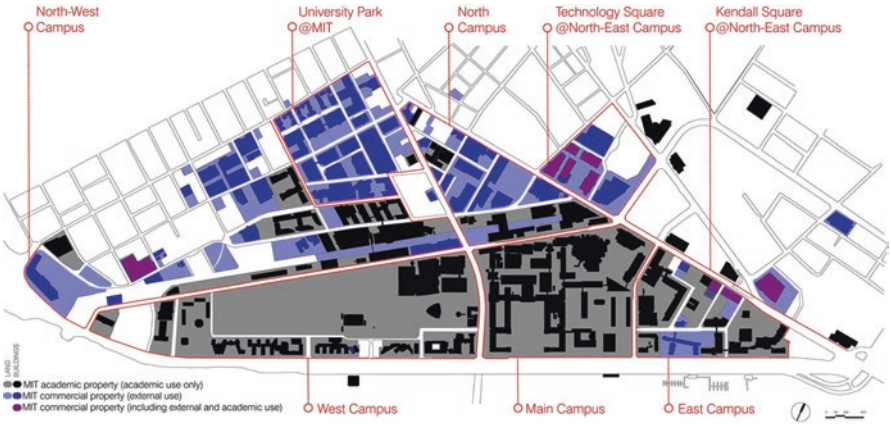

Fig. 10.2 MIT Campus in two types of properties and seven main development or planning zones (Curvelo Magdaniel 2016)

institution founded in Boston in 1861 and relocated to Cambridge in 1916. Since its foundation, the MIT emphasizes the "learning-by-doing" model, which was inspired in the typical education of the polytechnic universities that emerged in Europe at the end of the eighteenth century.

The MIT campus comprises about 104 hectares of land owned and leased by the MIT in Cambridge, which distinguishes two types of properties: the academic plant and the MIT's commercial real estate property. The first type accommodates only academic-related activities and therefore is a tax-exempt property. The second type is considered as a group of assets owned by the institute to generate income, adding to its financial resources. These properties are integrated in the urban fabric of the city and accommodate different activities including academic-related activities, R&D, housing, retail, and business (see Fig. 10.2).

10.3.2 Data Collection

This chapter used a variety of data sources for triangulation with the aim to document the CRE practice of campus development as a long-term process. The data was collected during the period from September 2014 to December 2015.

Open and semi-structured interviews with experts and key informants provided insight which lead to facts and relevant readings on the case and its context. Campus development experts possess an in-depth knowledge on particular domains of the CRE practice since they have been involved in this process over long periods (e.g., designers, planners, and managers with over 10 years of experience in the case). Three experts were contacted via e-mail and two of them responded (i.e., the campus

planner during the period 1960–2000 and the campus real estate manager since 2000). These interviews include about 10–15 open questions to gain knowledge on the campus development process from each expert's experience. The interviews focused on the university's goals that have influenced the CRE practice, the implementation of CRE decisions, and to which extent CRE helped attaining such goals. Other experts had particular knowledge about contextual dynamics in the region. Two experts were contacted and responded via e-mail (i.e., two senior researchers on technology-driven real estate). These interviews include about 10 open questions aimed to gain insight into particular the contexts influencing each campus development. The interviews focused on the perceived relationship between innovation and CRE and the external developments influencing the campus development.

Key informants played a role leading to facts on campus development and extra insights on context-related information. They were contacted incrementally as suggested by experts or as indicated in reports while documenting the case. Fourteen key informants were contacted via e-mail, and 10 of them responded. This group included professionals in urban planning, real estate management, facility management, innovation policy, and entrepreneurship. These interviews were tailored inquiries on particular campus development phases, strategies, or decisions. They focused on campus development history in general.

Documentation allowed collecting the exact information containing references, names, and details of campus development covering a long time. This included maps and photos from archives, official briefings, administrative reports, existing empirical research on the cases, and articles in the media. The work of Simha (2001) significantly contributes to document of the CRE practice at MIT.

Site observations allowed insights into cultural features of the concepts and opinions and lead to facts. These were possible during site visits including field trips, seminar attendances, guided walks, and informal meetings with campus users.

10.3.3 Data Analysis

For analytical purposes, the notions in the conceptual framework served as instrument to generate insights. First, it was used to provide understanding of the MIT's path to establish its current position as a role model of entrepreneurial university. Second, it served to identify the CRE practices that supported this university's evolutionary roles from traditional to entrepreneurial. An iterative analytical procedure is used to sharpen the constructs by displaying enough evidence with examples, anecdotal reports, and descriptions. Mapping using open access applications (e.g., Google Earth, Esri Maps, Google Maps) allowed corroborating exact and particular information containing physical details on campus development over time. Overall, tying the emergent insights to the concepts from the literature also enhanced the processing and synthesis of the descriptive information.

10.4 Results

10.4.1 The MIT's Path to an Entrepreneurial University

Massachusetts has been a center of industrial and technological innovation for a long time. In the last 70 years, it has successfully adapted technological changes from electronics to software and to biotechnology. New England became the first industrialized region in the USA. The concentration of industries in this region is addressed as one of the factors that led to the foundation of the MIT in 1861 as school of industrial science. The MIT became the first university of technology in the USA, which came to strengthen both the industrial tradition established in the region and the academic tradition already existing with the presence of Harvard University in Cambridge.

Over the last century, Massachusetts has gone through different economic cycles related to periods of technological developments leading three waves of change and revitalization of industrial processes in the USA. At the beginning of the twentieth century, Massachusetts was the home of traditional industries in the textile and apparel sectors, which declined during the 1930s and 1940s (Castells and Hall 1994).

The first wave took place during the postwar period, which is associated with a phase of political and military tension that followed the end of the WWII. During this period, technology advanced to support military and space programs. According to Castells and Hall (1994), Massachusetts concentrated in research and manufacturing "mainly in precision instruments, avionics, missiles, and electrical machinery." The technology shift in warfare traces back to the 1930s and during the WWII. Then, MIT had the oldest and most distinguished electrical engineering department in the USA and was open to conduct contract research with the government and industry. MIT's advanced laboratories led the formation of important companies working in military research and manufacturing in the region. Many of these companies spun off from Raytheon, a major American technology company specialized in defense and security which started also at MIT in 1922 (Castells and Hall 1994), and the MIT Lincoln Lab, which by the end of 1980, had spun 39 new companies (Lampe 1988). During this period several of MIT's faculty members that led research programs at MIT worked as science advisors for the US government. The same research programs spun-off several research and manufacturing companies in the area. The close relationships of this network helped to enhance the technological potential of MIT, which advanced its electronic research with the support of the government.

The second wave took place during the ICT industrial revolution, which was characterized by advancements in microelectronics brought by space programs in the early 1960s. These advancements created fast-changing industries, which evolved from minicomputers to networks of computers, software, artificial intelligence, and telecommunication technologies. A loss of manufacturing jobs between 1967 and 1975 contributed to a reindustrialization process in the region. The technology-related businesses that emerged in the 1950s were affected because of the recession

of military spending on research. A shift of technological paradigm was decisive leading the state's recovery from this downturn spiral. The establishment of Digital Equipment Corporation (DEC) in 1957 by MIT alumni was crucial in this shift. DEC was the first of many companies specialized in computer manufacturing that laid the grounds for an entire new industry that grew out of new knowledge and played a major role in the economic recovery of the state during the 1970s known as the Massachusetts Miracle. These new companies began locating in vacant factories along Highway 128 during the period of 1975–1980, giving shape to the high-tech complex known as Boston's Route 128. The employment in the state grew up because of the jobs generated by the fast technological changes of the ICT industrial revolution. Many of these new companies traced their origins also to research projects linked to MIT and/or other R&D firms (Lampe 1988).

The third wave has taken place during the Digital and Information Age that began with the invention of the WWW. In the region, the knowledge coming from the many universities and research institutes advanced technology in artificial intelligence, biotechnology, novel materials, and medical equipment. This wave can be seen as an evolutionary process of steady economy growth with an expansion of the industrial focus toward the creation of a biotechnology cluster. This process can be associated with the knowledge-driven reindustrialization, resulting from the global orientation of nations to use knowledge in strengthening their economies. In Massachusetts, it traces back to an economic development initiative introduced by the US Congress in 1980: the Bayh-Dole Act. This act provided legal basis and economic incentives for universities, giving them the right to own patents, grant licenses, and collect royalties arising from their federally sponsored research (Nelsen 2005). For research universities like a MIT, this led to an emphasis on licensing. In 1986, MIT reorganized its "Patent, Copyright, and Licensing Office" into a "Technology Licensing Office – TLO." The new office hired people with strong technical and business backgrounds and put emphasis on marketing and licensing of inventions while outsourcing the patent prosecution to law firms. As a result, the participation of faculty in patenting and licensing increased dramatically, i.e., about 100 licenses per year between 1986 and 2000. In 1987, the MIT TLO runs a policy experiment that allowed MIT to grant exclusive licenses to companies in which faculty members owned equity and to accept equity from licensed start-up companies as a form of royalty (Nelsen 2005). Since then, MIT has started more than 350 companies, which were formed to exploit MIT intellectual property in the fields of pharmaceutics, superconductors, batteries, Internet distribution, weather forecasting, and clean energy, among others. Informally, this office's role in starting companies is larger by encouraging the formation and growth of the start-up companies such as introducing them to investors and companies in raising capital.

Largely, the growth of formal technology transfer at MIT has had a significant contribution to the Massachusetts' biotechnology cluster, since most of the companies in the biotechnology sector have started as small, entrepreneurial companies within the past 15 years and a great deal of them were formed around MIT licenses (Nelsen 2005). The MIT campus has been the home of institutions and activities that have been a key in a complex process. It can be best described as an

evolving knowledge-base and industrial renewal across different technological paradigms. Today, a trend toward energy research is perceived as a major theme among MIT's faculty and researches and can be the next technological paradigm spun out off campus.

10.4.2 MIT Sensing and Seizing the Opportunities While Orchestrating Its Campus as Strategic Resource

This section described two major CRE practices that facilitated the evolution of MIT into an entrepreneurial university. It describes – through shifts in the CRE practice – how the MIT has sensed and seized the opportunities given by its dynamic context and used the campus as a strategic resource supporting its evolving path.

Land Acquisition Strategy: From CRE Problem Solver to City Partner
In using their resources efficiently, most universities locate where they own a property. In the current competitive context, it matters where these properties are since some companies increasingly want to locate close to universities.

For MIT locating in Cambridge, it was an emergent accommodation decision that turned out to be a positive strategy for the institute and for Cambridge. The MIT was accommodated in Boston for more than 70 years since its foundation. The growing number of students in the beginning of the twentieth century created the need for expansion of the Institute's physical plant. In 1911, MIT acquired an 18-hectare plot (46 acres) located in East Cambridge that was surrounded by industrial districts. Soon, some of them became available and were acquired by the MIT (Fig. 10.3). In 1912, the Institute arranged the purchasing of additional land to the west of Massachusetts Avenue anticipating the MIT's future growth. This zone developed as the supporting environment for the academic life, providing housing, sports, and cultural-related functions. In the years that followed, MIT purchased additional land for "either immediate academic use or for investment use on an interim basis, awaiting the need for academic purposes" (Simha 2001). With this early intervention, MIT began a long-term acquisition plan for its land resources that secured its future growth many years in advance and determined its synergetic relationship with the city.

Today, MIT owns 104 hectares in Cambridge from which 68 hectares are tax-exempt. The use of the land resources by tax-exempt institutions such as the MIT has been a concern in Cambridge because taxes are the city's main source of income. Since 1928 MIT signed different agreements with the city of Cambridge to payments in lieu of taxes for a period of 20 years. Over the years, these friendly agreements, which are not a legal requirement, have sustained a good relationship between the institute and the city since they both have benefited from it. The university has secured its future growth many years in advance while enjoying a unique tax-exempt position. The city has received payments for land removed from the tax rolls and benefited of the presence of students, employees, and the business tenants

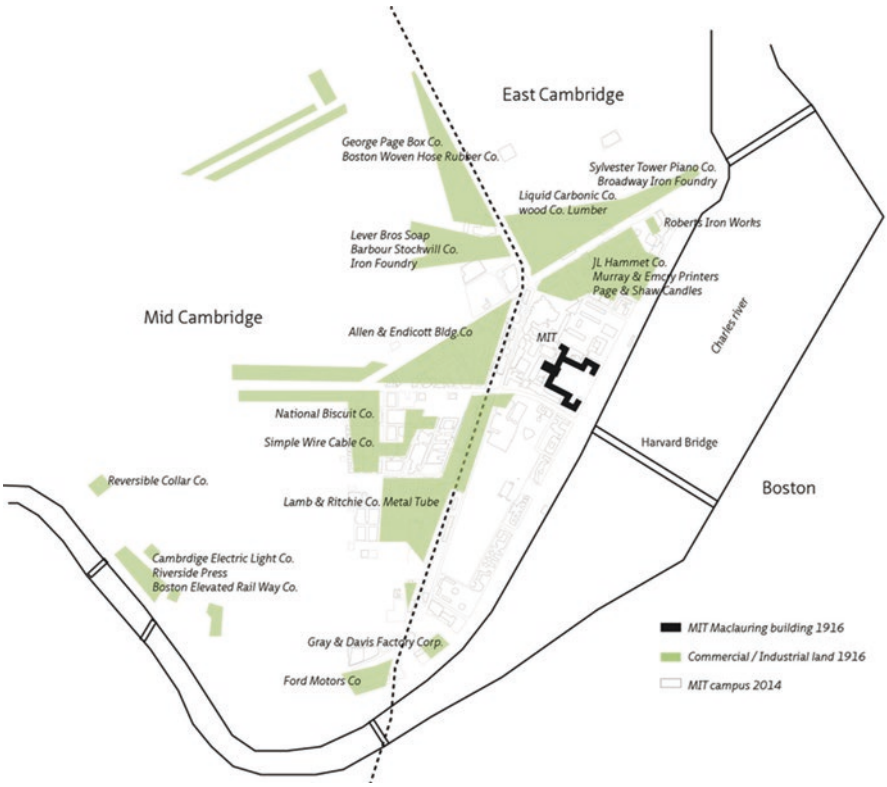

Fig. 10.3 Cambridgeport Land Use in 1916. Data base map: MIT Museum archives (Curvelo Magdaniel 2016)

of the MIT's commercial property. The latter are mainly large companies and research institutions that contribute to the local businesses in Cambridge by generating revenues for the city and attracting more companies to establish in the surrounding areas. Overall, the MIT's land acquisition strategy has been a good example of acting upon an emergent opportunity, which has mutually benefitted the MIT and the city of Cambridge.

Urban Area Development: From City Partner to Innovation Ecosystem Planner

MIT collaborated with public and private sectors in the development of three major urban areas surrounding the academic property: Technology Square, Kendall Square and University Park @MIT (Fig. 10.4). These areas have accommodated the changing activities resulted from the evolving knowledge base and industrial renewal across different technological paradigms in the region.

Technology Square

In the late 1950s, the city of Cambridge pursued an urban renewal project in East Cambridge. The area intended for development comprised residential land, known

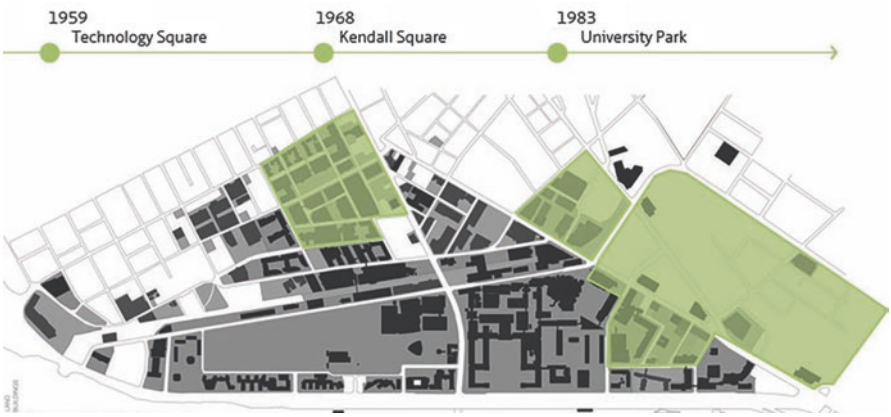

Fig. 10.4 Location of urban areas developed by MIT in collaboration with public and private partners (Curvelo Magdaniel 2016)

as the Roger's block demolished in 1957, and an industrial land, accommodating a major plant of the Lever Brothers soap factory, which closed in 1959 due to its relocation to New York. In view of this situation, the Major of the city contacted MIT in 1959 to develop the vacant site, and MIT saw an opportunity for investment. In 1960, MIT and Cambridge began the plans to convert the 6-hectare plot into an office and R&D complex. In 1962, MIT partnered with the real estate firm Cabot, Cabot & Forbes (CC&F) to begin the construction of the project. This marked a precedent, since it was the first time an educational institution worked together with a private firm to develop a business environment.

By 1967, the first four buildings of the complex were ready, and Polaroid set up its headquarters in Technology Square as well as others such as IBM, government agencies, and MIT's research groups. At the beginning of the 1970s, MIT sold its interest in Technology Square to CC&F but continued renting space for special research projects. During the 1980s Draper Laboratories – which became an independent research institute from MIT in 1973 – begins the construction of a new building in Technology Square. In 2001, MIT purchased the entire complex with the intention to maintain it as a tax-paying commercial property. This MIT's decision has benefited the city, which still receiving real estate tax revenues from this area and at the same time has reached its economic development goal of converting a former depressed industrial area into a R&D complex. Today, Technology Square is a mixed-use built environment that accommodates several offices, biotechnology lab, and street-level retail.

Kendall Square

In the 1960s, NASA funded research programs in Cambridge involving Harvard University and MIT. In the period 1964–1966, the Boston Redevelopment Authority

(BRA) oversaw the economic benefits for the region from NASA's presence and developed an urban renewal proposal for Kendall Square to clear its old industrial use. The proposal was presented to MIT because financing this urban renewal project would require MIT's cooperation and commitment to the City of Cambridge (Simha 2001). After MIT agreed to provide credits for the city, Cambridge invited NASA to locate its center here.

In 1968 the BRA, the Cambridge Redevelopment Authority (CRA) and NASA began the renovation works of the 12-hectare plot. The clearing of the old industrial uses took place between 1967 and 1975 during a period of economic recession. Within that period and after changes in the federal administration in 1969, NASA announced the termination of its Cambridge's activities. The new building erected for NASA's research center became vacant, but soon the CRA found a new occupant: the federal Department of Transportation (DOT) research center. In 1971 the DOT released 4.5 hectares of land that they considered a surplus. The CRA considered the option to sell the site to the MIT for academic purposes, but the Institute was interested in maintaining its academic activities compact. Instead, they proposed to convert the site into a housing neighborhood.

In 1974, the MIT and the East Cambridge Planning Team proposed a plan for a lively 24/7 neighborhood of mixed use including housing. This plan was based on 1964's study commissioned to Kevin Lynch, professor at the MIT School of Architecture and Planning at that time. In 1975, the CRA proceeded with the plan with changes allowing housing but not as a required function. In 1977 the zoning plan is approved proposing for first time mixed development zones for different land uses on a common site.

In 1979, Boston Properties were selected as a developer for the project. During the early 1980s, the proposal began development. Increasing traffic congestion issues triggered the planning of the new Kendall MBTA Red Line in 1983. In 1986, MIT participated in the design of the Kendall/MIT subway station, which construction in the 1990s would improve the connectivity of Cambridge in the region. As Boston Properties continued the mixed industrial and commercial development, the results have been criticized by the MIT for being monolithic and lacking sufficient services around the campus.

In 1999, an MIT alumnus established the Cambridge Innovation Centre (CIC) in Kendall Square. This became one of the earliest co-working spaces for start-up companies, offering affordable and flexible real estate for young entrepreneurs in the area, by renting space floor from MIT's owned building. By 2014, the CIC rented from MIT half of the space available in the same building to provide office space for over 500 companies, from which nearly 450 are start-ups. During the 2000s, several R&D companies, research institutions, and venture capital firms have located in Kendall Square. Most of them not only conduct businesses or research in the biotech and pharma sectors but also in IT and data and more recently in energy fields.

In 2011 the City of Cambridge released a planning study for Kendall Square, which area included 10-hectare parcel of MIT academic property. The same year

the Institute filed a rezoning petition for this area. Herein, the MIT community raised its concern about the need for a long-term planning that considers the preservation of academic land resources and social inclusion that can be hindered with the commercial development emerging in Kendall Square area. Hence, a design committee for MIT's Kendall Square Initiative was established. This committee, formed by faculty from the MIT School of Architecture and Planning and the MIT community, is a form of participatory planning and design to ensure high quality of the built environment and alignment with the current planning and design principles of the MIT campus. The first outcome of this initiative is the MIT Gateway to Kendall Square Zoning petition, which was approved by the Cambridge City Council in 2013. The MIT's vision of mixed use neighborhood for Kendall Square persists from the 1970s up to date.

Kendall Square continues under development, and it is facing a spatial and functional transformation. It has become denser resembling the image of a financial and business district rather than a university environment. The strong presence of large corporations such as Google, Microsoft, and Novartis is dominant in the landscape. The public space is still poor in some areas, and the existing shops and restaurants and the new residential development are getting expensive for the students' and Cambridge's residents.

University Park at MIT

University Park at MIT is a mixed-use development of commercial, private laboratory, and incubator and residential functions, located in the parcels once occupied by the Simplex Wire & Cable Company. This company was a manufacturer of wire and cable for telephones established in Cambridge since 1888. In 1969, this company is sold to a company in New York that moved the operations to Maine. The property was placed in the market, and after the success experienced with Technology Square, MIT saw the potential of transforming the industrial district into a housing and commercial development. Between 1970 and 1971, MIT acquired the property.

MIT conducted a study aimed to identify the site's needs, considering the interests of the Cambridge's community on housing development. This led to a complex process of negotiations with the city and the community before the plan was completed. In 1983, MIT selected Forest City Enterprises (FCE) as developers for the site. In 1985, the City Council appoints a Planning Committee involving representatives of the MIT, FCE, and Cambridge's community. In 1987, these parties completed a master plan, which was approved by the City Council in 1989 and changed due to rezoning in 1992. The same year the development of the area began.

University Park at MIT is an example of real estate development in which the MIT established a long-term relationship with the community, because of the social component of housing development.

10.5 Discussion

The role of MIT's CRE decision-makers in supporting the universities evolutionary role has been illustrated above. Nevertheless, this study identified challenging issues in the CRE practice that are considered a risk for the MIT's sustainable competitive advantage.

Since the late 1990s, there has been a change in focus in land acquisition policies at MIT. The allocation of campus' land resources and area development efforts to commercial uses has been raising a conflict between specific stakeholders, whose perspectives on the campus supporting both the traditional and entrepreneurial roles of the university are incompatible.

MIT leaders and CRE managers perceive the commercial development of urban areas around Kendall Square as an opportunity to generate income that will sustain the Institute's mission while keeping an entrepreneurial environment around campus. This can be considered a short-term competitive position. For instance, during the development of MIT's Kendall Square initiative, the Institute abandoned its commitment to reserve the land south of Main Street for academic purposes. As a result, the 10-hectare parcel of MIT academic property will be converted into a mixed-use development including new housing, retail, lab, and commercial space. Similarly, academic land reserves have been leased to private firms for long terms, closing off MIT's academic expansion in the North Campus.

These initiatives have been supported by the City of Cambridge since it will benefit because of the revenues coming from property taxes while succeeding in their ambition to create an attractive "place to live, work, and do business" as part of their economic development strategy. A collaborative model of mutual understanding has strengthened the relationship between MIT and the City of Cambridge for decades. Nevertheless, the strategic nature of such relationship is increasingly built on financial ties, in which the lack of long-term planning can result in uncontrolled development that can be followed by political action. The recent involvement of the MIT community in the Kendal Square project is an initial MIT political stand to ensure the long-term (social and financial) sustainability of this area in line with the future growth and expansion of the Institute as well as the preferences of its main users (i.e., academic staff and students).

Academic leaders and influential members of the MIT community have perceived the emphasis on commercial area development as a threat for the nstitute's future in accommodating academic growth and fulfilling its academic mission. For this group, ensuring the institute's growth of academic space is as important as generating income to sustain its mission and focusing on short-term financial returns can be at the expense of long-term welfare of MIT.

The implications of this strategy for the MIT's financial sustainability can be roughly drawn in possible scenarios. If the MIT schools would need space that has been allocated for commercial use, they would have to pay for it at the high market price. Eventually, if schools have financial trouble in accommodating growing education or research programs, they will have to get the MIT's financial support. This

can result in formal buying decisions in getting back those properties to academic use, which will decapitalize the Institute's endowment. Such decisions will raise political disagreements with the city that will suffer in the moment MIT decides to take such land off the city's tax roll. If not buying, the schools will have to lease more properties from other commercial parties at high costs. Potentially, the Institute must subsidize the cost of the rent, or the schools will have to raise capital outside MIT to buy buildings or rent space at the cost of their research programs. In this case, MIT schools and departments will be threatened by their academic competitors because the sponsors of research programs are unlikely to spend their budgets on space rather than on actual research.

Overall, there is a need for a healthy debate between these stakeholders to bring balance and to avoid uncontrolled development, which in the end can inhibit the role of MIT campus enabling both, research and education as well as other economic activities. The poor communication between these stakeholders and the cultural differences in their practices are not facilitating the required space for debate. CRE managers are aware of the risks on the long term but keep their position on investing MIT's capital according to the real estate opportunities while "learning by doing" on the process. The other stakeholders have manifested their opinions and reactions to this strategy through formal communication channels (e.g., the MIT Faculty Newsletter) in order to raise these concerns among members of the entire community (i.e., students, faculty, staff, alumni, parents, and more). Nevertheless, the periodic changes in administrations – both in MIT and the City of Cambridge – are major obstacles to have a continuous and healthy debate in overcoming this issue.

Simultaneously, the allocation of area development efforts to commercial uses is having an impact on campus life. Cambridge and Boston are exploiting the booming of the biotech and pharma cluster with urban development strategies aimed to sustain the presence of firms and research institutions in close proximity to the talent in academic institutions.

Nevertheless, the fostering of that mixed environment for "working, living, and doing business" is overlooking "studying" as part of that existing environment and more importantly as an essential activity in the city. Students and young people represent a considerable share of Cambridge's population. This trend is also visible in Kendall Square, where the MIT students' population is representative of the area's population. Nowadays the high concentration of firms and the intensification of commercial developments in Kendall Square are creating other problems. The area is becoming crowded and expensive. First, the dense concentration of users in the area generates traffic congestion with an environmental impact, which is not yet solved by the transit-oriented development. And second, the high rental prices of housing, office, and retail space are increasing the costs of living in the area, which can become unaffordable for the young community of entrepreneurs and students.

This situation is optimal for commercial real estate developers, who see physical proximity as an opportunity to boost their profitability. However, commercial real estate development needs to be controlled, especially around universities because

many young people (e.g., students) cannot afford it. Largely, there is a need for more involvement from the municipality and representative of the communities to create a balanced mixed-use development, which considers the income difference among individuals who are an essential part of their promoted "entrepreneurial ecosystem." Investments in affordable housing, public transportation, and public space are crucial to enable a healthy environment for all the involved communities in Kendall Square area.

10.6 Conclusion

This chapter illustrated in an anecdotal way how the MIT – a leading entrepreneurial university – has used its campus as strategic resource to react timely and adequately to the dynamic context of the KBE. First, it provided an understanding of the coevolving path the MIT followed influenced by socioeconomic, technological, and institutional trajectories and how this path shaped its current position in the competitive higher education and research context. Second, it described with shifts in the CRE practice how campus development was used as a strategic resource to support the MIT's evolutionary path.

Similarly, this chapter identified challenges in the CRE practice that can threat the MIT's competitive position. It describes recent developments in such practice that can lead to possible scenarios and ways to address this situation. Largely, these remarks are important to understand that the entrepreneurial role of the MIT has coevolved with socioeconomic and technological developments in context, and it is not to be forced. Therefore, the CRE strategies encouraging this evolution have to be orchestrated carefully, balancing short- and long-term positions to attain sustainable competitive advantage. Hence, it brings the attention to acknowledge CRE practice facilitating or threatening organizational competitive advantage. Herein, this chapter attempts to bring forward the field of CREM in strategic management, since CRE is still a relatively less obvious resource for many organizations when developing a competitive strategy.

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