Innovation, Technology, and Knowledge Management

Piero Formica *Editor*

Entrepreneurial Renaissance

Cities Striving Towards an Era of Rebirth and Revival

Springer

Innovation, Technology, and Knowledge Management

Series Editor

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To Mietta
I'll sing of the sweet time of my first youth…
(Petrarch, The Canzoniere)

Series Foreword

The Springer book series *Innovation, Technology, and Knowledge Management* was launched in March 2008 as a forum and intellectual, scholarly "podium" for global/local, transdisciplinary, transsectoral, public–private, and leading/"bleeding"-edge ideas, theories, and perspectives on these topics.

The book series is accompanied by the Springer *Journal of the Knowledge Economy,* which was launched in 2009 with the same editorial leadership.

The series showcases provocative views that diverge from the current "conventional wisdom," that are properly grounded in theory and practice, and that consider the concepts of *robust competitiveness,*[1] *sustainable entrepreneurship*,[2] and *democratic capitalism*,[3] central to its philosophy and objectives. More specifically, the aim of this series is to highlight emerging research and practice at the dynamic intersection of these fields, where individuals, organizations, industries, regions, and nations are harnessing creativity and invention to achieve and sustain growth.

Books that are part of the series explore the impact of innovation at the "macro" (economies, markets), "meso" (industries, firms), and "micro" levels (teams,

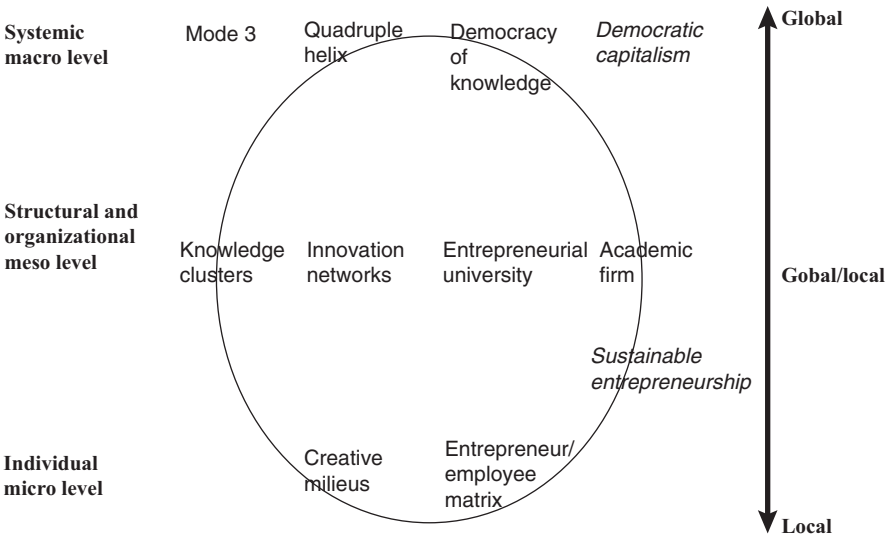
[1] We define *sustainable entrepreneurship* as the creation of viable, profitable, and scalable firms. Such firms engender the formation of self-replicating and mutually enhancing innovation networks and knowledge clusters (innovation ecosystems), leading toward robust competitiveness.

[2] We understand *robust competitiveness* to be a state of economic being and becoming that avails systematic and defensible "unfair advantages" to the entities that are part of the economy. Such competitiveness is built on mutually complementary and reinforcing low-, medium-·and high-technology and public and private sector entities (government agencies, private firms, universities, and nongovernmental organizations) (E.G. Carayannis, *International Journal of Innovation and Regional Development* 1(3), 235–254, 2009).

[3] The concepts of *robust competitiveness* and *sustainable entrepreneurship* are pillars of a regime that we call *"democratic capitalism"* (as opposed to "popular or casino capitalism"), in which real opportunities for education and economic prosperity are available to all, especially—but not only younger people. These are the direct derivative of a collection of top-down policies as well as bottom-up initiatives (including strong research and development policies and funding, but going beyond these to include the development of innovation networks and knowledge clusters across regions and sectors) (E.G. Carayannis and A. Kaloudis, *Japan Economic Currenrs,* p. 6–10 January 2009).

individuals), drawing from such related disciplines as finance, organizational psychology, research and development, science policy, information systems, and strategy, with the underlying theme that for innovation to be useful it must involve the sharing and application of knowledge.

Some of the key anchoring concepts of the series are outlined in the figure below and the definitions that follow (all definitions are from E.G. Carayannis and D.F.J. Campbell, *International Journal of Technology Management,* 46, 3–4, 2009).



Conceptual profile of the series *Innovation, Technology, and Knowledge Management*

- The "Mode 3" Systems Approach for Knowledge Creation, Diffusion, and Use: "Mode 3" is a multilateral, multinodal, multimodal, and multilevel systems approach to the conceptualization, design, and management of real and virtual, "knowledge-stock" and "knowledge-flow," modalities that catalyze, accelerate, and support the creation, diffusion, sharing, absorption, and use of cospecialized knowledge assets. "Mode 3" is based on a system-theoretic perspective of socioeconomic, political, technological, and cultural trends and conditions that shape the coevolution of knowledge with the "knowledge-based and knowledge-driven, global/local economy and society."
- Quadruple Helix: Quadruple helix, in this context, means to add to the triple helix of government, university, and industry a "fourth helix" that we identify as the "media-based and culture-based public." This fourth helix associates with "media," "creative industries," "culture," "values," "life styles," "art," and perhaps also the notion of the "creative class."
- Innovation Networks: Innovation networks are real and virtual infrastructures and infratechnologies that serve to nurture creativity, trigger invention, and

catalyze innovation in a public and/or private domain context (for instance, government–university–industry public–private research and technology development coopetitive partnerships).
- Knowledge Clusters: Knowledge clusters are agglomerations of cospecialized, mutually complementary, and reinforcing knowledge assets in the form of "knowledge stocks" and "knowledge flows" that exhibit self-organizing, learning-driven, dynamically adaptive competences and trends in the context of an open systems perspective.
- Twenty-First Century Innovation Ecosystem: A twenty-first century innovation ecosystem is a multilevel, multimodal, multinodal, and multiagent system of systems. The constituent systems consist of innovation metanetworks (networks of innovation networks and knowledge clusters) and knowledge metaclusters (clusters of innovation networks and knowledge clusters) as building blocks and organized in a self-referential or chaotic fractal knowledge and innovation architecture (Carayannis 2001), which in turn constitute agglomerations of human, social, intellectual, and financial capital stocks and flows as well as cultural and technological artifacts and modalities, continually coevolving, cospecializing, and cooperating. These innovation networks and knowledge clusters also form, reform, and dissolve within diverse institutional, political, technological, and socioeconomic domains, including government, university, industry, and nongovernmental organizations and involving information and communication technologies, biotechnologies, advanced materials, nanotechnologies, and next-Generation energy technologies.

Who is this book series published for? The book series addresses a diversity of audiences in different settings:

1. *Academic communities:* Academic communities worldwide represent a core group of readers. This follows from the theoretical/conceptual interest of the book series to influence academic discourses in the fields of knowledge, also carried by the claim of a certain saturation of academia with the current concepts and the postulate of a window of opportunity for new or at least additional concepts. Thus, it represents a key challenge for the series to exercise a certain impact on discourses in academia. In principle, all academic communities that are interested in knowledge (knowledge and innovation) could be tackled by the book series. The interdisciplinary (transdisciplinary) nature of the book series underscores that the scope of the book series is not limited a priori to a specific basket of disciplines. From a radical viewpoint, one could create the hypothesis that there is no discipline where knowledge is of no importance.
2. *Decision makers—private/academic entrepreneurs and public (governmental, subgovernmental) actors:* Two different groups of decision makers are being addressed simultaneously: (1) private entrepreneurs (firms, commercial firms, academic firms) and academic entrepreneurs (universities), interested in optimizing knowledge management and in developing heterogeneously composed knowledge-based research networks; and (2) public (governmental, subgovernmental) actors that are interested in optimizing and further developing their

policies and policy strategies that target knowledge and innovation. One purpose of public *knowledge and innovation policy* is to enhance the performance and competitiveness of advanced economies.

3. *Decision makers in general:* Decision makers are systematically being supplied with crucial information, for how to optimize knowledge-referring and knowledge-enhancing decision-making. The nature of this "crucial information" is conceptual as well as empirical (case-study-based). Empirical information highlights practical examples and points toward practical solutions (perhaps remedies), conceptual information offers the advantage of further-driving and further-carrying tools of understanding. Different groups of addressed decision makers could be decision makers in private firms and multinational corporations, responsible for the knowledge portfolio of companies; knowledge and knowledge management consultants; globalization experts, focusing on the internationalization of research and development, science and technology, and innovation; experts in university/business research networks; and political scientists, economists, and business professionals.
4. *Interested global readership:* Finally, the Springer book series addresses a whole global readership, composed of members who are generally interested in knowledge and innovation. The global readership could partially coincide with the communities as described above ("academic communities," "decision makers"), but could also refer to other constituencies and groups.

Washington, DC, USA Elias G. Carayannis

Foreword

Victor Hugo wrote 'there is nothing as powerful as an idea whose time has come' and so it is with the key idea put forth in this book. We are at a unique point in history where multiple disruptive technologies are arriving at the same time, enabling multiple and multiplicative situations in which Schumpeter's 'creative disruption' is happening, destroying old leaders and regimes and creating new winners. The tidal wave of digitization that is occurring as Moore's Law and Gilder's Law collide with virtually every domain is unstoppable.

Everywhere automation, substitution, dematerialization and transformation are taking place wherever ICT resources are available and used—and that is almost everywhere. Cloud computing and software as services allow small companies to compete with the very largest ones. Big Data is allowing the monetization of data and creating game-changing insights into everything from consumer behaviour to drug discovery to precision medicine. The Internet of Things will allow many physical entities to have a virtual identity and presence and will allow high-precision, high-frequency control loops to be put in place where previously open loop control was possible. For example, real-time distributed air quality monitoring will allow real-time traffic management and dynamic incentive modification for park-and-ride facilities to optimize between the best air quality, commute times and fuel management in cities and elsewhere. There are many more opportunities with other emerging technologies, such as block chain, creating new previously unthinkable possibilities. These disruptive technologies, coupled with the increasing availability of venture capital and increasing connectivity, are creating a new primordial soup which is beginning to unleash a Cambrian explosion of innovation and entrepreneurship that forms the basis of Professor Formica's entrepreneurial renaissance.

Open Innovation 2.0 (OI2) is emerging as a new mode and paradigm of innovation to help us get collectively to shared prosperity and shared sustainability which ultimately lead to sustainable intelligent living. This recognizes that the unit of competition has moved from how good an individual organization is to how strong the particular ecosystem in which the organization resides. It also recognizes the importance of the user, customer and citizen in the innovation process. The core pattern at the heart of OI2 is shared purpose, where shared vision, value and values are

espoused, lived and created. Professor Formica deliberately focuses on cities as the melting pots of this new renaissance, and with some justification. Many trends show more and more people moving to cities and mankind has just passed a major milestone, with more people now living in cities than elsewhere. There is a compelling logic behind this shift, as cities are the nexus of opportunity and innovation. Luis Bettencourt, of the Santa Fe Institute, and colleagues have shown that cities' economic attributes tend to scale super-linearly; that is, rather than outputs scaling proportionally with population in a linear fashion, outputs that increase super-linearly scale consistently at a non-linear rate greater than one for one. Bettencourt et al. showed that, with each doubling of city population, each inhabitant is on average 15% wealthier, 15% more productive and 15% more innovative.

Conversely, cities resource efficiency scales sub-linearly, in that the more people there are using a city's shared infrastructure, the more resource efficient is the city per head of population. This is a recipe to help achieve a more sustainable world. Increasingly the topic of urban metabolism, which is a holistic or unified way of viewing all the activities of a city, is being studied and thought about as a way to move towards sustainability. According to Kennedy et al. (2007, p. 43) urban metabolism can be defined as 'the sum total of the technical and socio-economic processes that occur in cities, resulting in growth, production of energy and elimination of waste'. Dolly Greenwood (2010) has advanced the hypothesis that the degree of 'connectedness' increases idea generation across an ecosystem to advance the capacity of an ecosystem to innovate. Increasingly cities councils such as those in Dublin, London and San Jose are explicitly working to cultivate and orchestrate the ecosystem to help enable entrepreneurial activity to advance growth and sustainability. Taken to the ultimate level, one could imagine a manifestation of Peter Russell's (2008) 'global brain', where the very high level of connectivity and light-speed communication could help elevate a city's population to a new stage of collective consciousness.

In parallel there is a movement for young people to consider serial entrepreneurship more actively as a lifelong career. The late Diogo Vasconcelus, a Portuguese politician and Cisco Fellow, was one of the first people to espouse the notion that, rather than students having the ambition to become 'employees' when they left university, they were increasingly harbouring an ambition to become entrepreneurs driving change and creating employment for others. The concepts of purpose-driven innovation and social innovation sit very comfortably with the new class of entrepreneurs who want to solve problems and be profitable at the same time. The President of the EU Committee of the Regions, Markku Markkula, has been a key driver of the concept of orchestrating regional innovation systems and smart specialization strategies within which individual entrepreneurs can flourish and achieve synergistic growth. Professor Formica's book and the contributions from many distinguished people sharing narratives and patterns from their own cities is an important contribution to the literature and offers key practices and exemplars that can be used to get us all collectively onto a trajectory for sustainable intelligent living fuelled by this new entrepreneurial renaissance. I encourage us all to be bold and 'Dream, Dare, Do'.

Martin Curley

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Foreword

I am writing this on my 76th birthday. Reading through this thought-provoking book has prompted memories of five decades of professional life. Piero and his fellow authors have stimulated reflections on the ways I have seen attitudes, cultures, mindsets and practice evolve and change, and how much of my experience I can relate back to earlier times of great creativity in history, which Piero himself relates to our age with his passionate and articulate narrative about the Renaissance, inspired very significantly by the great thinkers and families of his native Italy in those times. Some of us have been suggesting that in this century—described by the Royal Society in the UK as 'The Century of Science'—we may be living in 'a new Renaissance'.

The wonderfully comprehensive introduction by Piero sets the scene for a collection of diverse studies of how this proposition may indeed be considered as being close to reality in a number of centres around the world. It has long seemed to me that when we consider those moments when the world was set on undergoing change of momentous proportions we find, at the centre point of real revolutions or significant evolutionary change, major advances in communication, connections and the commitments of people to connect and communicate. Early in the text we are reminded by Piero of the importance of Einstein's great statement that 'intuition is a sacred gift'. 'Dream, Explore, Discover'—we are urged to consider; and so it should be. But beyond dreams, great explorations and discoveries comes the passion and commitment to connect and communicate. For me, the two great heroes who enabled the proliferation and globalization of knowledge and invention have been Johannes Gutenberg and Tim Berners-Lee.

I was fascinated to read in such detail some of the accounts gathered by Piero of the great families of the Italian Renaissance. We can now see, in many places, the transformation of ideas, imagination and vision into action, and the passing on of knowledge through human interaction and the concept of the 'bottegga' (workshop), which I see practised today under other names—for example the 'design factory" process being championed by the highly innovative Aalto University in

Finland, and the 'Fab Labs'.[1] In my native Cambridge, the success of the 'IdeaSpace' in the University has been remarkable in the encouragement of supported ideation leading to acceleration of start-up and scale up of businesses.

I return to my thoughts of Gutenberg, in 1458, and the combination of his innovative thinking and skills in mechanics and metallurgy which made possible the rapid dissemination of knowledge and entrepreneurial thinking across Europe and the wider world, and the proposition that we are indeed entering (or are already part of) a 'New Renaissance', based surely upon the World Wide Web—introduced in 1991 by Tim Berners-Lee and having potential we have not yet fully imagined. Here are disruptive approaches to communication and connectivity—500 years apart. However, both of these great inventions serve the purpose of the individual, the university, the corporation and indeed society—if used appropriately.

Much has been written about the earlier Renaissance as an 'Age of Knowledge', or the summation of such an age. As I reflect on the inspiring opening of the book (it must be read and re-read!) and the more practical case study chapters, I am more than ever convinced that our present transition as peoples is from an Age of Knowledge to a new 'Age of Imagination'. Albert Einstein repeatedly reminded us that 'Imagination is more important than knowledge' and that knowledge itself is limited. From the opening and subsequent chapters I draw inspiration and comfort supporting my own deeply held convictions that innovation—properly understood—is so critical for bringing ideas, knowledge and the best research into being in forms useable by mankind and helpful to society.

If indeed we are part of a re-birth, a regeneration, a 'changing of ways', then—reflecting on my daily existence, seeking to maintain very many connections and interests—I am drawn to conclude that, like many, I must become a modern day Hermes, the Olympian God referred to in the text who played several roles simultaneously, travelling in different directions. I wonder how many readers, as do I, feel the stress of such an existence? Nevertheless, it brings fulfilment—a human state different to happiness. It is fascinating to reflect upon how the leaders and participants in that first Renaissance found the means to bring together science, philosophy, artistic endeavour and creativity, enabling individuals and groups to enjoin and converge in ways we still find difficult to achieve today.

It is true that we do live in an 'Age of Convergence'—not least the convergence of technologies such as information technology, biotechnology and nanotechnology (as examples). There are elements beyond synergy relating to some of these modern day opportunities for convergence. Symbiosis can be demonstrated in the business world, where we find large corporations able to exist only in a symbiotic relationship with smaller, highly specialized partners who enjoy equally the symbiotic state. As one who spent a large number of years climbing the greasy pole in a large multinational corporation, I appreciate, in a seriously emotional way, the movements we have seen away from hierarchies towards networked relationships, offering opportunities for so much more individual creative space. In the narrative describing

[1] Fab Labs are purpose-built digital fabrication and rapid prototyping workspaces that have been, and are being, set up across the globe. See, for example, http://www.fablablondon.org/about/.

those early centuries, connectivity, convergence, confluence, co-creation and collaboration are seen to have been embedded in developing practices, behaviours and culture. Jim Collins is quoted with the statement—'Great vision without great people is irrelevant'; and throughout the text it is indeed inspiring to see that people are the key factor, lying at the heart of real progress.

Piero refers to the Renaissance as

> …a long thread stretched across centuries: from the earlier European Renaissance in the Middle Ages to Japan of the Tokugawa Period (1603–1868); the Timurid Renaissance and then the Bengali Renaissance of the Indian subcontinent, from which arose personalities such as the scientist Satyendra Nath Bose (1894–1974); the American Renaissance at the turn of the nineteenth and twentieth century; and from the 'New Culture Movement' which began in 1917 up to the present day, with the Chinese Renaissance taking place after centuries of oblivion in the Middle Kingdom.

Elsewhere, Piero elaborates on many of the entrepreneurial elements and effects of much earlier aspects of Chinese history—all the way back to the days of beginnings of the Silk Road. His proposition for the future is that, 'Today's artistic and cultural upheavals in human and physical sciences herald a new Renaissance, which could both affect and blend with entrepreneurship'. I agree, and in this regard I love the term I have shamelessly stolen from the text: 'Entreprenaissance'.

Education, world population growth and demographics are matters of great importance to us all. The challenges of climate change, food security, water supplies and the effects of industrialization and globalization are the subject of volumes of commentary and predictions. The content of some of the chapters in the book provides information and insights and should foster aspirations for success as we mere mortals strive to meet these great challenges of our times—not to mention security issues, wars and other man-made problems. Some chapters deal specifically with education; and some in part with the effects and implications of rapid urbanization. So much of what we entrepreneurs might bring as contributions to how the world deals with the challenges and opportunities in these subject areas will depend on our success in helping the establishment, and indeed embedding, of positive mindsets. The vision of a world where, in theory, everyone might one day soon be connected with everyone encourages some of us to urge our students and young entrepreneurs to think seriously about the concept and practice of 'A World Without Borders'—mindsets of international entrepreneurial thinking. An attitude of 'Why Not?' rather than 'Yes, But'.

Entrepreneurial education in a practical sense, as described in some of these pages, and transformational education in the universities of the twenty-first century, where the principle is student-centric learning—not teacher-centric activity—and where students and alumni become much more often the leaders and trendsetters, and where the university is the centre point and fountain of inspiration for the whole community, are already with us in growing numbers of centres around the world. The 'LbD' approaches—'Learning by Developing' being championed in universities in Finland and elsewhere at all levels of education, and from day 1—are indeed a throwback to the Renaissance and to the variety of educational processes that produced great minds and great change-makers during those Renaissance days.

The capacity for mass learning and super-connectivity creates opportunities for education and mentor support to reach places and people previously inaccessible. The workshops, design factories, Fab Labs and IdeaSpaces will flourish. The comments in one perceptive chapter here about the failure of business schools in general contribute to the creation of more successful entrepreneurs and more new businesses are well made. Those business schools which will hold prime positions in the future are emerging, taking note and finding new ways of connecting themselves to the mainstream of learning. The narrative describing the EDEN Centre for Entrepreneurship and Design Innovation at Maynooth University in Ireland is truly exciting.

I must put my finger on one concern that I have when I look around me today and ask the question: 'Are we doing as well in education and the emergence and development of new enterprises as in the early Renaissance when it comes to connecting and embracing the creative areas and creative industries?'. My sense, perhaps clouded by my technological education and living in Cambridge, one of the great technology clusters of the modern world, is that more could be done to bring art, design, literature and the creative industries further into the mainstream of the new renaissance.

The sub-title of the book is 'Cities striving towards an era of rebirth and revival'. There have been predications that by 2035 cities—or urban areas altogether—will be home to 70% of the world's people. Between 2004 and 2014 the proportion of we humans living in urban areas grew from 41 to 53%. In Asia the growth was from 38 to 54%. In China as many as 350,000 people a day have been moving from country to town for prolonged periods. This of course places many stresses on many points. But there are 'cities and cities'. I was recently in the megacity of Chengdu in China, having a population of some 15 million but still some way distant from Chongqing which has a population of 31 million (Beijing has a mere 23 million). My home city of Cambridge has a population of about 120,000; and yet Cambridge, by developing a joined-up entrepreneurial ecosystem over the past 60 years, with an 800-year-old university at its centre, has produced Europe's fastest growing regional economy, the biggest cluster of hi-tech bioscience companies in Europe and 15 companies that grew within 25 years to be valued each at more than $US1 billion. The largest is worth $US25 billion. Moreover, it is not that money has been the main measure: 60,000 new jobs have been created and a community of enterprise, common purpose and social inclusion has been sustained—with a great deal of foreign, inward direct investment.

The culture and atmosphere are decidedly 'new renaissance': active networks, open innovation and collaboration. Small can be more than just beautiful. So, cities are 'not just cities'; but communities are, however, communities. From all that I have read, the Renaissance was spawned in places where communities of common purpose were formed and flourished. How then can China and its megacities deal with the opportunities and challenges? I found the answer from an example, in mid-2016, in Chengdu: Chinese cities, not unnaturally, have districts and towns.

A real-life example is Jingrong Town, in Pixian County Chengdu: the town has one million inhabitants. The Chinese central government has designated 17 such

towns as entrepreneur centres and central funds have been dispensed accordingly. Some of us are working with Pixian to assist the development of an entrepreneurial ecosystem there. Here is an extract from a government document describing what is taking place. It is an interesting example of focus and essentially 'downscaling' to create a practical model in a large metropolis.

> Jingrong Town is located in Deyuan Town of Pixian County, Chengdu. The name Jing means 'young people'. With the instruction and support of Pixian County Peoples Government, Jingrong Town is a paradise for young people to start business, and an accelerator for the establishment of the new image of Chengdu—City of Business Starting and Dream Fulfilling. Jingrong Town will serve as a bridge to help all talents with dream, faith and pursuit to succeed.

Note the poetic language. China is big on dreams and visions. Pixian County has 19 universities, now focussed more on entrepreneurial education, and the Mayor of Pixian proudly announced recently that 'there are 925 entrepreneurial programmes now installed'. Furthermore, in case it is suggested that the emerging companies may be of a boring old-economy nature, quoting again from the Jingrong notes we see Virtual Reality, Augmented Reality, E-Commerce and Biotechnology listed.

China's 'entreprenaissance' is taking place in many locations not well known in the West—or not known at all to those not going there. Piero writes of 'Cities striving towards an era of renaissance and revival': nowhere more so than in China. The true extent of the contribution of Ancient China to the first great age of inventiveness and outreach, described in part in the opening chapter here, is exhaustively researched and reported in 'The Silk Roads—A New History of the World' by Peter Frankopan.[2]

My hope is that this present book will stimulate more deep thoughts and interest, and indeed actions, which support the evolution of a new renaissance. Confucius made the point about the importance of understanding history as we look ahead to the future: 'Study the past if you would define the future'. This will be the age not just of connectivity: there will be meta-connectors in abundance. But in a world where we will see far greater convergence of artificial intelligence, machine learning, genetics put to use, robotics and more, perhaps 'connectricity—creating the currents that determine the future'—is a better state to seek.

On a positive concluding note, I expressed above the view that 'hope will lead to action or actions'. On reflection, it would be better to reverse the action words and agree that 'action leads to hope'.

Alan Barrell

[2] Frankopan P (2015) *The Silk Roads—A New History of the World*. London: Bloomsbury.

Editor's Note and Acknowledgements

The intent of this book is to create a bridge between the Renaissance of the period between the second half of the fourteenth and the sixteenth centuries and the present, insurgent renaissance: a bridge that creates an ideal connection between the Renaissance entrepreneurship of that time and the new one of the current time.

The first Renaissance, conceived and developed in an urban environment, with the Medici family in Florence as pioneers, was a melting pot of art, culture, science and technology. It is in that context that entrepreneurship—with an artisan matrix and, hence, customized—was born, to meet the demands and anticipate the needs of individual consumers.

With the coming of the mechanical technologies of the first industrial revolution, art, culture and science have become divorced from entrepreneurship. The latter took on Fordist features, resulting in depersonalization and, therefore, standardization of the producer–consumer relationship. The present renaissance entrepreneurship returns to the ideals of customization—thanks, for example, to the coupling of 3D printing technologies and a sharing/on-demand economy—strongly linked to the sequence 'art–culture–science–technology'.

The metaphorical road to a new entrepreneurial renaissance is travelled by cities having creative communities. These communities actively participate in the mobility of international talent, promoting connections between the knowledge nomads who move around the world and other talents to whom the cities address their attention with a view to being recognized as the final destination of their wanderings ('come here and stay').

Against the background highlighted in the introductory chapter, authors from various cultural roots, different countries and continents paint the picture from the perspective of their cities. They offer stories that are having a major effect, like a renaissance, on the development of the cities of their narratives. Brought back to life in the different conditions of the current age, sewing together pieces of art, culture, science, technology and entrepreneurship, entrepreneurial renaissance gives cities renewed identity and pride.

In conceiving a publishing project for a new entrepreneurial renaissance, I drew inspiration from the interweaving of humanities, social sciences and natural sciences

that characterizes the University of Maynooth. Founded in 1997, the University is both the youngest and one of the oldest institutions of higher education in Ireland, tracing its origins to the foundation of the Royal College of St. Patrick in 1795. It was there that Father Nicholas Joseph Callan (1799–1864), professor of natural philosophy, demonstrated the transmission and reception of electrical energy without wires with a device that is now known as the electrical transformer. Professor Callan is best known for his work on the induction coil and for having built, at the time, the world's largest battery: his work contributed to the fertility of innovative entrepreneurship during the Industrial Revolution. Discoveries, inventions and innovations have flourished in hybrid contexts such as the College of St. Patrick where an invisible thread tied together theology, philosophy, art and science—a legacy that the University of Maynooth has renewed, enriching it with new contents.

I would like to record my special thanks to all of those who have accepted my call, offering evidence of the interesting times, informed by the renaissance spirit in which we live. In many different ways all of these people have enriched the book with their ingenuity.

Thanks are due, too, to John Edmondson and Tim Feest for their extremely valuable contribution to the editing, including further background research.

A special debt of gratitude is owed to Philip Nolan, President of the National University of Ireland (NUI) in Maynooth, and Ray O'Neill, Vice President for Innovation, for their active support and encouragement. Last, but not least, I am grateful to Martin Curley, co-founder of the Innovation Value Institute and my companion of adventure along the path of research in the discovery of unknown unknowns, unencumbered by presumption and preconceptions.

Postscript: Dr. Debra Amidon passed away on 13 August 2016. She was one of the original architects of the knowledge economy and founder of ENTOVATION International, a global innovation research and consulting network. We are very indebted to Debra for advising us in drafting the project that has inspired this book. Her pioneering spirit will stay with us always.

Contents

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Chapter 1
Scope of the Renaissance

Piero Formica

…..the human spirit since the Renaissance…has consisted and continues all the time to consist mainly, not in the discovery of positive truths, but substantially of negative ones. It consists, in other words, in knowing the falsity of what in the more or less distant past was thought to be certain…

Giacomo Leopardi: *Zibaldone* (*The Notebooks*) (Leopardi 2013)

Since the Renaissance, a concept called 'progress' has been baked into our society. Progress—founded on an accumulation of knowledge through experience (and in the case of science, through experiment). To build on the past rather than endlessly relive it. That's what separates us from the beasts.

Seth Shostak, US astronomer (Shostak 2012)

At the dawn of the Renaissance there was a strong sense of living in the end of days. Obscured by the shadow of the Middle Ages, the desire for a renewed identity, shaped by both humanitarian and scientific learning, was in its infancy. Artists and scientists began the work of dismantling everything that for centuries had been taken for granted. The Italian Renaissance contributed significantly to breaking down the boundaries—those of ideas as well as those of geography or demarcated by political power. The new entrepreneurship coming into force in Medici Florence, in Venice under the Doges and in Milan dominated by Ludovico il Moro, taking place as a result of advances in the textile industry and in the wake of the Italian Renaissance, extended beyond geographical and political borders and found profitable links with Flanders and, therefore, with the Renaissance in the Low Countries (corresponding roughly to the present-day Netherlands, Belgium and Luxembourg). It was in Flanders that the innovator and influential cartographer Gerardus Mercator (1512–1594) depicted the 'outside' world—that world beyond normal individual experience which had until then been hidden from view—thus paving the way for long-distance exchanges.

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The Renaissance has been a long thread stretched across centuries: from the earlier European Renaissance of the Middle Ages to the Japan of the Tokugawa Period (1603–1868); the Timurid Renaissance and then the Bengali Renaissance on the Indian subcontinent, from which arose personalities such as the scientist Satyendra Nath Bose (1894–1974); the American Renaissance at the turn of the nineteenth and twentieth centuries; and from the 'New Culture Movement', which began in 1917, up to the present day, with the Chinese Renaissance taking place after centuries of oblivion of the Middle Kingdom.

Today's artistic and cultural upheavals in human and physical sciences herald a new renaissance, which could both affect and blend with entrepreneurship.

1 Entrepreneurial Renaissance

Dream, explore, and discover: three distinctive features of a cultural movement referred to as 'Innovative Entrepreneurship'. It is a movement brought about by virulent epidemics of innovation, which was as rife in the Renaissance as it was during the Song Dynasty (960–1279) in China, the Dutch Golden Age (1568–1648), and in Britain in 1651–1851—to name but three epochs which experienced magic moments of the accelerated tempo of innovation.

The Renaissance put knowledge at the heart of value creation, which occurred in the workshops of artisans and artists. Here, painters, sculptors and other artists met and worked together; as did architects, mathematicians, engineers, anatomists, other scientists and rich merchants acting as patrons. All of them gave form and life to Renaissance communities, generators of aesthetic and expressive as well as social and economic values. The result was entrepreneurship that conceived revolutionary ways of working, of designing and delivering products and services, and of seeing the world. In short, here was a spark of prosperity characterized by discontinuity.

Although inclined to absorb the innovative content of past ages, every rebirth shows signs of discontinuity with the past. Discontinuity reverses the sequence between what was and what will be. In the logic of continuity, there is no future without a past. The route to the future is outlined and conditioned by events that have already happened. In the sign of discontinuity, there is no past without a future. The future marks out and traces its own path independently, taking from past events what it deems appropriate for its construction. Renaissance, Reformation, Scientific Revolution, Enlightenment, Industrial Revolution, Capitalism (in its various forms—corporate, molecular, family, etc.): these are stages of transformative social and productive structures brought about by discontinuity.

Analysing the unfolding of social and economic conditions, researchers and scientists at the Santa Fe Institute (www.santafe.edu) re-proposed the ever-increasing role of knowledge in order to grow and combine the 'well-having' and well-being of individuals and their communities. Equally, many years have now passed since Peter Drucker (1909–2005), the forerunner of modern management, advocated that, 'knowledge may come to occupy the place in the politics of the knowledge-based

society which property and income occupied over the three centuries that we have come to call the age of capitalism' (quoted in Kilpi 2011).

Countries and cities where policy makers are keen to usher in a renewed age of entrepreneurial renaissance are facing the maturity stage of the GDP life cycle—the yardstick of a country's economic performance. Studies on human capital initiated in the 1960s by Gary Becker (1930–2014), Nobel Laureate in Economics, had already cast a shadow over this monetary measure of the value of a country's overall output of goods and services. The entrepreneurial renaissance rewards specific qualities—for example, the contribution (the productivity) each employee brings to the team to which they belong—rather than numerical quantities (e.g., number of staff and hours worked).

In the framework of the entrepreneurial renaissance, value creation occurs in the crucible of dialogue, and then through interactions between interdependent people. Here is the cause of the prominence of disciplines at the convergence of the sciences—from econo-physics, which studies the cognitive flows and collisions of ideas within and between renaissance communities toward which stakeholders from different disciplines converge and integrate, to neuro-economics, which examines the human mind in relation to decision-making processes for the implementation of new solutions with regard to specific tasks to be carried out.

2 In Search of Shared Prosperity

In the games played on the innovation field, it may happen that the winner takes all. The market power of the new monopolist can cause severe disparities in the distribution of income and wealth. Growing inequalities occur not only between individuals; businesses are also affected. Those among them who raise high monopolistic barriers can enjoy returns on investment several times higher than the median values. As epicentres of value creation, cities are faced with a narrow path traced by innovation between progress and inequality, leading to the question: how to follow such a path? In the wake of Schumpeter, perhaps they should not worry about the new monopolies, whose strength might decline in the face of strong pressure from potential competitors determined to enter the most promising emerging markets. The best strategy might therefore be to let the market take its course. What, then, if the monopoly-derived profits of the incumbents withstand the attacks? In short, what if the markets are not as efficient and equitable as one might expect?

It is the different levels of government coming into the field, acting as referees, that we usually observe. On the front line in the battle against monopolistic powers, seeking to ensure economic democracy in the urban ecosystem of innovation, what motivations drive the behaviours of local administrators taking on the roles of referees? Does the answer lie in the simulation and the personal interest of the prince, or other, manifestly opposed, motivations? In the style of Niccolò Machiavelli (1469–1527) and Francesco Guicciardini (1483–1540), the referee must strive to possess, together with firmness, the qualities of honesty, loyalty and a sense of fair play.

This is not to say, however, that appearance necessarily matches reality. What is true for product and service markets is no less true in the political market where the prince, in the role of referee, can act for his own personal gain (what Guicciardini called '*particulare*') and so build a political monopoly, presaging disparities among people as well as among companies. Conversely, those referees who do not seek to achieve and maintain monopoly power, or the praise of the crowd through the mere appearance of their actions, seem determined to umpire properly in the field of innovation in order to pursue a shared prosperity and to provide opportunities that will not be stifled by entrenched monopoly power.

There will be cities that will give shape to the kind of public intervention which helps improve the lives of ordinary people, their families and communities, and thus will lay the foundations for innovative entrepreneurship which upholds the values of economic democracy against a new age of unbeatable monopoly. These cities will merit the epithet 'renaissance'.

3 Connected Cities

The history books tell of cities subjected to movements that generated connectivity among them. Newly encountered lands are harbingers of commonality between peoples of diverse cultures. In the Middle Ages, connected by trade and cultural currents that spread from East to West, the protagonists were the Mediterranean cities, as shown in the left-hand part of Fig. 1.1. Intellectual movements and entrepreneurial activities incubated and developed in the Islamic world were propagated in the West. Muslim Spain would play a key role in the evolution of science. From around the world of that time, researchers and students came together in Cordoba. It is connectivity that gives high status to a city.

Renaissance Florence is a strategic location at the crossroads of connectivity. Richard Goldthwaite (2009), eminent historian of the Florentine economy, has traced the connections whose origin lies in the markets of raw materials, manufactured products, credit and art. The Florentine merchants imported fine wool that was used to produce high-quality textile products. Starting from Bardi and Peruzzi, its leading bankers since the Middle Ages, the banking industry stretched up to the north, connecting with Antwerp in the Low Countries. With Antwerp and Bruges, Florence strengthened its connections in the art market. With the opening of new trade routes after the discovery of America, port cities bordering the Atlantic Ocean were engaged in building connected networks to the west. To the east, by means of land and sea routes, cross-cultural and trade relations wound their way through Venice and the Persian, Indian and Chinese cities imbued with the Renaissance spirit. Relations may have arisen in China, as suggested by Gavin Menzies (2008), for whom 'the transfer of Chinese intellectual capital was the spark that set the Renaissance ablaze'.

Since World War II, connectivity has blossomed in all directions. Encounters arise from a commonality of purpose rather than the geographical proximity of

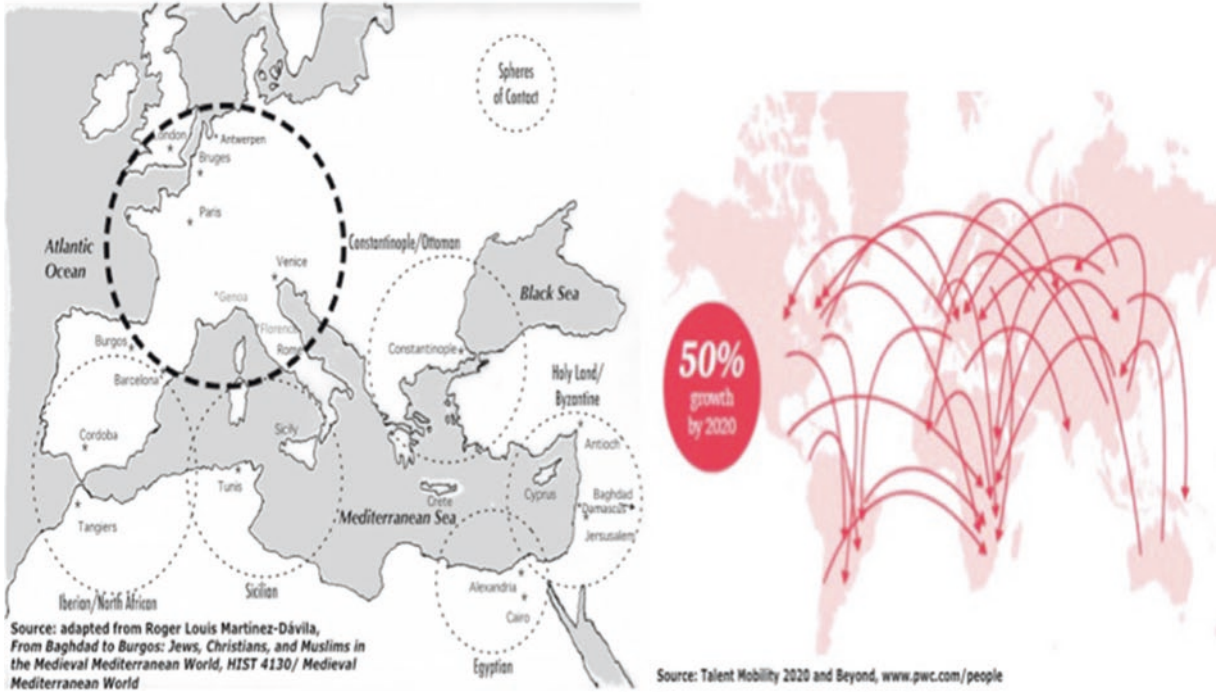

Fig. 1.1 Connected cities in the Middle Ages, in the Renaissance and in the Global age

cities. Political choices and openings that favour free trade as well as the growth of intellectual, entrepreneurial and financial capital without borders initiated the age of small-scale globalization which matured into large-scale globalization. The latter is characterized by the increasing propensity to international mobility of talents—among them aspiring and new entrepreneurs—and this is now contributing strongly such that the connected cities present the image of a single and dense network with many loops and knots (see the right-hand part of Fig. 1.1).

Human capital is among the factors that most influence the location choices for founders of start-up ventures. According to Startup Heatmap Europe 2016 (www.startupheatmap.eu), access to highly qualified talents is relevant, or very relevant, to the highest number of founders, with 23% of them having started their company outside their country of origin. The probability that founders of start-ups will move across national borders is five times higher than the average rate for European Union citizens. Cities where the two currents of talents and founders intersect become hubs of connectivity.

4 Cities on the Cusp of an Entrepreneurial Renaissance

The ideas generated during the Renaissance formed an inextricable tangle of artistic, scientific and technical inventions, and accumulation of capital in the cities. In a climate open to new ideas, plentiful sources of experimentation and innovation, cities became important and wealthy artistic and entrepreneurial centres.

The name of the future of cities is ‘Transformative Entrepreneurship’, to which ‘Renaissance’ should be added. The first half of the current century is experiencing an accelerated movement of rural populations to cities. In the age of worldwide mobility, fast-movers are those talents attracted by the research centres and laboratories of academia and industry located in cities, as well as by the opportunities to exploit the results of their investigations offered by the multiple connections among the leading protagonists who crowd the city. However, it is not only the talents who flock in large numbers to cities. The movement is much broader, engaging the different layers of a world population looking for opportunities that take shape in cities, which then become locations for the design and implementation of innovative approaches in social and economic fields. What really meets the needs of old and new citizens is the entrepreneurial culture that arises from the adoption of a behaviour that provides effective answers to scientific, technological and human dilemmas. This culture is synonymous with a new life, a renaissance, which gives to each city a unique conceptual imprint.

From education to science and entrepreneurship, the intangible factors of innovation are the central engine of that human change that is a renaissance. In the cities of a new entrepreneurial renaissance, the frontier of human knowledge is dynamic, always moving forward. The government of ideas springing from human creativity—the ‘ideocracy’—generates projects that create a demand for knowledge-based activities: from intuitive knowledge to knowledge along the two directions of

induction and deduction. According to a holistic and organic view of the city, it is the common weal—and therefore the prosperity of the community—that is the goal to achieve.

As with the English polymath Francis Bacon (1561–1626), in renaissance cities the figure of the scientific leader of new industry moves into prominence, relying heavily on science to manufacture different and higher-quality products than those of the Industrial Age. Also emerging onto the scene are 'political entrepreneurs' and 'public entrepreneurs'—characters whose names were coined by Galal and De Haas (2016). The former channel their renaissance vision into innovative strategies which are pursued by the latter—individuals or public sector organizations with a mission to increase the absorptive capacity of innovation.

Building upon these features, borrowed from the canon of renaissance economics outlined by Reinert and Daastøl (2004), the entire body of entrepreneurship rises to new life with more entrepreneurs and creators of innovative businesses who, bringing abundance, instil optimism in the cities that nurture them.

5 Revival of Education

Education is the precondition of any expectation about what can be achieved tomorrow. With regard to actively responding to the intermingling of technological and social changes with strong economic implications, the values, attitudes and behaviours of the school system are under pressure from irreversible transformations. At stake is the formation of the twenty-first century 'renaissance man', who, like his ancestor of the Renaissance, must be able to excel in different activities, performing a variety of tasks.[1] The new renaissance man is aware that the breadth and systematic nature of knowledge poses problems of such scale that decisive actions are required by people willing to establish meaningful relationships; relationships born out of passionate conversations that create emotional as well as intellectual connections. These are the people who shape the new renaissance communities.

The new entrepreneurial renaissance flowers from learner-centred education. The fifteenth century Renaissance was a time of learning, marked by humanists gathered at the court of Lorenzo de' Medici (1449–1492).[2] Educators conceived innovative ways of understanding education, breaking revolutionary paths and moving away from the then dominant teaching orthodoxy.

In a report from Tokyo in February 1990, the Italian journalist Tiziano Terzani wrote about Japanese education:

[1] 'Renaissance man' is a term coined to describe 'a cultured man of the Renaissance who was knowledgeable, educated, or proficient in a wide range of fields' (see http://www.dictionary.com/browse/renaissance-man). Of course, in our present, more enlightened times, 'man' could be 'woman': for convenience and simplicity, we will use the original phrase on the basis that it can refer equally to a Renaissance woman.

[2] The Medici were the famous dynasty of bankers and rulers of Florence.

> At school the child is not used to think for itself, but is trained to say the right thing at the right time. For each question there is an answer and that must be learned by heart. 'What happens when the snow melts?'—asks the teacher—and the entire class, in chorus, has to answer, 'It becomes water'. If one says, 'Spring is coming!', one is reproached. (Terzani 1998)

From another perspective, the neuroscientist Stuart J Firestein, Director of the Department of Biological Sciences at Columbia University, observed:

> I began to sense that the students must have had the impression that pretty much everything is known in neuroscience. This couldn't be more wrong. I had, by teaching this course diligently, given these students the idea that science is an accumulation of facts. Also not true. When I sit down with colleagues over a beer in meetings, we do not go over the facts, we do not talk about what's known; we talk about what we'd like to figure out, about what needs to be done. (Firestein 2012)

The Dutch Renaissance humanist Erasmus of Rotterdam (1466–1536) considered that the development of understanding through students' conversations with each other and with their teachers was far more important than the process of memorizing required at many religious schools of the Middle Ages. In the wake of Erasmus, the Moravian educator John Amos Comenius (1592–1670) suggested teachers should exploit the sensitivity, and therefore the feeling, of students rather than merely accepting their ability to memorize. Equally, learning through conversation, according to the English philosopher and physician John Locke (1632–1704), had to be at the centre of the school curriculum.

In the early twentieth century, the Italian writer Giovanni Papini (1881–1956) spoke against the school that '…does not invent knowledge but prides itself on transmitting it' (Papini 1919), and shifted the emphasis from teaching that takes students from giving the right answer to learning in experimental laboratories which provide a basis for raising, by both students and teachers, unspoken and unprecedented questions, and learning from errors.

Around the time of Papini, on the North American side of the Atlantic, the educational reformer John Dewey (1859–1952) ranked an unusual subject among the protagonists of education: ignorance, which he featured as 'genuine'. Ignorance could be profitable when accompanied by humility, curiosity and open-mindedness (Dewey 1933). As well as being genuine, this type of ignorance spawns new ideas. The knowledge gained is the equivalent of the medieval 'Finis Terrae'. Over and beyond the visible horizon of the 'Pillars of Hercules' there is the unknown continent—what you do not know, and you don't know that you don't know. As the neuroscientist Firestein claimed, to overcome the limits of the known requires an ability to remain in the mystery and the unknown, which, to adopt a saying of Confucius, can be likened 'to finding a black cat in a dark room, especially if there is no cat'. Hence Firestein's idea '…for an entire course devoted to, and titled, Ignorance. A science course [….] in which a guest scientist talks to a group of students for a couple of hours about what he or she doesn't know' (Firestein 2012).

Ignorance is not a barrier to action. The learning arising from creative ignorance is a journey that starts when you turn off the certainty of the light of the day, advancing in the dark night of unmeasurable uncertainty. What will happen along the way

towards the future you will discover en route, as part of the redoing and inventing processes. Living in the certainty of uncertainty, embracing creative ignorance, looking ahead, dealing with the unpredictable: this is how new paths are made (not found!), by walking in new directions in science, art and culture, and, not least, in entrepreneurship that draws nourishment from them. That is precisely what characterized the Renaissance Age.

A new entrepreneurial renaissance, then, is the result of a deviation from traditional teaching patterns. Deviations could be texts, essays, articles and courses focused on ignorance, which enrich both the literature and learning practices.[3] They come into conflict with knowledge maps and mental structures so far mastered.

6 Language Skills for the Entrepreneurial Renaissance

Intangible assets are under the spotlight in cities that promote entrepreneurial renaissance. From its logo to its artistic assets and corporate brands, the city communicates its excellence by relying on language skills to raise the productivity and competitiveness of the economy. The English language is the natural choice for communications, having achieved primacy as a communication medium for competing in international markets, creating businesses and interacting in digital networks.

The fortunes of a language can be traced in the ecology of the species that inhabit a community. From an economic point of view, growth fuelled by discoveries, inventions and innovations results in successful, universally recognized, entrepreneurial species whose popularity spreads the use of their language worldwide. The ecology of the species born from the Internet has been instrumental in promoting the supremacy of English. The economic growth fuelled by the status of English as the *lingua franca* eliminates the use of an increasing number of words in a language different from the dominant one, with the non-dominant language eventually withering away to such an extent as to run the risk of marginalization and disappearance. It is thought that this is a worldwide phenomenon, which is estimated to be systematically affecting 7000 known languages (Underwood 2014).

The above scenario neglects the metaphorical underground rivers that characterize the geography of languages. One of these is culture, which is more meaningful than the symbols and emotions evoked by the successful entrepreneurial species. In particular, plunging into the depths of classical cultures and their languages helps to extend the scope of imagination that creativity will put into action. This is the case for Latin which, at least in Western civilization, is notably re-emerging at the surface.

[3] With regard to the literature, by way of illustration we cite, in addition to Stuart J Firestein, Smithson (1989), Mark Forsyth (2014), Gross and McGoey (2015), Formica (2014); and Holmes (2015). With reference to learning practices, there are courses designed by the surgeon Marlys H Witte, the sociologist Michael Smithson and Stuart J Firestein, and the present author.

Fig. 1.2

Between the Renaissance and the present day, two technologies have been added to the process of communication. As well as being oral, written and printed, communication has benefitted, first, from the transition to electricity and, second, from the digital revolution. Today, communication through digital networks helps us to locate experts, partners and customers more readily and to identify prevalent trends, and, then, to seize opportunities offered by emerging trends. At the time of Gutenberg Latin was the *lingua franca* in movable-type printing. In the second renaissance, digital dexterity speaks English. Yet, Latin is rising to new life.

The revival of Latin was noted by *The Economist* on 27 July 2013: 'A dead language is alive and kicking online and on the airwaves'. Here are just some of the facts which, according to this weekly magazine, clearly highlight the resurrection of the Latin language:

- Turning back to the Classical Lyceum of Tampere, founded in 1901, whose tradition continues with the Classical School in which the study of the Latin civilization and language is still one of its hallmarks, Finland's YLE Radio 1 has, since 1 September 1989, broadcast a programme in classical Latin called *Nuntii Latini*, with listeners in over 80 countries.
- Similarly, Radio Bremen in Germany has broadcast a programme called *Nuntii Latini Septimanales* since 2001.
- Google Translate provides a service in Latin which attracts a larger number of users than Esperanto.
- In 2004, a Polish journalist started Ephemeris, an online journal in Latin, with contributors in Germany, Colombia, Chile and the United States.
- Schola is a social network in Latin, operational since 2008. Launched by Benedict XVI on Twitter in January 2013, the account *Pontifex Latin* records hundreds of thousands of followers. According to David Butterfield, a Latin scholar at the University of Cambridge, Latin is ideal for those who want to post 140 characters on Twitter; as Butterfield says, 'Five Latin words can often say more than ten English ones'.
- Google and Facebook offer users a Latin-language setting (Fig. 1.2).

Different forces are at play in favour of 'Latin lovers', revitalizing this language that was universal during the Renaissance. Among these forces, the imagination is what we want to emphasize here. In the second renaissance, the mass production of material goods using pioneering engineering technology is giving way to the production of a mass of ideas with the support of digital technologies. Imagination is not only a source of ideas; it also acts to combine ideas in different ways, some of which bloom in the garden of a renewed entrepreneurial renaissance.

Faced with Latin or other dead languages, we trigger a cultural process that brings us back to the origins of civilization. Symbols, metaphors and concepts that are the baggage of our tacit knowledge come to light in our memory. It is from here that the imagination draws its lifeblood, broadening its horizons so as to be induced to interact with others who are bearers of other cultures. Exposed to digital technologies, we realize that technology alone is not enough and that alone we can do little. Just as Steve Jobs imagined, we are ready to engage in a learning process to combine technology with the liberal arts; technologists with humanists. *Alienus non Diutius*, alone no longer, is the Latin motto of Pixar University, which has assimilated the lessons of Jobs. On the same wavelength, the Trivium University Centre in Tampere, Finland, which opened in January 2015, derives its name from the Latin word *trivium*, the meeting point of three roads. The University Centre has as its mission the encouragement of cross-disciplinary dialogue and the promotion of medieval and Renaissance cultures. Furthermore, the EF EPI, the largest international report on English proficiency, ranks Finland highly with regard to mastery of that language.[4] Technological culture and classical culture, English and Latin: this is the couple that contributes to the efficiency and effectiveness of the engine that drives the new renaissance entrepreneurship.

7 Renaissance Horizons

Is the aspiration of our age—the new age of knowledge with its high-powered entrepreneurial impact—as bold as that of the young Lorenzo de' Medici who, in 1469, called for a renewal that would be a transformative rather than an adaptive change? Can we make ours Lorenzo's *broncone* (stump) of laurel with the motto 'Le temps revient', recalling the passage of the Fourth Eclogue of Virgil '*redeunt Saturnia regna…surget gens aurea Mundo*' (The reign of Saturn is returning…..a golden race arises throughout the whole Earth)? Can we say that this new age of knowledge is the *viaticum*, our supply of provisions and money, for a journey towards the ideal golden age? Has the recent past been the Middle Ages of our times which has left unresolved problems deemed insoluble but which, on the contrary, we can solve in the near future?

[4] EF EPI is the Education First English Proficiency Index. See: http://www.ef.co.uk/epi/.

We can make several assumptions, the occurrence of which leads to positive answers to the above questions. The objective scientific sense is challenged by uncertainty and inconsistency as fundamental traits of nature. The observation of facts that clash with each other and the art of cultivating simultaneously opposing and even vague ideas—improvising, complying with contradictions, putting together logic and intuition and exploiting inexperience—these are mindsets that are oblique, and they therefore proceed along a path full of twists and turns. This winding road leads to the creation of entirely new things rather than just improvements of existing ones. The obliquity, which affected so many writers and artists of the Renaissance, was embodied in the mythological figure of Hermes, the Olympian god who held several roles, simultaneously travelling in different directions. Subsequently, the oblique approach was a favourite subject of Francis Bacon, whose thinking today's policy makers should recover to regenerate the art of politics, which currently favours the narrow and linear road of a planned evolution.

Asked by Pope Julius II (1443–1513) to paint the ceiling of the Sistine Chapel, Michelangelo di Lodovico Buonarroti Simoni (1475/1518–1564) at first replied that, being a sculptor and not a painter, he lacked experience to use the fresco technique. He therefore did not want to accept the assignment. If there is something deep and meaningful which subsequently prompted Michelangelo to accept the task—well, that 'something' can be found in the folds of inexperience. We believe it is the 'not knowing of not knowing' that causes revolutionary innovators to engage themselves in a thorough effort; and their aim is to seek solutions 'outside the box', in order to break from the dominant tradition.

Thus the revolutionary innovator passes over the visible horizon (Horizon 1) full of information directed at distant, not perceptible goals (Horizons 2, 3…*n*). Applicable to Horizon 1, the rules dictated by experience are no longer suitable for reuse once a journey of exploration to far-off horizons begins. This is where creative ignorance comes into play—after, not before, knowledge—and unlocks otherwise unthinkable paths of economic growth and social development (Formica 2014). With its charge of naïveté, creative ignorance discovers or even invents a new world, causing permanent damage to the world that complies with experience.

A close observation of Michelangelo allows one to recognize in oneself that 'swell kid' so vividly represented by the American writer J.D. Salinger (1919–2010) in his novel *The Catcher in the Rye*:

> The kid was swell. He was walking in the street, instead of on the sidewalk, but right next to the curb. He was making out like he was walking a very straight line, the way kids do, and the whole time he kept singing and humming. I got up closer so I could hear what he was singing. He was singing that song, 'If a body catch a body coming through the rye'. He had a pretty little voice, too. He was just singing for the hell of it, you could tell. The cars zoomed by, brakes screeched all over the place, his parents paid no attention to him, and he kept on walking next to the curb and singing 'If a body catch a body coming through the rye'. It made me feel better. It made me feel not so depressed any more. (Salinger 1951)

8 'Renaissance' Ideas

Intuition that, as Einstein said, is a sacred gift; imagination that begins with intuition; creativity that thrives when life and the surrounding environment are far from perfect; rewards for creative people; investments in new ideas that challenge the power of the Pope and sovereign rulers, that give impetus to science and birth to the new class of merchant creators of wealth; the many questions that stand out in the societal context and exceed the answers; freedom from formal education with its teaching kit, examinations and specializations that stifle intuition and imagination; the powers of observation unencumbered by preconceived assumptions and expectations; the *bottega* (workshop), the place where talents are nurtured, new techniques are at work and new artistic forms come to light; artists competing among themselves, but also ready to work together: all this and much more is what has been called 'renaissance'.

Ideas awaken the world; they do it as if being reborn. They are, in short, 'renaissance' ideas. 'No matter what anybody tells you, words and ideas can change the world'—so said the late Robin Williams, the great actor, in the movie *Dead Poets' Society* (1989). Further to his seminal work of 1986, 3 years before that movie was released, the economist Paul Romer explained that due to the non-rivalry of ideas—the fact, that is, that one person's use of an idea does not prevent others from making another use of it—innovations that arise from them enable the economy to be freed from the chains of the law of diminishing returns (doubling the input, the change in output is less than proportional).

By exploiting ideas, increasing returns (additional production inputs yield more than proportionate returns) change the economic world for the better because they raise material living standards. Hence, ideas, not objects, make the world move. The world is no longer caught between scarcity of resources and limits to growth. On the contrary, it is a playground for almost unlimited opportunities, where new ideas create new products, new markets and new possibilities for generating wealth. This is especially true in our present time, as access costs to knowledge dependent on technology are declining thanks to social media, digital services and applications for smartphones. What remain unchanged are the material and social costs related to the governance of education and educational processes that inhibit the emergence of new ideas, not allowing learners to gain access to sources of 'renaissance thinking' such as failure and creative ignorance.

There are periods in human history in which ideas, culturally very different from each other, look like threads to be woven into stories and projects that have a major impact on the social and economic fabric. Meeting people from diverse backgrounds, engaging in new and more effective dialogues, and also clashing—the intersection of artistic, scientific, business and policy ideas is the outcome of the creative process dubbed 'ideation'. This process was triggered by the social phenomenon that Frans Johansson (2004) called the 'Medici effect', revisiting the driving force of across-the-board innovation attributed to the Medici. In fact, in the Florence of the Medici ideation performs the whole cycle: from the generation of

the idea to its realization which, as Romer would say, comes in the guise of a recipe better than those hitherto produced.[5]

The Medici-inspired Renaissance shows the importance of the role of the city leaders—the aristocrats of that time—in outlining new trends and discovering talents whose original ideas would result in recipes for a better world. We live now in a time when the great migrations combined with the international mobility of the knowledge nomads anticipate a future in pursuit of the primacy of cities where, it is forecast, the majority of the world population will be concentrated by 2050. It seems that the appearance over the horizon of a phenomenon comparable to that which spread from Florence to the urban centres of Europe in the time of the Medici once again depends on the quality of local elites and leaders.

Cities aspiring to breathe the crisp, cool air of renaissance shape and attract unique entrepreneurial talents. History tells us something about the distinctive characteristics of renaissance cities. The entrepreneurs of the Florence of the Medici excelled in textiles, banking and financial services and, led by such families as the Medici, became patrons of the arts and science. Genoese entrepreneurs of the maritime economy opened up new trade routes to Northern Europe and the West, in the wake of the accidental discoveries of their illustrious fellow citizen Christopher Columbus, who was seeking a new route to the Indies '*buscando el levante por il ponente*' (seeking the Orient by moving Westwards). In Venice, the sea traders brought exotic goods and cultures from the Near and Far East to Western Europe.

9 The Age of Broken Certainties

With the dam of medieval certainties breached, uncertainty, coached and supported by the exercise of intelligence, opened a window on the landscape of the Renaissance whose perspective, starting with the Renaissance style, had its cradle in the theory of vision, optics and light developed in Baghdad during the golden age of Muslim civilization by the mathematician Ibn al Haithan (965–1039), known as Alhazen in the Western world. It was the beginning of a long happy time, manifested in the ascent of GDP per capita in Italy and the Netherlands, where the window was wider than elsewhere, as shown in Fig. 1.3.

As Voltaire (*nom de plume* of François-Marie Arouet, 1694–1778) tells us in *The Age of Louis XIV* (Voltaire 1751), Florence was at the heart of the third glorious age, preceded by the eras of Philip and Alexander, Caesar and Augustus, and followed by that of the Sun King, Louis XIV. 'Then,' wrote Voltaire, 'a family of private citizens was seen to do that which the kings of Europe should have undertaken. The Medici invited to Florence the learned, who had been driven out of Greece by the Turks; this was the age of Italy's glory. The polite arts had already recovered a new life in that

[5] See, for example, https://medium.com/designing-atlassian/how-we-disrupt-ideation-c558b9ca370#.h390k8gnt.

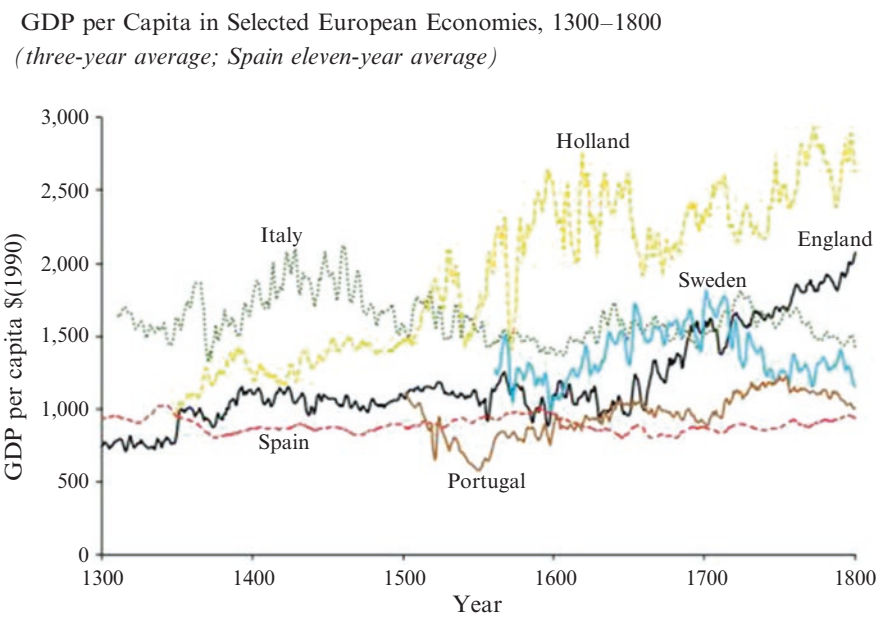

Fig. 1.3 GDP per capita in selected European economies, 1300–1800 (3-year average: Spain 11-year average). *Source*: Fouquet et al. (2015)

country; the Italians honoured them with the title of "*Vertu*", as the first Greeks had distinguished them by the name of Wisdom. Everything tended toward perfection.'

Imagine that we are in Florence between the late Middle Ages and the early modern period, when prominent figures such as those of the monk and the knight give way to the merchant and the craftsman. These new principal players perform the function of the silkworm which will later become a moth: this class of people with outstanding entrepreneurial skills—the 'merchants of light'—saw into distances most could not penetrate. This is the dawn of discontinuous change leading to the opening of previously untrodden pathways that threaten the authority of the holders of knowledge. Thanks to the severing of the old social bonds and the new emphasis on the rights of the individual and secular studies, artists, humanitarians, scientists and urbanites of mercantile cities start to travel along those paths in a spirit of entrepreneurial adventure. Masaccio (1401–1428), the first great exponent of Renaissance painting, combined pictorial art and the mathematical art of perspective. Born in San Giovanni Valdarno near Florence, this Tuscan artist was a pioneer of the cultural cross-fertilization which made the Italian Renaissance unique and universal. Recombining creatively the most diverse segments of art—sculpture, painting, mathematics, geometry, architecture—Masaccio contributed significantly to the cultural literacy that characterized the Renaissance and led to scientific revolution and enlightenment.

The city of Florence experienced the beginning of the Renaissance which, with the publication in 1486 of *Oratio de hominis dignitate* by the humanist Pico della

Mirandola (della Mirandola 1486), gave life to 'Renaissance man', free of chains, including those of the guilds that had restricted his movements in the Middle Ages. Such ever-increasing individualism eroded the collective ideals of the Middle Ages. The individual was placed at the centre and creativity was the key that opened the doors of entrepreneurship in unison with innovation.

The guilds controlled and kept the secrets of the trades they represented. Their attitude towards technological and entrepreneurial innovations was inconsistent: some were more conservative than others. If innate conservatism was not the primary cause of stifling innovation, change nonetheless depended on the leadership of a hierarchical decision-making process. Individuals who felt unfettered by corporatist schemes shaped the craft shops of those who would become raised to the status of the greatest Renaissance artists. In the centre of the scene were those who cooperated freely with one another to achieve a common goal. From this era arose the foundations of our anthropocentric age, with innovative start-ups heralding the entrepreneurship renaissance of the twenty-first century. Supported by digital technologies that create the infrastructure of 'knowledgefication', whose force of transmission is comparable to that of the electricity networks of the early twentieth century, the growing power of the human mind voluntarily builds its future using mental gymnastics to manage uncertainties, being unable to predict what tomorrow will bring.

Between the fifteenth and sixteenth centuries, free-thinking Venice shaped another great Renaissance backdrop. Thanks to special relationships developed between the Venetian Republic and Flanders, options and possibilities for artistic innovations coexisted with others entrepreneurial in nature (consider, for example, what was possibly the first assembly line, conceived and installed at the Arsenale di Venezia).

In 1482, and for the next 15 years, Milan stood on the shoulders of a giant at the service of Ludovico il Moro (1452–1508). Leonardo da Vinci—this is our giant, acknowledged as a universal genius, whom Giorgio Vasari (1511–1574), in *The Lives of the Artists* (Vasari 1685), described as a 'truly admirable painter, sculptor, art theorist, musician, writer, mechanical engineer, architect, scenographer, master metalworker, artillery expert, inventor, scientist'—not only gave Milan and its surroundings an artistic identity, but also helped to mark the transition from the feudal to the capitalist mode of production. Thus a new era began in Milan and its surroundings, introducing the profile of what would become the modern manufacturing entrepreneur.

10 The Spreading of the Renaissance Movement Mindful of Entrepreneurship

It was in Florence that artists discovered—some would say rediscovered from the Arab science of the eleventh century—the use of perspective in paintings. Later, the Renaissance was to follow different roads, from Florence, Venice and Milan. Those who created new pathways were able to rely on the distribution of a written culture that emerged as a result of the invention of the 'pocket book'. As a product of

cooperation between the technologist Aldo Pio Manuzio (1452–1515)—the first publisher of such works and perhaps the most famous printer of his time (see Matarese 2013)—and the humanist Pietro Bembo (1470–1547), the pocket book could be read anywhere, not just in public and university libraries.

The inauguration of an industry that previously did not exist can be a source of adjacent ideas which give rise to related entrepreneurial activities. Thus the Bolognese Francesco Griffo (1450–1518) drew inspiration from Manuzio's innovation to invent, and then put into an entrepreneurial practice, a new typographic style, that of the first italic type. Ideas are waves that propagate through space and time; and so, in the twentieth century, and with the advent of digital writing, Steve Jobs undertook a re-evaluation of calligraphy and font design, to make this a hallmark of Apple.

Crossing the Alps in the late fifteenth century, the Italian Renaissance fomented entrepreneurship by acting as a multiplier of commercial and cultural exchange between the countries and cities of Old Europe. The lands conquered by Protestantism proved the most receptive to calls for the strengthening of entrepreneurship and freedom to conduct business in the style developed by Renaissance culture. The radically decentralized system of government in the United Provinces (also known as the Republic of the Seven United Netherlands), which had liberated themselves from Spanish rule, promoted the commitment of the Dutch to generate financial wealth by creating commercial and manufacturing ventures. The three pillars on which the Dutch 'economic miracle' was built, which spread to science and military art (the so-called 'Dutch Golden Age'), across the seventeenth century, were: the solidity of the rule of law, the vigorous defence of property rights and contracts, and the low rates of taxation.

In England, during the reign of Elizabeth I (1533–1603), distinguished scientists such as the mathematician Robert Recorde (*c*1512–1558), controller of the Royal Mint, advocated the applied sciences as a means by which people could have full control over the course of their lives. From that time, a window opened on entrepreneurial spill-overs arising from scientific findings; so much so that, jumping ahead some 400 years, in the USA since 1995 more than 75% of the increase in productivity has been due to investments in science which resulted in new businesses. More than 400 start-ups from universities have been created annually—amongst them were the protagonists of the digital economy such as Google, Netscape, Genentech, Lycos, Sun Microsystems, Silicon Graphics and Cisco Systems. Furthermore, university spin-offs proved to be much more long-lived than others: amongst those born between 1980 and 2000, 68% were still trading at the beginning of the new century, in contrast to the 90% of start-ups of other origins which had failed in the same two decades.

In Japan, in the Togugawa period (1603–1868), education and entrepreneurship for the good of the nation marked a high point in the Japanese renaissance, giving rise to entrepreneurship that distinguished the Meiji period—the 'period of enlightened rule'—under Emperor Mutsuhito (1868–1912).[6]

[6]There is a helpful short essay on 'The Meiji Restoration and Modernization [of Japan]' on the *Asia for Educators* website: http://afe.easia.columbia.edu/special/japan_1750_meiji.htm.

From the fifteenth century, coinciding with the European Renaissance, the Timurid renaissance created an artistic and entrepreneurial milieu with a strong stream of cultural and commercial exchange between Persia and the Mughal Empire (1526–1857) of the Indian subcontinent.[7] Under the Grand Mughals, Ahmedabad, capital of the Sultanate of Gujarat, became a leading manufacturing centre which exported its products to foreign countries (Nehru 1946).

At the turn of the eighteenth and nineteenth centuries, Bengal was the renaissance counterpoint to Medici Florence. In the course of nearly a century and a half the Bengali renaissance was an innovative milieu of social and religious reformers, giants of letters and scientists. Illustrious personalities such as Sir Jagadish Chandra Bose (1858–1937), the multilingual physicist, biologist, botanist, archaeologist and writer of science fiction, and the physicist Satyendra Nath Bose (1894–1974), with their pioneering research that ranged from quantum mechanics (Nath Bose) to radio waves and experimental science (Chandra Bose) tilled the territory on which start-ups were then seeded and grew and which now enrich the landscape of the digital economy.

Michel de Montaigne (1533–1592), a vibrant personality in the philosophical thought of the French renaissance, viewed diversity as the most universal quality. The Bengal renaissance finds and maintains unity even in the most bewildering diversity of poets such as Rabindranath Tagore (1861–1941) and experts and scientists like Sir Jagadish Chandra Bose and Satyendra Nath Bose. Ideas from the two sides combine together and give rise to new ones, which live a life of their own. It is with this well-rooted attitude that in essence the 'renaissance personality' of India stands out as a globetrotter, building bridges between cultures: proof of this is the circulation of talents in research and science-driven entrepreneurship between Silicon Valley in California and Bangalore, two 'hot' and 'twin' shores of all-round innovation.

In North America, between the last quarter of the nineteenth century and the first two decades of the twentieth, the US renaissance is identified in particular by the determination of all its protagonists to give it a unique identity, typified by the self-confidence expressed with regard to new technologies. The steel suspension cables of the Brooklyn Bridge in New York are a visible sign of modernity in a nation that had begun its journey towards the goal of world leadership in politics and economics. Against the backdrop of the arts and architecture that shaped the US renaissance, this confidence in technology is the impetus of what has been called the Gilded Age of entrepreneurship in the USA.

[7] The Timurid dynasty, (fifteenth to sixteenth century) was '…of Turkic–Mongol origin, descended from the conqueror Timur (Tamerlane). The period of Timurid rule was renowned for its brilliant revival of artistic and intellectual life in Iran and Central Asia.' See, for example: https://www.britannica.com/topic/Timurid-dynasty.

11 Renaissance China

With mind and eyes ready to identify signs of political and economic turmoil across the Middle Kingdom, we can see that among the weaker, but by far the most significant, signals is that of China's return to the international scene of entrepreneurial renaissance at the intersection of science, art and culture. Under the Song Dynasty (960–1279), the city of Hangzhou was the Chinese version of Renaissance Florence. Many centuries were to pass before the re-emergence of the Chinese renaissance, seemingly from oblivion, in 1917. Influenced by India and variously known as the 'New Cultural Movement', 'New Thought' and 'New Tide', its identity was linked to a group close to the leadership of the Chinese philosopher Hu Shih (1891–1962). The movement was strongly characterized by its efforts to promote a culture of reason, freedom and human values in contrast to the existing traditionalism, authoritarianism and suppression, through a monthly magazine *Renaissance*, founded in 1918 by a group of government students at Peking (Beijing) University.

The Chinese renaissance smouldered under the surface up to the early twenty-first century. Now, like a frog leaps from the depths of a well into the open air, the word 'renaissance'—*fu xing* in Mandarin Chinese—has emerged and has been wholly accommodated in the vocabulary of Xi Jinping, Secretary General of the Communist Party of China since November 2012: he used the word three times in his first press conference. The entrepreneurial renaissance in China seeks to redraw the geopolitical map of the distribution of power. If the old and cultured Europe of the Enlightenment was inspired by Chinese philosophers, entrepreneurial spirits were released by the metaphorical statement by Den Xiaoping (architect of Chinese economic reform between 1978 and 1992): 'It doesn't matter whether the cat is black or white, as long as it catches mice'. These spirits are observed with curiosity and with a desire to emulate them by both the old and the new generations of the advanced Western world.

Today, Hangzhou once again breathes renaissance air, so much so that it is considered the first 'Sinopolis' in China—a 'small country', as the Chinese say, by size and economic strength.[8] The propeller of growth turns rapidly in Hangzhou, moved by new-generation enterprises, led by Alibaba which, still in its 'green-shoots' years, has reached the top of the e-commerce industry. In addition to Alibaba, Tencent, Baidu, Lenovo, Huawei, Xiaomi and, more generally, highly innovative and dynamic private enterprises not restricted to the field of information technology, give visible presence to the Chinese entrepreneurial renaissance. Alibaba was founded in 1998 by Jack Ma, a 30-year-old native of Hangzhou. Listed as one of the 'heroes of philanthropy in Asia', it would seem that Ma is willing to recover the renaissance tradition of Hangzhou coupled with Medici-style patronage. Evidence of this are the 14,000 privately financed students enrolled in the 38 higher education institutions of Hangzhou who, in just one year, 2014, have swollen the ranks of

[8] www.weekinchina.com/wp-content/uploads/2016/02/Sinopolis-Hangzhou-v.pdf

twenty-first-century wandering students—the knowledge nomads around the world of the most prestigious university cities.

12 The Emerging Eurasian Dialogue

The great Mongol Empire, created by Genghis Khan, brought together many tribes under the same flag. This unification was the start of a dialogue between East and West that spread along the Silk Roads—a network of trade routes that connected Asia, the Middle East, Africa and Europe. Previously, the lords of the tribes, if they did not kill foreigners passing along these roads, forced them to make exorbitant payments in return for safe transit. The empire introduced a tariff policy that allowed the Western merchants of Renaissance Europe to resume travel to Asia. However, it was not only traders but also soldiers, members of religious orders, pilgrims, philosophers, diplomats and others who travelled the Silk Roads. As well as the commercial negotiations to secure supplies of silks, gems, minerals, spices and many other products, a dialogue of ideas took hold. Material and non-material wealth respectively enabled the middle class and the intellectual class of the Renaissance society to flourish.

Today, we live in the time of a renewed Eurasian dialogue that permeates the 'Silk Road Economic Belt' and the 'Maritime Silk Road'—the two infrastructures of the new Chinese strategic thinking that takes the name 'One Belt, One Road'. Along these routes travellers meet the people of Eurasian cities—conurbations that intersect trade in goods and services between East and West and which lie at the crossroads of significant and increasing human movements: in 2015 there were 429 million international passengers worldwide and five million students enrolled in universities outside China. This is not simply about the ever-increasing reach of China in the globalization process: the emerging forms of competition and cooperation between the cities of the 'Two Silk Roads' (see Fig. 1.4) will play an influential role in determining whether it will be state actors or Eurasian cities along those two routes that will dictate the rules of conduct of the Eurasian dialogue. To give but one example of what is at stake, it is sufficient to observe, in the field of sustainable development, the nascent entrepreneurship that crosses national borders to seize, with the formation of borderless start-ups, the opportunities offered by the '5 Rs'—recycling, reuse, reduction, recovery and rethinking of natural resources.

13 The Spirit of a New Entrepreneurial Renaissance

Jacob Christoph Burckhardt (1818–1897), an influential historian of art and culture, called the Renaissance 'anthropocentric', interpreting the age in terms of individual human values and experiences existing at the centre of the universe. 'Anthropocene' perhaps defines the age in which we live today; an age in which the protagonists are

Fig. 1.4 Eurasian cities of the 'Two Silk Roads'

people who, through their activities, have modified significantly the physical, social, cultural and entrepreneurial environments. By launching projects which combine scientific and humanitarian approaches to creativity, the entrepreneurs of the twenty-first century are bringing into being a new renaissance, described by Creel Price, perhaps one of the most dynamic entrepreneurs in Australia, as the 'Entreprenaissance'—that is, entrepreneurship which marks the reawakening or the rebirth of learning and culture, building a bridge between past and present renaissance men: from Leonardo da Vinci's invention of a flying machine to Elon Musk's advanced rockets and spacecraft.

What can we expect from renaissance 2.0, the entrepreneurial renaissance of the twenty-first century? I suggest that the way ahead lies in a close partnership between art and science. It was the fusion of humanities and natural sciences that characterized the free thinking of our original Renaissance Man, personified in the famous drawing by Leonardo da Vinci of the Vitruvian Man which links art and science in the representation of the human body, but with the addition, in our times, of the entrepreneurial acceleration of creative actions by artists and scientists. We like to think of renaissance 2.0 as a novel art form in which the spirits of adventure, imagination and autonomy make the entrepreneurial journey accessible to artists, scientists and humanists. The art form of entrepreneurship is the network in which creative relationships between the different participants intertwine; and the innovators of the sixteenth century Renaissance were regarded as the protagonists of this interweaving. Today, digitization is the technological medium that facilitates and expands the formation of networks where mutual learning, through experiments that lead to business opportunities, can occur more rapidly and more effectively.

As in the Renaissance workshops, in which the masters were committed to teaching the new artists, so today innovative entrepreneurs trace fresh pathways of education for the new generations of entrepreneurs. Some established innovative entrepreneurs teach by using their knowledge maps on which they find these new pathways; others—a minority—cast off the maps and rely on intuition that springs from the source of their creative ignorance.

This is the underlying scenario that gives us a glimpse of extraordinary results—both substantial in scope and altruistic—that contrast with short-term perspectives, concerns for quarterly results and, in particular, the lower production costs achieved through economies of scale that defined the journey of the industrial economy over the course of the twentieth century. Learning that enhances the expression of one's own original ideas, and digitization that provides resources online and in the cloud, herald the arrival of the creative age of entrepreneurship. Each of us has the opportunity to act as an artist of production, able now to manufacture at marginal cost, effectively down to zero cost, goods of high aesthetic and functional value that consumers can acquire and use the next day. The draft model of the product no longer looks like Hans Christian Andersen's ugly duckling, but rather a beautiful swan that inspires admiration. In short we are witnessing the rebirth of entrepreneurship involving artists and craftspeople who make a cultural difference by exploiting new technologies that assist them in the act of production.

14 Meetings of Minds and Hearts: Learning from the Workshops of the Renaissance

Willingness to make individual performance dependent upon the 'meeting of minds and hearts' (the combined intelligence of people with different skills and abilities, and a passion for what they do instead of obsessively following a predetermined path) is a fundamental requirement for transporting ideas that have taken shape on the education side to the other, entrepreneurship shore.

We are living at a time in which the entrepreneurial spirit is enjoying a blossoming of public and private initiatives to encourage the incubation and development of companies in varied fields of human activity. At the same time, the academic literature and fiction about entrepreneurship have brought a wealth of suggestions. To give strength and presence to the movement, a growing number of scientists, writers, opinion makers, event organizers and entrepreneurs seek to enrich their personal store of knowledge by making it not only deeper but also much wider. Despite the existence of a vast and complex body of knowledge, albeit manageable to an extent because of easy and direct access to the information society, the aim of these individuals is to gain experience in a broad range of disciplines so that they can act as versatile experts. The pivotal, exemplar figures are the polymaths who, in the Renaissance age, achieved the status of a versatile personality: geniuses in a wide variety of fields.

This is the context in which co-working spaces are increasing in number; from NextSpace in California to Google's 'Campus' in London—the space that Google has made available to 'Googlers' determined to create companies. Much has been made of these shared workspaces emerging as a brand new idea, one that barely existed 10 years ago. However, the way they function reminds us of the Renaissance heart of Florence whose beat marked the time of active life, from art and science to entrepreneurship. Florentine workshops were communities of creativity and innovation where dreams, passions and projects could intertwine. The apprentices, workers, artisans, engineers, budding artists, and guest artists were interdependent yet independent, their disparate efforts loosely coordinated by a renowned artist at the centre—the 'Master'. While such a person—almost inevitably, at that time, a man—might help spot new talents, broker connections, and mentor younger artists, the Master did not define others' work.

Among the most famous Renaissance workshops was that of the Florentine Andrea del Verrocchio (1435–1488)—sculptor, painter and goldsmith. In the midst of painting, sculpture, mechanical engineering and architecture, pupils were educated in the various artistic and scientific professions and completed their studies by giving life to their business ventures. Verrocchio's workshop gave free rein to a new class of entrepreneurial artists—eclectic characters such as Leonardo (1452–1519), and those of the calibre of Botticelli (1445–1510), Perugino (*c*1446/1450–1523) and Ghirlandaio (1449–1494).

What can those who want to create innovative and collaborative workplaces today—and the others who are already responsible for managing the knowledge economy infrastructures such as business incubators and FabLabs (Fabrication Laboratories) for design and production in digital form—learn from the workshops of the Renaissance? The three major selling points of the Renaissance *bottegas* were turning ideas into action, fostering dialogue, and facilitating the convergence of art and science. Today's innovative and collaborative workplaces can derive valuable insights by revisiting the attributes of the *bottegas* to function as Renaissance workshops.

14.1 Ideation: Turning Ideas Into Action

Renaissance workshops were not only a breeding ground for new ideas. They were mainly envisaged as an ideation field, in the sense that the ideas moved ahead to cross the finish line of entrepreneurship. It is as if the *bottegas* were equipped with a furnace to make the ideas incandescent, then to be worked on an anvil until they were transformed into enterprises. Similarly, today's innovative workplaces should be equipped with a suitable metaphorical furnace to heat insights, inspirations and mental images, and then submit them to the entrepreneurial process. That is how, in the Renaissance workshops, innovative ventures in art, culture and science, and at their points of intersection, were forged.

14.2 Fostering Dialogue

Ferdinando Galiani, a Neapolitan economist of the eighteenth century, argued that markets are conversations. The quality of the network—that is, the combined intelligence of people and organizations with different skills and abilities—plays a critical role in innovation. In a collaborative environment, the ferment of dialogue paves the way for participation. In Renaissance workshops, communication between individuals not kept separate by insurmountable barriers of specialization occurred with consistency and fluidity. The conversation was a *cum versare*, a turning (*versare*) or dancing together (*cum*), which facilitated mutual understanding and succeeded in mitigating errors.

The dialogue in the Renaissance workshops also allowed for clashes and confrontations of opposing views. Such creative conflict removed cognitive boundaries, thus calling into question truths taken for granted. The warring parties were aware of their differences in perspective and attempted to expand each other's understanding in order to achieve agreement on a common goal. Today, we often recognize the need for such illuminating conversations without really making space for them in our organizations, either because organizations are too afraid of creative conflict or because people are simply too busy to try to expand their understanding of each other. However, Renaissance workshops, which diverse talents made into lively spaces, offer proof of how important it is for collaborative workplaces to draw on sources of opposing ideas and controversial opinions.

14.3 Convergence of Art and Science

While often remembered as primarily artistic today, in truth the Renaissance workshop was transdisciplinary. This helped create a holistic approach to creativity—in contrast to our own, present organizations in which people in different specialties are often separated into mental and operational silos.

As Vitruvian Man reminds us, nature and the way of representing it were the basis on which art and science converged in the time of the Renaissance. This was essentially the concert in which the creators were the star performers. In the Renaissance workshops, established artists were teaching budding performers. Today, in the same way, we would like to see innovative entrepreneurs adopting novel educational approaches for the younger generations of 'start-uppers' in the workplace. Combined with digitization, which makes resources available online and in the Cloud, a learning environment that prepares the mind for an understanding of creative ignorance enables creative entrepreneurship at the intersection of art and science. Examples of Renaissance teachers include Leonardo and Filippo Brunelleschi (1377–1446), whose famous dome of the Duomo, the *Cattedrale di Santa Maria del Fiore* in Florence, is the result of the fusion of art, science and design; and, equally, Isabella d'Este (1474–1539), a leading figure to whom we

shall return later in this chapter. Such individuals as these contributed to the development of the Renaissance workshop as a collaboration between art and science. This Renaissance marriage of art and science hand-in-hand is the third lesson that innovative and collaborative workplaces are invited to embrace. Many of today's most exciting business opportunities are similar meetings between technological advances and aesthetics. Bringing these disciplines together fosters mutual learning through experiments that lead to business opportunities.

15 From the Well of Knowledge to the Experimental Fields

Renaissance Man emerged from the medieval well of the desire for existing knowledge. The medieval schools headed by the scholars (in effect, philosophers and theologians acting as 'schoolmen') were involved in systematizing existing knowledge, rather than developing new knowledge. With 'foxes' who know many little things compared to 'hedgehogs'—the scholars—who know one big thing,[9] the Renaissance ushered in a new narrative that altered the state of the world, preparing for the age of experimentation, with Bacon's method reliant upon experiments.

Approximately 50 years were to pass between the time of the experiments of Johannes Gutenberg (1394/1399–*c*1468) in developing the printing press and 1492, when Christopher Columbus (1451–1506) unveiled the New World. These two events revolutionized the flow of information and goods. The new technologies of printing and navigation gave rise to an entrepreneurial class strongly oriented to wide-ranging exchanges of ideas and commercial transactions.

The innovative printing technology developed by Gutenberg was a source of entrepreneurial creativity. Around it, Renaissance start-ups, comparable to those of today arising from the computer and the printer, came to light. The new entrepreneurship, emerging from what we now call 'information technology', widened the dissemination of ideas and accelerated their acquisition, thus celebrating a new way of seeing the world. This is what Cardinal Nicholas of Cusa, a contemporary of Gutenberg, did when he established a publishing house in Rome which employed the technology of the German goldsmith. Teaching and learning stepped beyond their university walls, as in the case now with MOOCs (Massive Open Online Courses).

With the discovery of new lands and the removal of geographical and cognitive boundaries, the will to question truths previously taken for granted gained ground. In the search for new answers, it was mainly the Northern Renaissance that produced major scientific advancements in Europe.

Today, the 'spirit of the North' blows in communities where the dialogue about what we do not know is widespread and intense. 'The larger the island of knowledge grows,' argues Michael Smithson, a social scientist at the Australian National

[9] This alludes to Isaiah Berlin's 1953 essay on Tolstoy's view of history: *The Hedgehog and the Fox: An Essay on Tolstoy's View of History*. London: Weidenfeld & Nicolson.

University, 'the longer the shoreline—where knowledge meets ignorance—extends' (from Holmes 2015). Here the learning process supersedes the teaching process in order to cultivate abstruse questions that reveal unusual paths to explore. Teaching is focused on knowledge maps so that the student is placed in a position to say 'I know'. Learning, instead, prepares the mind for an understanding of ignorance as something that is normal rather than something that deviates from the norm. Learners exploring ignorance—'agnotology' is the term coined by the historian of science Robert Proctor (Proctor 2008)—take pleasure in *not* finding what they are looking for (Forsyth 2014), and they are not afraid to confront the uncertainty that comes from the 'unknown unknowns'. In this way facts classified as immutable, fixed once and for all, are challenged and may be proven wrong.

Emancipated from unquestioned traditions because they were considered sacred, millenary and therefore inviolable, Renaissance cities became places of individual and social creativity at the shoreline where knowledge and ignorance met and clashed. The cities were exposed to new ideas using vague and even conflicting information. In addition to arousing emotions ranging from euphoria and surprise to frustration, uncertainty gave the Renaissance cities an imprint of ambiguity that made creativity flourish. In the case of Florence, as Susan Zimmerman and Ronald Weissman wrote,

> Florentines were bound to each other through kinship and friendship, through neighborhood and politics, in many complementary and yet antagonistic ways. This social complexity fostered a sense of the theatrics of everyday life, in which the adoption of artful ambiguity, of trickster behavior, allowed the townsman to negotiate the heavy demands of sociability without losing honor or friends. Projecting ambiguity, rather than clarity, became a highly prized mechanism for preserving the self. (Zimmerman and Weissman 1989)

16 The Ambiguity of the Knowledge Nomads and Their Ideal Host City

In the renaissance cities of the twenty-first century, younger generations, encouraged by technology to run swiftly, are abandoning the heavy burden of knowledge maps entitled 'twentieth century' in order to travel light along multi-directional paths. These are the knowledge nomads whose actions help to overcome not only geographical but also cultural separations, as well as the chasm between researchers and entrepreneurs.

The behaviours of these knowledge nomads are no less ambiguous than those prevalent among the Florentines at the time of the Medici. Knowledge nomads replace competition, which leads to collusion between rival parties, with collaboration in the ambiguous form of 'co-opetition'—a mix of competition and cooperation which forces the actors to tie bonds of trust outside the historical groups to which they belong (Nalebuff and Branderburger 1996). It is in the ambiguity of social interaction in co-opetition that they cultivate business interests to meet the great challenges of our times; for example, the improvement of healthcare, a wide

range of options for ageing populations, the availability of clean and low-cost energy, and universal coverage of information and communication networks. Many of them have assimilated the advice of the physicist and Nobel Laureate Richard Feynman (1918–1988) to carry out experiments in search of something new and curious that invalidates their assumptions, rather than dwelling only on evidence that is in line with their expectations.

In various fields of experimentation—from basic research to the industrial application of discoveries, from technological innovations to new business models—young talents are internationally mobile. From the four cardinal points, there is movement of individuals, coming and going from all over the world. Their paths cross in their travels, often heading in opposite directions. Until recently it was young people from China, India, Korea and, more generally, the wider Orient who mingled in the West with Europeans and Americans. The latter are now doing the same, moving eastward.

With equal determination, businesses are taking broader actions across the board, playing the game of open innovation with suppliers, customers and competitors in order to meet the needs of a rapidly evolving global middle class with increased purchasing power. The decisions of these businesses about the location of their R&D activities become crucial in comparison with their choice of location for factory (manufacturing) operations. For example, Intel emphasizes that if it has been relatively easy to decide on where to install a factory, it is something of an art to choose where to locate a research centre. That latter decision depends on the availability of the best skills and talents on offer, taking precedence over access to consumers and the influence of government policies.

Together with the mobility of people and companies, the pervasiveness of technology threatens an already large and growing number of industries. Consider, for instance, the rising tide of global Wi-Fi: the more this technology strengthens the propensity to mobility, the more it weakens traditional operators with strong and extensive roots in the telecommunications sector.

The ideal city for knowledge nomads has a special touch of renaissance. The renaissance city is open, as shown in the painting ‘Ideal view of the city’ attributed to Francesco di Giorgio Martini (1439–1501). New ideas are the keys that open the doors of the city. As noted earlier, referring to the thoughts of the economist Paul Romer, ideas are not rivals. The person who makes use of an idea does not prevent others from using it, from a different perspective. Discoveries, innovations and new businesses arising from ideas result in increasing returns, and the plus-factor of the sharing of ideas is an incentive to practise the co-opetition gym. In short, ideas are the equivalent of so many small nudges capable of moving large boulders and stones—the ones used to build solid walls to protect the medieval-style city from the alien invader.

The modern-day renaissance city shows a great deal of understanding and sympathy for the new rules of the co-opetition game and knows how to play. In Eastern culture this game is represented by an inverted figure eight, the symbol of infinity. Co-opetition, in fact, leads to ‘win–win’ relationships (Nalebuff and Branderburger 1996), with multiple winners whose success does not necessarily occur at the expense of others forced to fail; and if there are losers, they will learn from today’s

winners how to be successful tomorrow, in a game which is endless. Serendipity and sagacity, more so than rules and procedures, go hand-in-hand with co-opetition.

17 Achieving the Impossible

> *Almost any question you ask can be answered. It's only the questions that you didn't know to ask that remain, dancing the can-can behind your back. The unknown unknowns.* (Mark Forsyth 2014)

The culture of the impossible is the hallmark of a renaissance, and those who stand out are entrepreneurs eager to change their way of thinking to differentiate themselves from others. These 'others' begin by doing what they believe is necessary, but then they struggle with what is possible. For them, as reasonable people complying with established customs, 'possible' is the equivalent of incremental change—that is, doing what they have always done, but doing it better and for more people. For them, the impossible is a goal as distant as it is unattainable with the business plans to which, too closely, they adhere.

Renaissance entrepreneurs, by contrast, are 'unreasonable' people. They abandon the shore of today's opportunities, which conform to prevailing habits, to sail into the 'sea of absurdity', seeking business opportunities that will not become clear until long after the original perception. For them, coming to terms with the absurd from the start is not a risk but a sport that is worth practising, to achieve the seemingly impossible. They regard as entrepreneurial those business ideas which at first sight may appear ridiculous and dangerous—believing, like Aristotle, that 'A likely impossibility is always preferable to an unconvincing possibility' (Dacier 1875 [1967]). Renaissance entrepreneurs, following in the footsteps of the likes of Pablo Picasso, force themselves to attempt what they cannot do and, in this way, they learn how to do it.

What unfolds in the eyes of the entrepreneurs involved with the impossible is the 'experimental scenario'—an entirely different matter to the 'expert scenario' that is very familiar to traditional innovators. The expert scenario involves specialists from different disciplines starting out on a journey of mutual collaboration. Each expert is immersed in the deep well of his or her knowledge. The further the individual experts descend into their wells, the more they lose sight of the overall, wider vision. Climbing back up from the bottom of the well, in order for the experts first to recover this original vision and then create, together, a new one is a major challenge, made even more difficult if it is the same discipline for all concerned that initially causes the experts to work together.

Experts aim at perfection, and to this end they are accustomed to draw extremely detailed knowledge maps, comparable to the cartographic maps described by Jorge Luis Borges:

> In that Empire, the Art of Cartography attained such Perfection that the map of a single Province occupied the entirety of a City, and the map of the Empire, the entirety of a Province. (Borges 1999)

Today, thanks to Big Data, experts can draw maps that literally approach perfection: to return to Borges, the map of the empire would have the same scale as the empire. For the experts, knowledge maps with as many details as possible will enable them to find the most reliable pathways to travel along. The Big Data constitute indispensable elements of reason on which to build the future, by adapting to signals sent from the outside world and transposed into data. However, the reality is that, unfortunately often with irrecoverable delays, experts realize that such maps have misled them for far too long with regard to the major changes that are taking place.

In the experimental scenario, participants collaborate in the spirit of those who have emerged from the well and are travelling light—that is, who are not weighed down by knowledge accumulated over time. Travelling light, they are able and inclined to socialize spontaneously and experience together new ways of proceeding. Such individuals are no longer known by the names of their discipline; rather, they are recognized by the extent of their propensity to be creative and behave as 'creative ignorants', in order to ignore the obstacles that hinder progress in the fields of innovation filled with experts immersed in their wells of knowledge.

The expert scenario leads experts to find new paths on their knowledge maps—the 'already known'. The individual who becomes familiar with this scenario is a path finder—one who finds paths in the world of perceived reality. The experimental scenario opens up paths from nothing, outside the known maps. The individual who identifies with this second scenario is a path creator—one who creates paths penetrating into the unknown world in order to explore it.

The expert scenario is a guide to incremental innovation. The experimental scenario is a beacon that sheds light on the unknowns of innovation that change the state of the art, achieving the impossible.

18 Between Experts and Experimenters: The 'Opificio Golinelli' in Bologna, Italy

From the second half of the fifteenth century, Florentine Historical Football was widespread in Florence. The city's squares, where the game took place, with 27 players on each team, were crowded. Football now is so popular that it has become an international sport.

Today, the sport of innovation has also become popular and international, with the world championship featuring the most aggressive teams of experts competing for the title. For many years, those experts have supplied the winning team, but now, suddenly, teams of experimenters are also qualifying. With this development, many established and prestigious champions are likely, sooner or later, to lose their supremacy. The ascension to commercial and financial heaven, followed by the fall into hell, of experienced players and great stars such as BlackBerry and Nokia is well documented.

Yet, to the present day, the 'sail syndrome'—a term derived from the perseverance of sailing ship manufacturers in investing in technology that had been long in use, in the conviction that steam ships were nothing but an ugly duckling (reference

is made here to one of the most renowned economic historians Carlo Cipolla Maria 1965)—has affected a large number of experts.

In Bologna, the city known as 'the Learned' because of its ancient and famous universities, Marino Golinelli, a renaissance figure, has combined a passion for entrepreneurship with the spirit of patronage. The 'Opificio Golinelli', inaugurated in October 2015, is a new centre—a laboratory—for knowledge and culture in Bologna, with the goal of promoting science education among young people.[10] Bologna is a city known for its laboratories: from crafts to politics. With the opening of the 'Opificio Golinelli', another important element is added to the existing components of 'Made in Bologna'; namely, the learning laboratory that prepares the city for the future of education by doing the work (*opus*, in Latin, from which 'opificio' is derived) of facilitating a dialogue between science and art, as was the case in the Italian Renaissance.

More than 100 years have passed since the writer Giovanni Papini proposed the creation of workshops where students, acting as experimenters, could expose thoughts, ideas and results of their studies to their classmates and teachers. What part will the experts, on the one hand, and the experimenters, on the other, play in the 'Opificio' initiated by the founder of the pharmaceutical company Alfa Wassermann? If the spirit of the experimenter Enrico Fermi (1901–1954), Nobel Laureate in Physics in 1938, is present in the 'Opificio Golinelli' then perhaps participants in the educational activities of the laboratory will be pleased, not dismayed, to see results that contradict original hypotheses: this is how they will make discoveries that will enable Bologna to leap several metres higher in the pole vault of innovation.[11]

19 Thinkers of the New Renaissance: Inspirers of 'Creative Creation'

The great figures of the Renaissance in art, literature, science and education were the revolutionaries, rather than reformists, of thinking. For instance, at the forefront of innovative thinking, Paracelsus (1493–1541), the German–Swiss physician, revolutionized medical practice on the basis of observing nature rather than reading ancient texts. In a different field, Nicolò Machiavelli, the Florentine political philosopher, revolutionized political science. Credit is due to these celebrated personalities for the rebirth of creativity, with the emergence of energized, visionary innovators and entrepreneurs willing and able to take initiatives at the frontier of new discoveries.

Today, the rebirth of creativity depends on similar characters. Sir James Whyte Black (1924–2010), the pharmacologist and Nobel Laureate in medicine who contributed to scientific research working in academia and industry, and Edward de

[10] See, for example, http://www.bolognawelcome.com/en/home/discover/places/culture-and-history/museums-and-art-galleries/opificio-golinelli/.

[11] As quoted in Jevremovic (2005), Fermi had maintained that 'There are two possible outcomes: if the result confirms the hypothesis, then you've made a measurement. If the result is contrary to the hypothesis, then you've made a discovery'.

Bono, physician and psychologist—and the proponent of a new branch of education, the teaching of thinking—are among the leading stimulators of unorthodox and imaginative thought. It is this form of thinking which gives rise to 'creative creation', made manifest in an adventurous lifestyle with exuberant creativity and discovery combined with scaling-up start-ups, as advocated by Andy Grove (1936–2016) of Silicon Valley, one of the founders and CEO of Intel Corporation:

> Start-ups are a wonderful thing, but they cannot by themselves increase tech employment. Equally important is what comes after that mythical moment of creation in the garage, as technology goes from prototype to mass production. This is the phase where companies scale up. They work out design details, figure out how to make things affordably, build factories, and hire people by the thousands. Scaling is hard work but necessary to make innovation matter. (Grove 2010)

If start-ups are the swallows that herald a new entrepreneurial spring, sometimes with the blossoming of previously unknown species, then scale-ups lead the flock flying above the treetops of the Forest of Growth. The scale-ups are companies that do not arise from the need of their founders to find employment, but rather from the ability to foresee opportunities that others do not perceive. In other words, the scale-ups pursue a value creation process that is non-linear, iterative and based on intuition. A process, in short, which is discovery not optimization. This is the yeast of their accelerated growth.

According to James Black (BJP 2010), a new idea comes suddenly and with great excitement of mind and spirit. However, it is necessary to keep the mind well-trained in order to generate original ideas. In the gymnasium of mental gymnastics, following the method of lateral thinking developed by de Bono (1967), it is possible to keep creativity moving with thought experiments, observing reality from different angles rather than confronting it head on.

By moving on two legs, one represented by Black and the other by de Bono, creative people are explorers of unknown lands. Their mental maps offer ideas, projects and potential entrepreneurs to the path of innovation that changes the state-of-the-art. With the engagement and interaction of scientists and engineers, academics, researchers and analysts, poets and writers, architects, designers and stylists, artists and actors, new businesses can emerge that mix together highly varied technologies. Such businesses are, for example, those that change the way we communicate (consider the Apple iPhone), or provide the opportunity to try at home, with more enjoyment and less difficulty, a range of sports (for example, Nintendo's Wii—the game console targeted at those wishing to put fun and excitement into game play).

The new entrepreneurial economy multiplies the value of the complementary roles covered by entrepreneurs, scientists, technologists, humanists and investors. In attempting to slow down or even halt the increase in the prevalence of 'precarious' jobs, the introduction of new generations into the entrepreneurial population must prevail over the determined defence of the status quo. Preventive action should replace mere reaction. It would be a major loss of important potential inherited from past entrepreneurial generations if Renaissance-style freedoms were not used to divert resources from the dinosaurs of medieval-style professional guilds to the 'gazelles', the rapid-growth start-ups that now populate an entrepreneurial generation characterized by the view that 'together we can do that'.

20 The Fusion of Art, Science and Design: Treading in the Footsteps of the Renaissance Protagonists

Art, the humanities and technology shape the aesthetic of products that arise from the emerging entrepreneurial renaissance. The digital artisans of the twenty-first century take us back to the all-round and influential personalities of the Florentine Renaissance. In today's Italy, treading in the footsteps of the Renaissance protagonists, new craftspeople, whose artistic talent is manifested in the design and production of, for example, spectacles, lamps and many other artefacts of the 'Made in Italy' brand, find in the 3-D printer a tool that combines technological intensity with aesthetic potential. In Trentino, a small province in the North East of Italy with strong aspirations and a commitment to innovation, the technological craftsman Ignatius Pomini helps to create brands in eyewear (for .bijouets) and lighting (for Exnovo).[12] As in the original Renaissance workshops, the cross-fertilization in Pomini's laboratory of different abilities, skills and knowledge transforms a feather into an innovative design feature—a lamp that is a real art object.

Neo-Renaissance Entrepreneurship in the Twenty-First Century: Plüne, the Feather-Lamp

'The name of the lamp, Plüne, is derived from two words in Latin: "*Pluma*", which means feather, and "*lunè*" which means to illuminate. With a little imagination and just a touch of a French accent, the word "Plüne" is born. The feather in itself conveys the idea of lightness but it could also be a wish for a beautiful evening and a good night. Sweet dreams!'

'This product is produced by the 3D Printing technology: it's a 3D electronic file transformed into a solid part. Due to the manufacturing method, none of the products are the same.'

[12] See http://bijouets-italia.com/en/ and http://www.exnovo-italia.com/assets/exnovo_about-us.pdf.

The lamp fully embodies the challenge to creativity which, thanks to the *.exnovo* technology, takes shape.

Source: http://www.select-interiormarket.com/en/exnovo-plune-e19-wall-lamp

21 The Second Renaissance of the 'Cultural Consumer'

The enthusiastic creation of machines, and an equal fervour for the consumption of new commodities and luxury goods: these are the driving forces that, in the society and culture of the Renaissance, spurred the attitude to the new sciences of artificial life—what we now call 'second life'—with their strong effect on entrepreneurship.

On the technology side, Leonardo da Vinci was engaged intellectually in the birth of modern machines. Vasari, in *The Lives of the Artists*, recalls that Leonardo,

> …made designs for mills, fulling machines and engines that could be driven by water-power … In addition he used to make models and plans showing how to excavate and tunnel through mountains without difficulty, so as to pass from one level to another; and he demonstrated how to lift and draw great weights by means of levers, hoists and winches, and ways of cleansing harbours and using pumps to suck up water from great depths. (Vasari 1685)

From the perspective of consumer goods, from pepper and glazed pottery to pictures and furnishings, Isabella d'Este, Marquise of Mantua, a contemporary of Leonardo, is regarded as the 'First Lady of the Renaissance'. It is the patrician Isabella, patron of the arts, the ideal embodiment of the 'cultural consumer', who attends the marketplaces in person. Here, a new class of direct customers, the patricians, who are no longer or not only represented by their intermediaries, joins the commoners. Isabella does more, promoting a new shopping channel, one operating by mail, a forerunner perhaps of e-commerce.

The two driving forces, machines and cultural consumption, are a historical legacy of the Renaissance that still permeates our ways of thinking, communicating and interacting. This now applies to the frequent availability of new alternatives in the production and consumption of goods and services which, because of the speed of change, occur so often.

Leonardo and Isabella d'Este were transporters of ideas whose forms of expression are inexhaustible sources of inspiration. This is the case too for the modern-day renaissance generation, consisting of millions of individuals, highly diversified on age, who share a passion for entrepreneurship associated with technology and culture—an intersection that imparts confidence and encouragement to the entrepreneurial mindset. This attitude is altogether different from the anxiety and foreboding about cultural ventures predicted to occur in the age of digital reproduction of creative content (Johnson 2015).

With a keen sense of self-expression, this latter-day renaissance generation seeks to build new ideas for a better society—being, concurrently, producers of ideas that are worth sharing as well as cultural consumers. The birth of creative markets that are social communities of collaboration, sharing in a wide range of cultural fields and supported by technology platforms, is attributable to them. Independent creators, who give rise to digital communities, sell their creations directly to customers in online markets—the result of mutual collaboration. Creative Market, founded in 2012 in San Francisco by Aaron Epstein, Chris Williams and Darius Monsef IV, brought together some 9000 independent creators (see https://creativemarket.com/about).

Will the vital spirit of independence of this renaissance generation be used to trace the pathways of entrepreneurship in the years to come? The answer must take into account those overlords who have emerged onto the entrepreneurial scene since the closing decades of the last century. The pioneers and early followers of the digital age have accumulated financial fortunes that break down national, geographical, linguistic and currency barriers. Along which roads will they be taking their fortunes? As in the Middle Ages, will it be their ambitions that dictate the rules of the game? Or, as happened in the Renaissance, will today's renaissance generation show a willingness to encourage the mobility of social classes and individuals that will disrupt the power of the feudal hierarchy of the lords of giant enterprises?

22 Seigniors of the Twenty-First Century

The Renaissance was the era of the Seigniors[13]—individuals generally, but not exclusively, of noble lineage who centralized power to themselves, giving their subjects conditions of legal equality in return. In Italy, it was not only Florence, with the financially powerful House of the Medici, which stated, 'We are on the side of the population'. The Seigniors became established in Milan, with the Visconti and then the Sforza; in Verona with the Scaligeri; the Este in Ferrara; the Gonzaga in Mantua; and other Houses in smaller centres. Seigniors were powerful magnets that attracted artists, entrepreneurs and businesses. They would give way to the modern states, only to reappear on the horizon of the globalized economy.

Even if history does not repeat itself, there are parallels. Today, the Seigniors are the city-states of Singapore and Dubai, with the dynasties of Lee Kuan Yew and Maktoum, respectively; but there are others too. In San Francisco, as in other communities where what *The Economist* has called the 'Cambrian explosion' of entrepreneurship in the digital age was especially pronounced, new entrepreneurs who have accumulated great fortunes are established in the same way as the Renaissance Lords.[14] The status of financial wealth has replaced dynastic nobility. According to

[13] (also written as 'seigneur'), 'A feudal lord; the lord of a manor', see http://www.oxforddictionaries.com/definition/english/seigneur?q=seignior.

[14] See http://www.economist.com/news/special-report/21593580-cheap-and-ubiquitous-building-blocks-digital-products-and-services-have-caused.

a list compiled by Forbes (2015), the now-celebrated Elon Musk (founder of SpaceX and co-founder of Zip2, PayPal and Tesla Motors) is one of the highest-paid entrepreneurs in the world; and Bill Gates had a net worth estimated at about US$73 billion (compared, for example, to the US$16 billion of Mohammed bin Rashid Al Maktoum, ruler of Dubai).

The Seigniors of the twenty-first century are at the *avant-garde* of economic and social transformation: from photography (Instagram) to music (Apple, Spotify); from books and shopping (Amazon, Alibaba) to the exchange of information and ideas (Facebook, Twitter, YouTube), and mapping human resources (LinkedIn); from hospitality travelling around the world (Airbnb) to local transport (Uber, Lyft); from telephone calls (Apple, Google, Skype) and cars (Google, Apple, Tesla). Here are the entrepreneurs who have replaced their predecessors from the Industrial Age and have given a unique fingerprint to their local communities, as shown in the intermingling of attracting talents and direct foreign investment. With regard to the latter, we find Dublin and San Francisco among the top 20 cities in the world rankings for 2014 (led by the city-state of Singapore): Table 1.1 lists the top twenty cities. These cities are two examples of a culture which, leaving behind the managerial economy with its large Industrial Age factories, has provided the energy for the 'Cambrian explosion' of entrepreneurship. This is a phenomenon akin to that which gave rise to the Renaissance with its culture which spread far beyond its own traditional borders—the monasteries.

The new Seigniors clearly provide fertile breeding ground for talents attracted from all over the world. For example, Dublin—according to data released by LinkedIn—acts as a magnet for an increasing inflow into Ireland of creative, innovative and highly professional individuals in the various branches of the knowledge economy (around 20% in the second quarter of 2015). Perhaps the most significant arrivals originate from Italy. The city of Florence traced the path that led from a contemplative to an active life characterized by experimentation in art and entrepreneurship. However, Italy, as we shall see, remains in the rear echelons of the new entrepreneurial renaissance.

23 Italy: Barely Keeping Pace with the New Entrepreneurial Renaissance

Renaissance Italy, as anticipated by Masaccio, is now visible in the museums, churches, castles, villas and palaces located in cities and villages. The Renaissance, then, is the subject of research and conferences that involve scholars and students around the world. However, that Italy is also hidden in small museums in old villages that often fail to attract tourists and that seem indeed to shy away from promoting themselves, such that it is largely by chance that they receive the occasional—and accidental—tourist. Thus it is that the San Giovenale Triptych, a magnificent early work by Masaccio, is almost hidden, and largely unvisited, in a museum behind the Church of San Pietro in the village of Cascia, in the valley of the Casentino in Tuscany.

Table 1.1 Top cities for greenfield Foreign Direct Investment (FDI), 2014

City	Number of projects	Capex (US$m)[a]	Average capex (US$m)[a]	Jobs created[a]	Average jobs[a]	Number of companies
Singapore	409	11,380	27.8	2732	88	390
London	334	6978	20.9	3550	131	320
Shanghai	245	8153	33.3	4235	264	236
Dubai	234	7771	33.2	684	48	227
New York	169	2316	13.7	247	19	167
Hong Kong	162	4534	28	401	44	158
Sydney	125	3474	27.8	768	69	125
Beijing	97	2186	22.5	884	98	96
Bangalore	97	2332	24	4953	247	91
Tokyo	96	1365	14.2	30	10	90
Dublin	91	2724	29.9	3999	76	82
Paris	90	1319	14.7	490	30	89
San Francisco	90	1049	11.7	167	33	90
Melbourne	88	2841	32.3	1690	88	88
São Paulo	87	2646	30.4	1185	197	85
Kuala Lumpur	69	3487	50.5	787	112	68
Helsinki	68	782	11.5	98	10	68
Amsterdam	63	1551	24.6	300	75	62
Mexico City	62	2243	36.2	514	257	58
Toronto	62	1799	29	326	40	62

Source: Financial Times (2015)
[a]Includes estimates

Suffering both from 'the rheumatics of old age' and 'the growing-pains of over-rapid changes', in the words of John Maynard Keynes's short essay *Economic Possibilities for Our Grandchildren*, today's Italy faces difficulties in drawing new nourishment from the huge reservoir of cultural resources accumulated during the Renaissance.[15] However, there are many entrepreneurial opportunities for our grandchildren, not only Italian, who already live or could be attracted into the towns and villages with a rich cultural heritage dating back to that golden age.

24 Italy: Addressing and Analysing Rapid Change at Snail's Pace

From the Renaissance heart of Florence, the spirit of active life, both in art and entrepreneurship, spread to other cities of the peninsula and continental Europe. Today, Italy is some distance from pole position in the race to the finish line of the

[15] See http://www.aspeninstitute.org/sites/default/files/content/upload/Intro_Session1.pdf for the full version of Keynes' essay.

new renaissance. In 1970, when the ordinary statute regions were instituted, it failed to take advantage of the opportunities offered by regional sources to revive the fortunes of the Seigniories in the age of the city-state.

Economic policy, largely a prerogative of national and international technocracies, from the Bank of Italy to the European Commission and from the OECD to the IMF, could have been reformulated by the culture and aspirations of local communities gathered around their regions. The reversed formulation of economic policy (from top-down to bottom-up; from unaccountability to accountability) would have encouraged the creation of innovative companies—a goal beyond the reach of central government and related technocracies whose approach to economic policy was, and remains, albeit with increasing and widespread disagreement, centred on negotiations with representatives of vested interests that entail the protection of their privileges. Regional governments have, unfortunately, neglected the active life of the new transformative entrepreneurship that radically changes the landscape of society. They adopted the medieval-style contemplative life, which does not process new knowledge to redefine the ways and means of economic policy to focus on the renewed and transformative entrepreneurial passion and motivation of local communities. Because of the denial of and disregard for a bottom-up narrative of economic policy, Italy has neglected precisely those passions and motivations that led to an extraordinary flourishing of the country's economic miracle after World War II.

The 2015 Change Readiness Index developed by KPMG ranked Italy at number 66 among the 127 countries surveyed.[16,17] It is change, accepted and practised as expeditiously as possible, however, that will bring Italy closer to the Keynesian goal of 'freedom from pressing economic cares'.[18] A second Italian renaissance would then flourish in which, to return to Keynes's 'grandchildren', start-ups nourished by the cultural heritage of the Renaissance would unleash the use of leisure and personal time that 'science and compound interest will have won for [us]'.[19]

Artists and tourists from around the world flock to Florence, cradle of the Italian Renaissance. Entering the places of art in the city of Lorenzo the Magnificent, as in the rest of Tuscany and among the many other villages and districts of the *Bel Paese* (the 'beautiful country'), visitors might fleetingly catch sight of young humanities graduates checking admission tickets and monitoring exhibition halls. As in *À la Recherche du Temps Perdu* by Marcel Proust (1871–1922), it seems that these young people want to try to escape the passage of time (Proust 1999). Yet the 'Proust effect' could be averted if there were also entrepreneurial expeditionary forces, made up of volunteers, both Italian nationals and foreigners, at the start of this new Italian renaissance; think here of an expeditionary force formed by 'Googlers'—

[16] For the Change Readiness Index, see: http://www.kpmg.com/global/en/issuesandinsights/articlespublications/2015-change-readiness-index/pages/default.aspx.

[17] See also https://assets.kpmg.com/content/dam/kpmg/pdf/2015/06/2015-change-readiness-index-v1.pdf.

[18] See http://www.aspeninstitute.org/sites/default/files/content/upload/Intro_Session1.pdf.

[19] See http://www.aspeninstitute.org/sites/default/files/content/upload/Intro_Session1.pdf.

Google employees and 'inhabitants' of the Google ecosystem—which could promote entrepreneurship among young talents, now passively related to institutional activities born and raised in the cultural context of the Renaissance.

How many young people now doing routine jobs in Italian museums and elsewhere might follow in the steps of the Google business creators if they were overseen by a 'true eye' that could discern their real potential, as the appropriately named Verrocchio watched over and nurtured the budding and multitalented artists in his Renaissance workshop? And if, through the watchfulness of that true eye, or *vero occhio*, new factories of creativity were established, how many new entrepreneurs would emerge at the meeting point of art and science?

With the help of expeditionary forces, fostered by and between those youngsters, innovative companies might arise which, with the tools made available by digital technologies, would bring their stories, and the stories of the Renaissance age, to a new fruition. Google knowledge maps of the Renaissance would complement Google geographical maps. The creative possibilities are infinite. Do no more than take a look at the video games of the entrepreneurs of Tale of Tales (http://tale-of-tales.com) to realize how Masaccio, and with him all the protagonists of the Renaissance, might rise to a new life, beyond the heritage and museum sites where they are currently guarded and even confined.

We could then rebut—finally!—Adam Smith who in *The Wealth of Nations* (1776) wrote of the decayed wealth and extinguished genius that produced the artistic wonders of Italy. We will otherwise be obliged to accept the paradox of entrepreneurial poverty in the presence of an abundance of renaissance culture. Suffice it to say that, at the end of June 2015, Infocamere, an IT consortium company owned by the Chambers of Commerce in Italy (see http://www.infocamere.it/), recorded a mere dozen enterprises, out of a total of 4206 innovative start-ups, that related in some way to artistic activities; truly, no more than a drop in the ocean, even if there were actually more than those recorded by Infocamere.

25 The Compelling Need to Align Research and the Art of Transformative Entrepreneurship

Artists and scholars shared the atmosphere of the Renaissance workshops. Scientific reasoning moulded artistic creation. The same atmosphere reigns in the new entrepreneurial renaissance that brings with it a multifaceted change in the economic geography of innovation—a change that will deeply affect the future of the city.

The space is reshaped by the mass of the world's demand for patents which has increased from hundreds of thousands of requests each year in the early 1980s to millions today. With royalties and licensing of intellectual property rights spiralling—their revenues amounted to US$2.8 billion in 1970, US$27 billion in 1990 and US$180 billion at the end of the last decade—businesses operating in knowledge markets extended their reach across borders.

Still very much dominated by the high-income countries, the space of R&D expenditure (about 70% occupied by these countries, with expenditure doubling at constant values between 1993 and 2009) is changing: the proportion occupied by the emerging countries is growing, with their R&D expenditure increasing over the same period, especially under pressure from China, by 13% points.

While innovation is increasingly international, with companies placing their research centres in different countries, the 'continental drift' of R&D is underway. The 'Input' continent has moved, joining with the European Union platform. The 'Output' continent is joined to the American platform. Important indicators, such as research expenditure, numbers of patents filed, scientists and researchers involved, scientific publications, collaborations between companies, and others that enter the innovation process, contribute to the configuration of 'Input'. In contrast, 'Output' enhances the ability to convert innovative ideas into successful products and services for markets. The conclusion, then, is that 'Output' favours entrepreneurship and the availability of risk capital.

In the European Union, R&D spending in academia is symbolized by the solar disc—the all-seeing great eye in the sky of innovation; that is, the game of public intervention for innovation is played almost entirely in the academic half of the pitch. In contrast, there are those entrepreneurs at the forefront of 'Output' who innovate business models in depth, revolutionizing principles and routines deployed for production and income generation. Their great eyes are the hybrid communities of scholars, researchers, students, entrepreneurs and financiers committed to combining scientific creativity and enterprise creation, relying both on research results and on experimentation with new business models.

According to the reasoning that governs 'Input', innovation is like a bee that, in order to fly, must exploit the updrafts of R&D government spending, while many academic bodies do not attend the gymnasia of scientific entrepreneurship. How much better could the performance of 'Input' be if a rich mix of individuals, who find mutually acceptable opportunities given their respective motivations and attitudes towards science and entrepreneurship, were to tread the stage of the production, dissemination and commercial exploitation of knowledge?

Gymnasia of science-with-entrepreneurship are the ecosystems of Google, Apple and Intel—to name only three of the most obvious—that attract other than the traditionally-based young university graduates: they seek those who aspire to make a difference with effective changes in the economy and society. Such ecosystems invest in human and financial capital to establish, alongside the scientific laboratories of universities, experimental labs for new venture creation with high growth potential in the interstices between the humanities and sciences. This is what, for example, has for some time now been designed and accomplished by Intel in Europe, with approximately 50 technology labs born from synergy with the academy.

26 Science and Technology: What Drives What?

The formidable naval power of Venice; an innovative urban plan for the city of Ferrara; the inventive genius of Leonardo in Milan; and the city of Urbino that excels in military art and defence technology: four examples of Renaissance cities where science and technology were combined throughout the period.

Since then, the question remains open on the *primum mobile*. Is science the engine of economic and social progress, or is it technology that drives science? What if science and technology form a system that co-evolves and is self-organized to the extent that the relationships between the two provide for a common life? Technology expands the field of exploration by science and it does this by realizing tangible and intangible artefacts—as highlighted by George Bugliarello (1984)—which extend our biological and mental capabilities.

Between the fifteenth and seventeenth centuries, maritime voyages to discover new lands led to significant advances in the scientific fields of astronomy and cartography. In that 'Age of Discovery', as the time of the great geographical explorations was christened, developments in technology and techniques of navigation, which occurred through trial and error on the part of sailors, triggered the speculative process by scientists.

In the early part of the Renaissance, the invention by Johannes Gutenberg of the printing press represented a quantum shift. The German printer and other technology craftsmen with a deep understanding of mechanics—'the ingenuity of the makers of the machines', in the words of Adam Smith (1776)—managed to anticipate the advancements of science. In the eighteenth century, it was Adam Smith (1723–1790) who highlighted the original and primary role of common workers and artisans in developing technologies which were followed by revolutionary scientific discoveries. In Book I, Chapter I of *The Wealth of Nations* (Smith 1776), Smith wrote, 'A great part of the machines made use of in those manufactures … were originally the inventions of common workmen.'

It was the case that, illuminated by the events of that time, the assumption that science preceded technology was a belief not always supported by the facts. The debate is ongoing, as illustrated by an article written by Matt Ridley and published in the columns of the *Wall Street Journal*:

> When you examine the history of innovation, you find, again and again, that scientific breakthroughs are the effect, not the cause, of technological change. It is no accident that astronomy blossomed in the wake of the age of exploration. The steam engine owed almost nothing to the science of thermodynamics, but the science of thermodynamics owed almost everything to the steam engine. The discovery of the structure of DNA depended heavily on X-ray crystallography of biological molecules, a technique developed in the wool industry to try to improve textiles. (Ridley 2015)

The generally accepted view is that science explains and predicts natural, social and economic phenomena, whereas technology is the practical application of science and relies on techniques, tools and machines to solve problems that science has explained and predicted. Supporters of the priority of science claim that the cases where technology has led to scientific discoveries are accidental. In general, they

would argue, science must come before technology because an understanding of scientific principles is the basis for their practical application. For others, in contrast, deep scientific insights are fruits that fall from the tree of technological change. Still others see in science and technology a couple dancing together, hand-in-hand. In cyclic mode, sometimes it is science that sets the rhythm; in other circumstances, the opposite is the case. What is certain is that the linear sequence science ⇨ technology ⇨ innovation has long been questioned.

We seem to be faced with an endless series of parallel instances. Whether it is science or technology that is involved in triggering the process which then leads to entrepreneurial innovation, all is dependent on the spontaneous process of interaction between people—provided their way of acting unbidden is not restricted by laws and customs.

Amongst economists and scientists themselves there is increasing support for the idea that technology is able to organize itself by creating an environment that science will then explore. In this view it is technology, as an autonomous organism—which, in 2014, the maverick science writer Kevin Kelly dubbed 'technium',[20]—that will give rise to the wave of innovation which will then be ridden by the inventors and entrepreneurs it has itself found.

To the printing process, Gutenberg applied techniques and instruments used in other sectors—from the goldsmith's punch to screw-type wine presses. This kind of 'contamination' is the beginning of a long process of design and development of a variety of communication tools, an object of study of a specific discipline that deals with the entire set of human artefacts and technologies which act as media—in the sense of messages to communicate and interact, as introduced by the Canadian sociologist Marshall McLuhan (McLuhan 2001; McLuhan et al. 2008).

Other impressive examples are the Wright brothers, Orville (1871–1948) and Wilbur (1867–1912), aviation pioneers, and Guglielmo Marconi (1823–1904), the pioneer of long-distance radio transmission. More recently, computer technology has opened the door of a new scientific discipline: 'computer science'. In turn, argues the computer scientist Danny Hillis, 'The computer, with its mechanistic playing out of predetermined rules, is the direct descendant of the clock': namely, 'the gears of the clock which spun out science, and all its many cultural descendants' (Kelly 2010).

[20] 'The ordinary pen you use every day seems very simple but it probably took 100 different technologies to make this pen technology, technologies of plastic, ink, ball bearing, metal, and each of those different technologies probably themselves required another 100 sub-technologies to support it and, of course, there's kind of a circular way in which pens might be necessary to make a ball bearing in the same way that electricity is necessary to make a generator, and a generator may be necessary to make the wires of an electrical system. A hammer requires a handle and a head, and the saw requires the hammer to make the saw that cuts the handle, so there is a sense in which all of this is very recursive and that there is a network of different supporting technologies, and that the whole web of all these things I call the technium. The technium is that largest network of all the technologies working together to support each other, and while this pen is definitely not alive, there is a sense in which the technium as a whole exhibits life-like behaviors in the same way that your neuron doesn't really think, but the network of neurons in your brain can make an idea.' (See: https://www.edge.org/conversation/kevin_kelly-the-technium).

Thus a shift of perspective shows the inextricable connection between science and technology: it seems there is no dichotomy.

Scientific advances far removed from astronomical science contributed to the technological development of the telescope, which in turn has led to breakthroughs in astronomy and astrophysics.[21] However, as a matter of no little significance, it should also be noted that the deep knowledge of astronomers has not always produced the expected results. For example, in the eighteenth century the long-term problem of how to calculate longitude was solved by a technological craftsman, the carpenter and clockmaker John Harrison, to whom we owe the development of the reliably accurate marine chronometer, and not by the court astronomers led by Nevil Maskelyne (Sobel 1995).

The technology that has resulted in the construction of the particle accelerator—the Large Hadron Collider—at CERN in Geneva has led to significant progress in physics, providing physicists with the means to confirm, between 2011 and 2013, the existence of the sub-atomic particle imagined by the Nobel Laureate Peter Higgs (the 'Higgs Boson'). Equally, the same technology that led the way to such a scientific discovery depended in turn on previous advances in the field of physics. Here is evidence to support those who argue that science and technology go hand-in-hand.

Science related to military defence has far-reaching consequences in the field of technology: the Internet is perhaps an obvious case. Thus arise the arguments in support of the absolute need to increase public funding for research. Such requests are confronted with the problem of crowding-out: whether and by how much the pool of private resources for research shrinks once governments intervene to increase the capacity of the public reservoir.

In light of the above, I would argue that the linear path from science to technology is not as obvious as is commonly thought. Nor does it seem obvious that public funds injected into research have an impact on economic growth. An OECD study on the sources of economic growth in its member countries stated, 'The results… point to a marked positive effect of business-sector R&D, while the analysis could find no clear-cut relationship between public R&D activities and growth, at least in the short-term' (OECD 2003). Certainly, economic growth must take into account the long-term spillovers from public research. In this respect, we should not disregard the role of technology as an accelerator of both scientific advances and their economic benefits, while serving as a *trait d'union* between science, innovation and new entrepreneurship.

27 The Scientist–Entrepreneur: 'I Think, I Act and Therefore I Construct'

Science and the various forms of art are united by the ability to surprise people, to stimulate fantasies and passions within them. In science, as in art, imaginative minds draw models that must adopt a second nature in order to have a practical effect. This 'second nature' is the attitude to entrepreneurship. The intentional and

[21] See: https://www.physicsforums.com/threads/technology-or-science.548592/.

systematic growth of entrepreneurship, with new entrants from science and art, is the hallmark of an entrepreneurial renaissance. From the limited practical impact of Leonardo's machines to the research activity at Bell Laboratories and the Xerox Research Lab, big ideas and great models will produce sustainable and widespread success in society only if they are properly enhanced by the innovation, manufacturing, marketing, and commercialization of the 'ability to make'.

In the first Renaissance, with the fusion of art and science, thought flew high, exhibiting positive effects on entrepreneurship. We have the perception of artists of great renown such as Michelangelo, Botticelli and Dürer as entrepreneurs. They demonstrated an ability to negotiate with their patrons and customers, as well as creativity, by inventing new business models and business strategies, and of organizational skills, with perhaps hundreds of people helping them to complete their artworks. Michelangelo, as William Wallace (1994) noted, organized and handled day-to-day operations at the building site of San Lorenzo, a key Florentine monument of the Renaissance, as well as his own personal and professional relations with nearly 300 individuals who assisted him in realizing the designs.

As did artists, scholars and scientists shared a passion for invention-driven innovation and entrepreneurship which enabled the creation of more effective machines to investigate and enhance the physical world. The challenge of the second renaissance now before us is that the encounter between art and science can provide an even greater impetus to entrepreneurship.

The irreversible change in the way society unties the knots that, over time, entangle knowledge, culture, education, art and science characterizes a renaissance age. The renaissance person loosens the knots without separating the threads of knowledge from those of doing. The Cartesian dictum '*Cogito ergo sum*' (I think therefore I am) couples with that proposed by Edward de Bono (1967), the father of lateral thinking—'*Ago ergo erigo*' (I act therefore I construct).

Renaissance people enhance the thought with the action of doing. They accomplish this task by building a bridge between their own mental algorithms and their translation in productive processes, both physical and in the domain of virtual reality. Representative figures of knowledge in action are those scientists who, from their discoveries, draw entrepreneurial inspirations that give life to the science-driven start-ups of which they are founders.

Renaissance spirit and thought defy commonly held opinions about scientists. It is said that their ideal locations are the major research centres of the most prestigious universities, where they can enjoy full autonomy and benefit from valuable human resources and substantial research funds. The argument is that such is not the case in industry where, although the available resources are considerable, scientists enjoy much less freedom given the commercial secrecy imposed on the results of their investigations, and where the quality of their research will certainly be inferior, being required principally to address themes relating to applied science which will be less challenging than those of 'pure' research. According to this view, the significant financial incomes offered by industry will not be a sufficient incentive for scientists to refrain from carrying out work as interesting as that offered by academic research centres.

'Renaissance thinkers', the term used by Steven Shapin, historian and sociologist of science at Harvard University, are those who turned the edifice of science, as it is usually described, upside down. Shapin said, in an interview following the publication of his book *The Scientific Life*, that,

If we look at the pure research done in industry and that done in academia, many of the most popular contrasts describe the situation rather poorly. If autonomy is the issue, many industrial scientists from early in the twentieth century enjoyed as much of that as their academic colleagues. And the same applies to notions of secrecy and openness. A clear contrast of *quality* between university and industrial science similarly seems not to hold, while a presumption that applied research and development requires less brain-power than pure research is just dogmatic. (Shapin 2008)

In our own age, as happened to some extent with the printing press in the Gutenberg era, ideas and content exploiting digital technologies acquire that commercial value which in the Industrial Age was assigned to material goods. Thus, in the renaissance profile of the scientist, one can glimpse the increasingly pronounced traits of the entrepreneur. This, however, is a profile not equally visible in the all parts of the world. In a history of entrepreneurism in India and Italy, for example, whilst the figure of the scientist entrepreneur would be highly regarded, such an individual would be considered as marginal, with the prominent roles taken by those blue-collar workers and technicians, active in manufacturing and as company founders, who made fruitful the soil of industry in both countries. Nevertheless, world-renowned scientists displaying an entrepreneurial spirit can help in translating the most complex problems of the research community into commercial ventures. To increase the number of scientists who, in setting up companies, are able to reconcile interest in research with entrepreneurship, it is necessary for a country to be endowed with industrial research laboratories where scientists can combine thought with action. With the research laboratories of large companies having been moved to other locations across the globe, and failing to attract replacements, a nation will encounter seemingly insurmountable difficulties in developing new industries that are fed by scientific discoveries and in which scientists play the role of (co-) founders. This is what happened in Italy after IBM and Microsoft transferred their laboratories elsewhere. It is a lesson to be learned by all concerned.

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Chapter 2
Harbouring the City of Sydney's Fluid Renaissance: Incorporating Community, Creativity and Collaboration

Kim Chandler McDonald

1 Flowing from a Modern Renaissance to Fluid Modernity

Regardless of your views on his politics, it can easily be argued that Winston Churchill was a 'Renaissance Man' and, therefore, it is fitting that I begin this chapter by quoting him: 'We shape our buildings; thereafter they shape us'. I do so because there is little doubt that this is even more relevant to the cities in which we now live, particularly those in the midst of, or striving towards, an era of renaissance and revival. This new renaissance focuses on the assimilation of academia, art, culture, innovation, science and technology in the context of urban entrepreneurship. As such, I will focus specifically on the renaissance of the City of Sydney (the City), rather than the vast, politically fragmented, suburban expanse that is loosely labelled Sydney.

The City of Sydney is one of the world's great harbour cities and, in many ways, it epitomizes a new, evolved renaissance of fluid modernity. This is a distillation of liquid modernity, as introduced by the sociologist Zygmunt Bauman (2000), which focuses on the global economy as it is underscored by increased capitalism supported by the twenty-first century data and digital revolutions. Fluid modernity, particularly as it relates to a contemporary renaissance, brings together often inconstant, collaborative and cooperative entities striving to create something mutable, which develops all the stakeholders involved.

Organizational structures, whether corporate or community based, are adapting—some more successfully than others—to this fluidity. Their stakeholders are perceptively embracing the imperatives and economic benefits of culture, creativity

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and innovation. As such, fluid modernity sees the emergence of identities, both communal and individual, based on lifestyle, consumption and connection.

With 89% of its population living in its major cities,[1] Australia is a nation of city-states and the City of Sydney, a city of villages whose citizenry—popularly known as Sydneysiders—are strongly affiliated with lifestyle and consumption, as well as both the local and global, creative and knowledge economies. It is open to question whether the City, as an entity, is a forerunner in the modern renaissance; however, its human capital is certainly at the forefront of fluid modernity in its attempts to pivot economically towards a creative, innovative foundation.

2 Strategic Frameworks

Creative thinking is the basis of successful start-ups, new economic models and an educated, high-quality workforce. As such, creativity and culture are not optional extras for forward-facing, fluid modernity; they must be embedded in the frameworks of cities whose intent is to have an effective knowledge economy.

The direction of the City of Sydney's governing body, led by the immensely popular Lord Mayor Clover Moore, is determinedly pointing towards becoming a creative city. This is clear in Mayor Moore's message regarding the City's strategic priorities in relation to its 2030 planning documents. In the Creative City Draft Cultural Policy and Action Plan 2014–2024 documentation[2] she states,

> While money matters, ideas can be more important. Opportunities can sometimes be created out of little more than a fertile imagination and a determination to achieve. As a city government, we have a responsibility to maximise these opportunities, and create an environment where ideas, imagination and creativity can flourish. We also have an obligation to ensure that we use our resources to effectively encourage and support cultural and creative activity. This is why we have developed our Creative City policy… [which] will ensure a robust future for Sydney's cultural life, and maintain Sydney's position as one of the world's leading creative cities.

This is echoed by Alex Bowen, Executive Manager of Creative City for the City of Sydney, who affirms that the policy and action plan were critical:

> We made the effort to embed a roadmap for the next 10 years for the City of Sydney, this was to ensure that all of the City's departments had a role in the delivery of key Creative City actions, from planning to legal and finance to libraries. The policy, and 10 year action plan, safeguards our work if we have a leadership change, we still have the road map, which is absolutely integral to everything we do.

The City's goals are based on three key factors: (a) Green—exceptional environmental performance and economic growth generated through new 'green', clean industries; (b) Global—remaining an international hub, which attracts and absorbs

[1] Sourced from United Nations, World Urbanization Prospects—Catalog Sources World Development Indicators.

[2] See: sydneyyoursay.com.au/creativecity/documents/12773/download.

talent through its support of innovation, creativity and collaboration; and (c) Connected—through improved transit and transportation infrastructure, improved access to affordable housing and 'partnerships and cooperation between governments, the private sector and the community to lead change'.[3] However, it should be noted that, particularly in the infrastructure arena, the City does face challenges. Specifically, in accordance with the 100 Resilient Cities 'Resilience Challenge Report', these challenges are 'ageing infrastructure, flooding, heatwaves, infrastructure failure, lack of affordable housing and a poor transportation system'.[4]

Undoubtedly, in the face of such challenges, the results and attributes of fluid modernity—such as attitudes and behaviours, and the social bargain between the various stakeholders in an ecosystem—can be difficult to measure. However, 2015 found Australia ranked the ninth happiest and world's most creative, economically competitive country.[5,6] This ranking was based on the nation's levels of technology, tolerance and talent, specifically in the 'Creative Class' and education—in arenas such as architecture, art, business, engineering, entertainment, finance, media, science and technology, all key factors in a nation's innovative and economic growth.

While clearly identifying the City of Sydney's resilience challenges, the 100 Resilient Cities organization made clear that those same challenges 'are spurring innovation in this bustling metropolis'; a metropolis that is at the centre of Australia's creative, digital, finance, innovation and start-up sectors. In fact, the 2015 Global Startup Ecosystem Report[7] found that the City of Sydney was 16th in the world when the rankings for funding (16th), market reach (17th), performance (20th), startup experience (tenth) and talent (sixth) were combined.

3 To the Matter of Mateship

Be that as it may, the City of Sydney, as a brand, is not one of innovation; rather, it is one of lifestyle and, dare I say it, relaxation. Rather than moving to the 'Land Down Wonder' to be at the heart of entrepreneurialism or innovation, I am comfortable in surmising that most migrants—excepting economic, environmental and political refugees, I hasten to add—choose to move to Australia in general, and the City of Sydney in particular, for its ease of access to warm weather, sparkling water and clear, blue skies. They come for the celebrated camaraderie of 'mateship' and a lifestyle based on consumption—cultural and otherwise.

The City of Sydney, and its environs, has long been an arena for gathering together; the area was a cultural melting pot long before the local Gadigal (aka Cadigal) people witnessed the First Fleet of 11 British ships land in Botany Bay

[3] From Creative City Draft Cultural Policy and Action Plan 2014–2024.

[4] See: http://www.100resilientcities.org.

[5] Sourced from World Happiness Report 2016.

[6] Sourced from The Global Collectivity Index, 2015.

[7] Available via http://startup-ecosystem.compass.co/ser2015/.

in 1788. With an abundance of fresh water, fertile lands and easily caught fish and wildlife, it is of little wonder the Gadigal and other Indigenous/Aboriginal clans—the Eora, (meaning 'here' or 'from this place'—Central Sydney is therefore often referred to as 'Eora Country')[8]—chose to inhabit Sydney and its coastal areas, including what is now the City's Central Business District (CBD). A land of abundance, it lent itself to cultivating a collaborative, laid-back lifestyle that enticed Indigenous/Aboriginals from other parts of the country to migrate and settle in its environs.

In the subsequent two centuries Sydney has increasingly become a magnet for migration. With more than 200 languages spoken by its multi-ethnic inhabitants, the City is in the midst of shifting its direct and indirect economic narrative and strategic branding towards the Asia–Pacific region and the interdependence of its inhabitants with their cultures, creativity and collaborative connections. As noted in the 2015 World Cities Culture Report,

> As with many other world cities, Sydney enjoys a position both as a crossing point between regional blocs and as a place of innovation. It is a city where ideas and capital coexist, although its full potential has yet to be fully tapped. … as one of the most culturally diverse and globally connected cities in the region, Sydney has the opportunity to create content for and with people from anywhere and everywhere.

4 The Imperative Creative Corridor

An excellent example of content creation is the Vivid Sydney festival. Launched in 2009 to drive winter visitation to the City and branded, predominantly, as summer-centric, some 1.7 million people attended in 2015, nearly 350,000 of them being visitors rather than residents. Light is the most visually captivating component of Vivid, and the light-based installations draw in the majority of people attending. However, there are two other key elements to the festivities: the music and ideas programmes.

Vivid Ideas focuses on the creative industries and specifically on professional and market development in the knowledge economy. It includes a vast spectrum of industries: from film and screen content, gaming and music, through to the built environments of architectural objects, fashion, content and interior design, as well as technology and start-ups. Via Vivid, a myriad of artisans, guilds and craftspeople are able to break down knowledge silos and successfully generate a cross-fertilization of ideas, ideation and potential innovation by shaping a space for safe conversations and potentially profitable collaborations.

The mindsets, practices and ethics of the creative world are beginning to play an essential role in the broader world of business. In particular, traditional consulting, finance and professional service firms are coming to realize that creativity and design thinking, if embedded in the core of their offerings, can help protect

[8] Sourced from Barani: Sydney's Aboriginal History.

them from disruptive encroachments. Thus these customary bastions of corporate conservatism are adopting some of the innovation inherent in the creative sector in order to adapt and pivot towards operating in the new, global Digital, Attention and Collaboration Economies (DACE). The greater the ability of an organization to connect and collaborate, the easier it will be 'to take advantage of the fact that geographic boundaries and traditional market barriers have become increasingly meaningless [as] the business world becomes ever more flattened'.[9]

Because the nature of the relationship between end-users and suppliers has changed, a constant two-way communication has developed between these stakeholders which conclusively challenges—and changes—the role of media. Most end-users' experience of brands is no longer moderated via the media but rather through direct experiences. As a result, companies of all kinds need both to commission content and to be content creators. Thus the creative sector is being co-opted into the service of the broader economy and enjoying greater appreciation for the 'value-add' that their creativity brings.

Vivid Ideas is an inherently Sydney event specifically because it is about the creative industries. Whilst it includes the cultural sector, it is industry-focused; it is about the business of creativity, which puts imagination, communication, collaboration and knowledge at the centre of the City's economy and culture.

The interdependent social, political, public, economic and cultural systems are integral as they pertain to the City of Sydney's ecosystem and brand. This is underscored by the digital convention of art, academia, culture, entrepreneurship, science and technology, which is the most effective way to ensure an equitable experience of, and place within, the future of the City.

This is echoed in the New South Wales state government's vision, which asserts that by 2020 NSW will be '…recognised globally for leading innovation and driving productivity gains in key sectors of the economy, enabled by strong, vibrant and connected ICT and Creative Industries'.[10] Because more than 60% of the country's ICT regional headquarters and operational centres are situated in the City, the NSW Digital Economy Industry Taskforce Action Plan of 2012 underlines the importance of the City's digital arena—a corridor that includes Pyrmont, Redfern, Surry Hills and Ultimo—to the state and its post-mining boom economy.

Growing Sydney's Digital Precinct will support the development of an 'innovation ecosystem' for NSW. By bringing together industry leaders, entrepreneurs in emerging technologies, relevant research and academic partners, the Digital Precinct will become a force of innovation and entrepreneurship, attracting our best and brightest, and generating a substantial new source of economic activity.[11]

A future-facing city of fluid modernity must be innovative and the City's Ultimo precinct, in particular, with the University of Technology Sydney (UTS) at its centre,

[9] Sourced from Flat World Navigation: Collaboration and Networking in the Global Digital Economy.

[10] Sourced from NSW Government Digital Economy Industry Action Plan Issues Paper.

[11] Available via https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/53725/digital_economy_iap_final_20121213.pdf.

exemplifies an ecosystem based on creative, digital innovation and research industry collaborations. Forty per cent of Australia's creative industries are within one kilometre of UTS: these include fashion design, digital media, film, television and software services. Perhaps in response to this environment, as well as to quench the thirst of a student base wanting a non-commercial, trans-disciplinary experience, UTS has changed the way it delivers education by means of the Bachelor of Creative Intelligence and Innovation (BCII). This world-first, future-facing degree combines all seven faculties, so that education is delivered in a more centralized, non-siloed manner.

The university market sector has changed dramatically and the BCII degree, together with the new eMBA, sees UTS pioneering new programmes and approaches to serve its local and global markets. As Professor Roy Green (Dean of the UTS Business School) makes clear, industry is increasingly demanding graduates, 'with an entrepreneurial rather than technical or managerial mind-set'. To this end, the university is focused on fluid modernity through the creation of strategic collaborations and partnerships with the creative, technological and start-up communities in their ecosystem.

Reflecting this collaborative spirit, UTS is at the heart of the Piivot innovation precinct in Ultimo. This is a 'partnership of tech start-ups, digital, creative, cultural, corporate, government, and education organisations centred on digital creative innovation. It is directed towards entrepreneurs, partners, investors and students looking to connect, learn and work together'.[12] Piivot is well-placed because, in addition to playing host to international behemoths such as Google and IBM, Ultimo is home to the densest entrepreneurial start-up activity in the country.

UTS has played an important part in the regeneration of this former industrial area which has moved from accommodating industry to being the headquarters for the knowledge, creative and collaborative economies that are central to strategically successful fluid modernity. Breaking new ground, both figuratively and literally, UTS's Business School is housed in the Dr. Chau Chak Wing Building designed by Frank Gehry. Opened in 2015, the boundary-pushing, curved form of the building is reminiscent of the sails of the City's most famous piece of architecture, the harbour-side Opera House, which is also evoked by the fluid feel of the communal spaces. An iconic manifestation of fluid modernity, the building's interior creates a sense of communication, collaboration and innovation, while its exterior resonates with Sydney's urban brick-built heritage and reflects the City's landscape via a glass façade.

Across the road from Ultimo is the revived Chippendale central district. In the midst of its own renaissance of fluid modernity, this vibrant neighbourhood is awash with world-class architecture, award-winning bars and restaurants and internationally acclaimed art galleries and installations. The Chippendale Creative Precinct, founded in 2010 by Nicky Ginsberg, the indomitable art luminary, is central to the resurgence of this, until recently, rundown—one might even say ghettoized—area of the City. Within the precinct, collaborations are conspicuously encouraged between a wide range of artisans, entrepreneurs and patrons.

[12] Australia's Innovation System: The Senate Economics References Committee, December 2015.

5 Impactful Patronage

In reflecting on the area's patronal renaissance, one must reference both Judith Neilson and Stanley Quek who have embedded themselves in the precinct and continue to expand their cultural and architectural footprints. Ms. Neilson, founder (along with her former husband) of The White Rabbit Gallery, which exhibits selections from the White Rabbit collection of twenty-first century Chinese art (one of the largest of its kind in the world), has several other noteworthy buildings in the area for both residential and commercial use.

As well as funding artistic prizes and engaging local architects, Stanley Quek, CEO of Frasers Property, was instrumental in bringing Pritzker Prize winning architect Jean Nouvel to the City. Nouvel created the precinct's showpiece, Frasers Property owned One Central Park, in collaboration with botanist Patrick Blanc, the inventor of the vertical garden which flows down the face of this exceptional structure.

If we accept that, at this level certainly, patronage is the arena of the elite—in terms both of people and projects—then it is not feasible to go any further without discussing James Packer and his controversial casino, which has been exempted from the City's lockout laws that have affected almost every other night-time entertainment establishment (apart from casinos). It has been strenuously argued that, whilst not 'bad' architecture, it is in the wrong place (Barangaroo) and it will dominate rather than enhance everything around it. This may be likened to the battle over the height of the San Gimignano Fortified Tower Houses in the fourteenth century.[13]

Perhaps one unavoidable aspect of a patronage model is that it can leave the culture of any city to be animated and engineered at the behest and pleasure of only a few benefactors. That may be the price to be paid if one wishes to 'go with the flow' while living in a global city of fluid modernity.

Few would argue that, across the City of Sydney, real estate developers are the unspoken, unheralded shapers of the City and, as such, they have a huge impact on the liveability of the urban arena. Thinking for the moment economically, rather than aesthetically, the City of Sydney is in the midst of an increasingly rapid circulation of capital, which may go some way to explaining the building frenzy in which it finds itself. This intensification, as well as gathering residents into more high-density living conditions, further spurs the velocity of capital as this equity is invested in property, which then increases in value and is, before long, sold again. The cycle is interminably self-feeding.

That notwithstanding, the City, as a brand, is most recognisable by its real estate—its architecture; there are sandy beaches around the world but there is only one Sydney Opera House. With the architectural fluid modernity of Gehry's Dr. Chau Chak Wing Building and Nouvel's One Central Park to join it, the City is further reducing its reliance on spectacular geography for its iconicity—and there is more to come with the aforementioned Barangaroo development.

[13] See, for example, http://whc.unesco.org/en/list/550; and Gilchrist (2016).

Barangaroo is the City's largest new precinct and it has the potential to accommodate a diverse community of residents and working people. Given its proximity to the harbour and the CBD, this former, largely obsolete, shipping and stevedoring area of disused railway sidings and derelict docklands has the capacity to provide a quintessentially Sydney-esque experience of fluid modernity. Its mix of venerable Yellowblock sandstone cuttings, a headland park, corporate headquarters, apartments, and the previously mentioned James Packer led hotel/casino complex, has the potential to benefit the people occupying and visiting the space. Indeed, Barangaroo South has received a six-star rating for sustainability as assessed on economic prosperity, liveability, governance, innovation, sustainability and the environment; and to this end Lend Lease, the developing company, has committed to ensuring that the area is both carbon-neutral and water-positive.

However, with its high-density commercial towers, which are out of scale with its surroundings, the area does run the risk of becoming a playground for the privileged few. To counter this potential fate the area, which was once part of what was known as the 'Hungry Mile'[14] (so-called by workers in the Great Depression who would walk from wharf to wharf looking for employment, too often unsuccessfully) is the culmination of the City's Cultural Ribbon. The ribbon, part of the renaissance of the urban infrastructure, is 'A foreshore walk linking some of the city's large cultural institutions … from the Art Gallery of NSW through to Barangaroo through a series of connected precincts'.[15] It includes public spaces and parks, waterside walks and the revivified Darling Harbour and Cockle Bay neighbourhoods—with their convention, exhibition and entertainment amenities—reflecting the City's captivation with consumption, connection and a convivial lifestyle.

Sydney Harbour is the City's largest public plaza; it is a liquiform participant in, and backdrop to, the visual spectacles that motivate Sydneysiders to gather together in communal celebration. The water reflects the illuminated Opera House, Harbour Bridge and Museum of Contemporary Art, creating a critical mass around events, which often take place on the harbour itself. All of these play their part in shaping the carefully cultivated City of Sydney brand. A culmination of corporate and community, East and West, innovation and indolence—the City of Sydney is the urbanization of fluid modernity made manifest.

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[14] Sourced from Union leaders walk the Hungry Mile, Sydney Morning Herald.

[15] Sourced from Creative City Draft Cultural Policy and Action Plan 2014–2024.

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Chapter 3
Bangalore: Development Through Intercultural Interaction

Mathew J. Manimala

Abstract This chapter is an elaboration on a 4-stage model of cluster development (through *incubation, nucleation, agglomeration* and *attrition*) proposed in an earlier paper by the author based on an analysis of the inception and growth of the Bangalore ICT Cluster. Through a chronological analysis of several centuries of Bangalore's history, this chapter identifies 'intercultural interaction' as the principal means of 'incubation', which made a significant contribution to the human capital development of the region, especially in terms of its technological and entrepreneurial capabilities. The city was therefore ready to receive (nucleate) and nurture the ICT industry that landed there due to a series of 'negative pushes' it experienced elsewhere. Agglomeration, therefore, was a natural consequence. The chapter further explains the process of cluster formation and agglomeration using an analogy of the chemical process of crystal formation and growth. Both of these involve a fairly long period of preparation (incubation) and a rather sudden and unexpected change within (nucleation) induced by changes in the external environment. The new entity thus formed will attract similar entities to itself and achieve fast growth under the nourishment provided by the internal environment already prepared and enriched by the long period of incubation.

1 Bangalore: A City of Several Epithets

Bangalore (locally known as 'Bengaluru'), the Indian city located in the South-Central part of the Indian peninsula on the Deccan Plateau at an elevation of over 900 m (~3000 ft), is the capital of the Indian State of Karnataka. Its location makes

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it the highest of the major large cities of India and gives it pleasant and salubrious weather conditions throughout the year. Bangalore is a city of several epithets, the most prominent of which is the 'Silicon Valley of India'. While this is the most recently accorded epithet for the city—and probably the most appropriate one, given the information technology and information technology-enabled services (IT/ITES) entrepreneurial revolution that is taking place there—one cannot ignore the several others by which it has been known in the past and/or continues to be known today. These include: the Garden City of India, the Pensioners' Paradise, the Pub City of India, the Fashion Capital of India, the Fun City of India, and so on. Each denotes a special aspect of Bangalore's growth and development.

It is somewhat unusual for a single city to have so many epithets, which is probably an indication of the diversity it represents. Epithets such as 'Fashion Capital', 'Fun Capital' and 'Style Capital' could have been attached more legitimately to other (older) metro-cities of India like Mumbai (formerly Bombay), Kolkata (formerly Calcutta), Chennai (formerly Madras) and Delhi, which have more established initiatives and industries in the areas of film, music, art, culture and fashion. However, the recognition of Bangalore as pre-eminent in these sectors is not based merely on casual usage in the local communities, but is given by national and international agencies based on the perceptions of people who matter in the respective fields. For example, the 27 October 2003 issue of *Newsweek* included Bangalore among the 12 'Capitals of Style' on the planet, along with Paris, London and Los Angeles. The 'Fun Capital' epithet was given to the city by an Indian magazine (*The Week*) during the same period in an article entitled 'Thank God It's Bangalore'. An earlier (2001) issue of *Newsweek* had rated Bangalore as one of the 'Top 10 Hot Spots', while *Business Week* called it one of the 'Top 10 Tech Cities'. To cap it all, *Die Zeit* (the German weekly magazine) called Bangalore the 'City of the Future' (Yue et al. 2001).

The diversity reflected in the current epithets for Bangalore may well be attributable to its chequered history. The city has, at different periods, been under the control of various dynastic rulers, mostly outsiders or their representatives and, ironically, this has helped to build diversity and entrepreneurial spirit in its human capital, as we shall see in detail in the later sections of this chapter. Before taking a historical perspective of the development of Bangalore as a city of high-tech entrepreneurs and professionals, it will be useful to examine briefly the different stories told about the name of the city itself, as these also highlight the influence of various factors that have contributed to the development of this region into an entrepreneurial city.

2 What's in a Name? Quite a Lot

The different stories about how Bangalore got its name may suggest that there is no common agreement on the city's origin. As noted above, Bangalore is an anglicized version of the Kannada name Bengaluru (also written as 'Bengalooru'). A popular story associated with this name is that of King Veera Ballala II of the Hoysala Dynasty (1117–1343). During one of his hunting expeditions in 1120, King Ballala

lost his way in the forest and wandered into the hut of a poor old woman, who offered the tired and hungry hunter some boiled beans (‘bende-kaalu’) and water. Pleased with the woman’s hospitality, the grateful king named the place ‘Bende-Kaalu-Ooru’, which over time became shortened into ‘Bengaluru’.

While this story of hospitality (for which Bangalore is reknowned) is credible and creditable, the historical records show that the name ‘Bengaluru’ existed a few centuries earlier, as demonstrated by a ninth century stone inscription (‘veeragallu’, meaning ‘hero-stone’) in the Naganatheshwara (Lord Shiva) temple in Begur village, 15 km south of Bangalore. ‘Hero stones’ are memorial stones erected as a tribute to the heroes who died in battle defending the king, cattle or women in distress. The Begur hero-stone, erected by the Western Ganga dynasty, extols the virtues and exploits of a soldier who died in the ‘Bengaluru Yudha’ (‘Battle of Bangalore’), which was fought in the year 890 CE. Apparently the stone was erected more than 100 years after the Battle of Bangalore, because the inscription also states that the place was part of the Ganga Kingdom until 1004 (who ruled from Gangavadi in Talakadu from the second to the tenth century CE), and was known as ‘Bengavaluru’, which means the ‘City of Guards’ in Halegannada (Old Kannada). This then brings us another story about the origin of the city and its name. It is believed that, during the fifth century CE, the Ganga rulers constructed a hamlet near Kengeri, on the outskirts of the present city, for their security guards and this was known (in Kannada) as Bengavalu. Their dwelling place was popularly known as Bengavaluru, which later changed to Bengaluru.

In spite of such evidence for the prior existence of Bengaluru, the founding of modern Bangalore is credited to Hiriya Kempe Gowda (popularly known as Kempe Gowda I), a feudatory ruler under the Vijayanagara Empire, who built a mud-and-brick fort in 1537 in the central (market) area of present-day Bangalore. The choice of this site for the fort is also associated with a hunting legend. Kempe Gowda, who was Chieftain of Yelahanka Nadu, a principality under the Vijayanagara Empire, located towards the northern end of present-day Bangalore and hence known as Yelahanka Nadaprabhu, would go hunting in the southern forests. On one of these trips he was surprised to see that a rabbit was chasing his hound. He decided that a land that nourished such strong and healthy rabbits should be the site for a new fort. He called the place ‘gandubhoomi’ (the land of heroes). While having the ground prepared for the construction of the fort, he is said to have burned the forest, and so the area became known as ‘Bende-kaadu-uru’ (the ‘town of burnt forest’), later shortened to ‘Benkaduru’, and finally to ‘Bengaluru’.

This story is also unlikely to be true, because the name ‘Bengaluru’ was already in existence. In fact it was in the neighbourhood of Kempe Gowda’s headquarters (Yelahanka). There is a village there today, known as ‘Halebengalooru’ (‘Old Bangalore’), near Kodigehalli, south of Yelahanka. Legend has it that Kempe Gowda’s mother and wife hailed from this village. It is therefore likely that he named the newly built fort-city as ‘Bengaluru’ in honour of his mother and wife. Another association of the city’s name with Kempe Gowda is through the several temples he built for the deity Venkataramana Swamy, because of which the place began to be known as ‘Venkat-uru’ and later as ‘Benkat-uru’ and Bengaluru.

These four stories about the origin of the city's name are based on human actions and their consequences; and, now, there are two more stories to add, which are based on nature. One is associated with a medicinal plant called 'Benge' in Kannada (also known as the Indian/Malabar Kino tree, whose botanical name is *Pterocarpus marsupium*), a deciduous species that grew abundantly in this region. The land of benge (Benge-uru) later became Bengaluru, according to one theory. The other theory based on nature is associated with the name of a quartz stone (Benachu Kallu) which is abundantly available in the region. 'Benachu-kallu-uru' later became Benkalluru and Bengaluru.

Among all these stories, only one is likely to be true, but all of them live in the minds of people as symbols of the aspirations of diverse segments of the city's population, which are many. This city is about human kindness and hospitality, valour and heroism, protection and patronage, nurture and nourishment, construction and development, respect and relationships, religion and rituals, nature and environment (both in terms of destruction of forests to build the city and the reintroduction of greenery with gardens) and so on. And, if we borrow some ideas from the epithets discussed above, many of these concepts are reinforced and a few others are added—and we get the Bangalore city of today, which has effectively combined fun, frolic, fashion and enjoyment with technology, entrepreneurship and futuristic development. The entrepreneurial renaissance that is happening in Bangalore may be attributed to intercultural interaction and the development of its human capital through an incubation process that has been going on for several centuries. A brief examination of the city's history will illustrate this phenomenon further.

3 Mysteries of the Early History

As in the case of the name, there is little unanimity about the early history of the city. There are claims that this area has had human settlements since 4000 BCE, supported by the discovery in 2001 of stone-age implements at Jalahalli, Sidhapura and Jadigenahalli, all of which are in the suburbs of present-day Bangalore. Similarly, the burial grounds discovered in Koramangala and Chikkajala on the outskirts of the city date back to the Iron Age (about 1000 BCE). More importantly, there is some evidence of entrepreneurship among the early settlers of the place (including evidence of overseas trade), as indicated by the discovery of Roman coins dating back to about 27 BCE to 51 CE (showing the emperors Augustus, Tiberius, Caligula and Claudius) during excavation work to lay the foundations of Yeshwantpur railway station in 1891 and the HAL (Hindustan Aircraft Limited) factory and airport in 1965. From the second century CE till the ninth, the area (identified as Bengaval-uru, after the residences built by the Gangas for their security men) was ruled by the Ganga dynasty belonging to the Ratti (now Reddi) tribe from the Kongu region (at present in the neighbouring state of Tamil Nadu) with their capital in Kolar (in the east of the current Bangalore region) until 350 CE and later from Talakad (in the west of the present Bangalore region) until they were defeated by the Cholas of Tanjavur in the eleventh century CE. However, the first

references to a predecessor of the present-day city date back to 850 CE, on a Mauryan Empire milestone, and 890 CE, on a hero-stone found in the Begur temple, both of which mention 'Bengaluru'.[1]

While a settlement with the present name seems to have existed in the area at least from the ninth century CE, there are no indications of the developmental status of the place until 1537. During the 500-odd years from 1004 to 1537, the area was under the rule of Chola, Hoysala and Vijayanagara kings. Of these, the last two are sentimentally remembered as contributors to the development of modern Bangalore. The Hoysalas (literal meaning: 'Strike, Sala', associated with the legend of the hero Sala killing a tiger) were Jains hailing from the Malnad (Hills) region of Karnataka and converted to Hinduism. They started their rule as subordinates of the Western Chalukyas, but later became independent rulers of present-day Karnataka and a few regions in Tamil Nadu, Andhra Pradesh and Telangana. They ruled initially from Belur in the Hasan district of Karnataka, and later shifted their capital to the nearby town of Halebid—both these places are of tourist interest today because of the temples built by the Hoysalas. This was the first time (after the Western Gangas, whose region of origin is disputed) that a dynasty from the Karnataka region had ruled the place, and thus the story about one of them (King Veera Bhallala II) naming the town as 'Bende-Kaalu-Uru' after eating the boiled beans offered to him by the poor old woman has become quite popular, despite the evidence that the name 'Bengaluru' predates his time. The present administration of Karnataka has recognized the 'contribution' of the Hoysalas to the development of Bangalore by naming the Bangalore City Police's (BCP) mobile patrol 'Hoysala'.

4 The Mud Fort and the Muddles of the Middle Ages

Although there is evidence for the existence of a place called 'Bengaluru' in the vicinity of the present city since the ninth century BCE, the foundations of the present city were laid in 1537 by Kempe Gowda I (a vassal of the Vijayanagara King, Achuta Devaraya), who was ruler of the Yelahanka region (north of the present-day city). Kempe Gowda I had the ambition of replicating the Vijayanagara capital of Hampi in this region; but the king, fearing the potential power of his vassals, did not permit him to build a stone fort, and so Kempe Gowda had to be content with a mud fort. There were two main streets inside the fort: Chikkapeté Street, which ran east–west, and Doddapeté Street, which ran north–south. Their intersection, Doddapeté Square, was the heart of the town. In addition, there were three other market places (little towns)—Balepet, Cottonpet and Chickpet—which exist with the same names today in the market area of the city.

[1] A few important events in the development of Bangalore as a city of entrepreneurs and technologists – including the governmental initiatives to set up industries and educational institutions – are extracted from a comprehensive list of events in chronological order from 4000 BCE to 2014 CE (prepared for an earlier version of this paper) and presented in Appendix 1.

In 1565, when the Vijayanagara Empire fell in the Battle of Talikota, Kempe Gowda I became the independent ruler of Bangalore. His successor, Gidde Gowda, had only a short tenure of 15 years (1570–1585), but his son, Kempe Gowda II, had a long and illustrious reign of 48 years (1585–1633), during which period he constructed temples, lakes, two forts (Magadi and Savanadurga) and watch-towers in the four corners of Bangalore city (at Lal Bagh, Kempambudhi Tank, Halasuru Tank and Mekhri Circle)—now known as the 'Kempe Gowda Towers'. Symbolically and commemoratively, the Bangalore City Corporation has chosen the watch-tower as its insignia.

The local self-government of Bangalore by the Kempe Gowdas lasted for only 101 years (1537–1638), after which the area was constantly under attack, but paradoxically no one wanted to keep it. During the rule of Kempe Gowda III, the city was attacked and captured in 1638 by the army of the Bijapur Sultan (Adil Shah) under his chieftains Ranadulla Khan and Shahaji Bhonsale, but was gifted to Shahaji by the Sultan as jagir. Subsequently, the jagir was inherited by Shahaji's younger son Venkoji, but he took little interest in protecting it from attackers and gradually withdrew to Tanjavur in Tamil Nadu in 1675 to rule from there. The city was recaptured by Shivaji, Venkoji's older half-brother and the Maratha King ruling from Reighad, but he too had no interest in keeping it and gifted it to Venkoji's wife, Deepabai, as Choli-Bangdi (pin-money or pocket money given to a daughter!). Then came the Moghuls in 1687, when Aurangazeb's commander Khasim Khan captured the city, but they too had no interest in keeping it and sold it to the Mysore King, Chikkadevaraja Wodeyar, for 300,000 pagodas (local currency in gold, worth about 8 shillings per unit). Strangely, the Wodeyars too could not keep the territory for long, and in 1759 gifted it to Hyder Ali (their chieftain) as jagir, paving the way for the emergence of Hyder and his son Tipu as the *de facto* rulers of Mysore. During their rule, there was some attention to the development of Bangalore—it was Hyder Ali who took the initiative of building the Lal Bagh Botanical Gardens on the pattern of the Moghul Gardens in the nearby area. With subsequent developments, Lal Bagh (literally meaning 'Red Garden', then known for its collection of red roses) has become the subcontinent's largest collection of rare plants, harbouring about 673 genera and 1854 species of plants.

5 Bouncing with the British: Towards Modern Development

Although Hyder Ali and Tipu Sultan were aggressive fighters, they could not withstand the repeated onslaughts of the English East India Company, in spite of the alliance they made with the French. While the three Anglo–Mysore wars were concluded with treaties that were mostly favourable to the British, the fourth war ended with the death of Tipu Sultan (1799) and thus offered a decisive victory to the British. Even though the kingdom of Mysore, together with the city of Bangalore, was returned to the Mysore king (Krishnaraja Wodeyar III), the British established a 'Residency' at Mysore and controlled the administration through a Commissioner. The Residency was later shifted to Bangalore in 1804, and then onwards the British

were focused more on Bangalore than Mysore.[2] The many and varied institutions and facilities created by the British after 1799, either on their own or in collaboration with the local rulers and/or Indian entrepreneurs, which had a positive impact on the entrepreneurial and technological development of Bangalore are listed chronologically in Appendix 2.

Whilst it is often argued that the contribution of colonial rule to the economic development of India was negative, it cannot be denied that the foundations of the modern administrative and technological developments in India (and in Bangalore) were laid by the British. Starting with the establishment of the General Post Office in 1800 and ending with the City Improvement Trust in 1945 (towards the end of their rule in India), the British were (partly in some cases and solely in others) responsible for the introduction of new-technology-based products, facilities and administrative systems in Bangalore (see Appendix 2). The manpower introduced (often from outside the region and even outside the country) and developed to create and manage such technological products and facilities has contributed to the development of diverse capabilities and entrepreneurship.

6 India's Independence and Initiatives Galore

The democratic government that came to power in India after Independence (1947) believed in the development of all regions and hence in the equitable distribution of facilities and resources. Despite this, it would not be wrong to say that Bangalore received special considerations, for climatic, locational, historical and political reasons. Bangalore is the only large city in India with moderate and salubrious weather conditions throughout the year, a consequence of its elevated location on the Deccan Plateau.[3] The weather helps to make the place acceptable to people from diverse regions and countries. The location of the city away from the country's boundaries makes it an ideal choice for setting up strategic industries such as defence and space. The historical reasons relate to the various groups that have come into the city at different periods and the facilities and institutions they have created, which have made the place attractive to subsequent entrepreneurs and technologists. The political reason is that, for several decades after Independence, Karnataka had a government of the same party as that ruling at the Centre, whereas the 'more eligible' city in the south (Madras) was in a state (Tamil Nadu) ruled by a different party.

The collaboration between the Central and State governments and the many other congenial factors mentioned above led to the setting up of several public-sector undertakings (PSUs) and institutions of national importance in Bangalore. The more prominent among the PSUs established in Bangalore after Independence are listed in Table 3.1.

[2] Though the 'Residency' was permanently closed in 1947 in the wake of India's Independence, 'Residency Road' still remains in the heart of Bangalore.

[3] In fact, it is often suggested that the epithet 'Silicon Valley' is a misnomer for Bangalore; it should rather be called 'Silicon Plateau'!

Table 3.1 Prominent Public Sector Undertakings (PSUs) of national importance in Bangalore

PSU	Year
• Indian Telephone Industries (ITI)	1948
• Hindustan Machine Tools (HMT)	1953
• Bharat Electronics Limited (BEL)	1954
• National Aeronautical Research laboratory (NARL), restructured and renamed as National Aerospace Laboratories (NAL) in 1993	1960
• Hindustan Aeronautics Limited (HAL), a restructured and expanded version of Hindustan Aircraft Limited (HAL) originally set up by private entrepreneurs in 1940	1964
• Bharat Earth Movers Limited (BEML)	1964
• The Indian Space Research Organization (ISRO)	1969
• Bharat Heavy Electricals Limited (BHEL), Electronics Division	1972
• Electronics City (an industrial park in three phases exclusively for electronics and IT/ITES companies)	1978
• International Technology Park Limited (ITPL), in collaboration with the Government of Singapore	1994

In order to support industry, the government has also taken the initiative of setting up several educational institutions of national importance in Bangalore, including:

- Indian Institute of Management Bangalore (IIMB), 1973;
- National Institute of Mental Health and Neurosciences (NIMHANAS), 1974;
- National Institute of Fashion Technology (NIFT), 1986;
- National Law School of India (NLSI), 1987;
- International Institute of Information Technology-Bangalore (IIIT-B), 1999;
- Institute of Bio-informatics and Applied Bio-technology (IBAB), 2001; and
- National Institute of Design (NID), R&D Campus, 2006.

These are known as 'Institutions of Excellence' and aspire to maintain world-class standards in education.

It is often alleged that public-sector companies in India have not risen to the level of performance expected of them. While this is true of many PSUs, quite a few have excelled as role models in their respective fields, as have institutions such as the Indian Institutes of Science (IISc), Technology (IITs) and Management (IIMs). In fact, many of the Bangalore-based PSUs have made it to the 'excellence' list ('Maharatna', 'Navratna' and 'Miniratna', as they are called in India for something like an A–B–C grading). More importantly, a major but often unacknowledged contribution of a Central PSU or an institution of excellence to a region is the development of technology and human capital in and around its location. Many of these organizations engage in technological collaboration with world-class corporations and/or institutions, and this has a spillover effect on the local community. Moreover, recruitment to these companies and institutions is done from among the most qualified candidates across the country, thus contributing to the enhancement of quality and diversity of the region's human capital. Bangalore too has been a beneficiary of this process.

7 Life After Liberalization: Entrepreneurial Effervescence

By the mid-1980s, the processes of liberalization, privatization and globalization were slowly being unfolded in the Indian economy and were formally adopted as government policy in the early 1990s. This was a major opportunity for the new technology (IT/ITES) based firms that were slowly developing in the country. Although the Department of Electronics had initiated some special schemes for promoting software exports as early as 1972 (e.g., permitting the duty-free import of hardware in exchange for exporting software worth twice the import value), the real push for the sector came with the economic liberalization of the 1990s, when many changes were introduced in taxation and foreign exchange rules. Moreover, foreign companies were permitted to establish wholly owned subsidiaries in India. Similarly, Indian companies providing services abroad were permitted to spend up to 70% of their earnings on marketing and other expenses.

A major initiative of the Government of India in promoting India's IT industry was the setting up of the Software Technology Parks of India (STPI) in 1991 as an autonomous society under the Department of Electronics and Information Technology (DeitY) in the Ministry of Communications & Information Technology. The first STPI unit was established in Bangalore in 1991. The main objectives of STPI are to create and manage infrastructure facilities, promote the development and export of IT/ITES products and services, provide statutory and promotional services through the STPI and the Electronic Hardware Technology Park (EHTP) schemes, provide data communication and other services, such as technology assessment and professional training, and promote micro, small and medium-sized enterprises in the IT/ITES fields. Accordingly, companies located in STPI units were given special benefits (Sareen 2005) such as:

- 100% duty free imports;
- 100% foreign equity permitted;
- 100% Corporate Income Tax exemption till 2010;
- Excise duty exemption and reimbursement of Central Sales Tax;
- Dedicated data communication links;
- Single window clearance; and
- Custom bonding and export certification.

In designing the STPI scheme, the government's intention was to spread the IT industry to different parts of the country and thus to set up centres in more than 50 cities and towns. Similarly, it was also envisaged as a means of promoting software exports from India and so it was designed as a 100% export-oriented scheme. As of 2012–2013, there were 4534 operative units under STPI, of which 3755 units had exported software. In monetary terms, the value of exports in 2012–2013 was INR 2,514,980 million, which was about 11% higher than in the previous financial year. Bangalore is a major beneficiary of the STPI scheme, as it was the location of the first STPI, which now houses more than one-third of the STPI units in the country and has more exports than any other centre (https://www.stpi.in/).

While STPI is the crowning initiative of the Government of India (GoI) to promote the country's software industry, there have been various other initiatives by the Government and public institutions (Rajaraman 2012), some of which are listed in Table 3.2. Although these initiatives were intended for the country as a whole, with the projects being established in different regions, there were indirect benefits to Bangalore from all of them, as well as direct benefits from a few, for which the Indian Institute of Science (IISc), Bangalore, was a natural choice.

As can be seen from Table 3.2, initiatives for liberalizing the IT industry started about two decades before the formal introduction of economic liberalization policies in 1991. In fact, 1984 has become the watershed year for the liberalization of the IT industry, because it marked the beginning of a series of initiatives in quick succession for developing the hardware and software competencies of the country. It should be noted that 1984 was the year when Rajiv Gandhi became India's Prime Minister, and hence there is a tendency for historians to ascribe the IT liberalization to him. However, one should not forget that Rajiv Gandhi came to power towards the end of the year (in November), and so it is highly unlikely that all the initiatives listed above (and more) were conceived, developed and introduced in the last 2 months of the year. It seems that the credit for these initiatives should be shared with the previous governments, especially since they were active in the promotion of electronics and computers from as early as 1954 (when Bharat Electronics Limited—BEL—was established in the public sector in Bangalore) and 1955 (when the government facilitated the import of the first computer to India by the Indian Statistical Institute, Kolkata).

8 Bonus to Bangalore (B2B)

Although the Government of India's schemes for promoting the IT industry were intended for the whole country, Bangalore did get some 'bonus points', because it was the preferred location for many public-sector industries and institutions. A major initiative of this kind in the corporate sector, as far as the IT industry is concerned, was the setting up of BEL, the first electronics manufacturing company in India, in Bangalore in 1954. This is just one of the several public-sector companies and institutions of strategic importance in the high-tech areas of defence, space, aeronautics, electronics, and so on, set up by the GoI in Bangalore (see Table 3.1). Among those institutions, the most prominent is the Indian Institute of Science (IISc), originally set up in the pre-Independence period in the private sector by JN Tata in collaboration with the British and the Maharaja of Mysore, and later brought into the public sector and supported by the GoI. As we have seen, IISc was a natural choice for many of the IT-related initiatives of the government.

What, then, was so special about Bangalore that attracted the IT industry to the city? There are many hypotheses as to the factors that facilitated the growth of the IT industry in Bangalore, amongst which are the following.

Table 3.2 IT initiatives in Bangalore by Government and public institutions

Year	Initiative
1971	Electronics Commission was set up to promote the electronics and computer industries in India
1972	GoI permitted the duty-free import of hardware in exchange for exporting software of twice the import value
1975	Computer Management Corporation (CMC) Private Limited was launched as a fully-owned GoI company with its headquarters in Delhi. It was converted into a public limited company in 1977, renamed as Computer Maintenance Corporation Limited (CMC Limited) in 1984, and privatized in 2001 by selling its shares to Tata Consultancy Services (TCS)
1978	The first degree programme in Computer Science (CSc)—BTech (CSc)—was started by the Indian Institute of Technology, Kanpur (IIT-K), and was later introduced by all other IITs and many engineering colleges
1980	Electronics Commission recommended the introduction of a Master's level programme in computer applications (MCA—Master of Computer Applications), which could be pursued by any graduate so that computer expertise would also be accessible to non-engineers
1981	CMC Limited secured funding support from the United Nations Development Programme (UNDP) to train professionals in neighbouring countries on computer and software related issues. The INTERACT project (International Education and Research for the Application of Computer Technology) thus became India's first foray into the international arena in the field of IT
1984	Department of Electronics (DoE), GoI, obtained UNDP grants to set up the Computer-Aided Design (CAD) Programme at four national-level institutions, including IISc Bangalore, and the Computer-Assisted Management (CAM) Programme at the Administrative Staff College of India (ASCI) and three Indian Institutes of Management (IIMs), including IIM Bangalore
1984	Reserve Bank of India (RBI) stipulated that all commercial banks in India should computerize their 'back-office' work. This move was resisted by the trade unions, who observed 1984 as 'Anti-Computerization Year'! (Ironically, when the unions were expecting massive reductions in employment in the banks, the RBI stipulation created plenty of work for software companies and provided a lot of employment in the IT sector)
1984	IISc Bangalore was awarded a grant of Rs. 500 million by the Ministry of Human Resource Development (MHRD), GoI, to establish a Supercomputer Education and Research Centre (SERC). The plan could not be implemented fully because of a ban imposed by the US Government on the export of Cray Supercomputers to India (the ban was lifted in 2008 with the signing of the Civil Nuclear Deal between India and the USA), because the products were then classified as 'dual use technologies', which included high-performance computers and certain types of software, such as high end CAD/CAM tools, having the potential to be used in nuclear projects. GoI therefore set up the Centre for Development of Advanced Computing (C-DAC) during 1986–88 for the development of supercomputers in India (see below for the details), while IISc continued its efforts with the help of European collaborators
1984–86	Indian Railways (the world's seventh largest commercial or utility employer) computerized its reservation system with the help of CMC Limited, using only Indian engineers and indigenously developed software
1985	Texas Instruments (Bangalore Centre, established in 1984) was permitted by GoI to break the monopoly of the Department of Telecommunications (DoT) and to have its own dedicated satellite communication link to its Dallas Centre in the USA, thus laying the foundations for the development of off-shoring business and software exports from India

(continued)

Table 3.2 (continued)

Year	Initiative
1985	DoE launched a scheme for training university and college teachers in computer science
1985	Using a UNDP grant, DoE set up the Knowledge-Based Computing Systems (KBCS) Development Programme in five academic institutions, including IISc Bangalore
1986	Supported by a UNDP grant, Department of Electronics, GoI, launched a networking project called 'Education and Research (in Computer) Networks (ERNET)' in seven national institutions, including IISc Bangalore. Currently it is the largest nationwide terrestrial and satellite network, with 15 points of presence at premier academic and research institutions
1986–88	Centre for Development of Advanced Computing (C-DAC) was set up by Department of Electronics and Information Technology, in collaboration with Russia, to develop indigenous supercomputers in India (to overcome the ban imposed by the USA in connection with the nuclear non-proliferation issue). The aim was to cater to the specialized computing needs of the country, such as: high-performance computing/computers; grid computing; information and cyber security; speech and natural language processing; ubiquitous computing; bioinformatics; geomatics; and digital forensics. The first indigenous supercomputer (PARAM 8000) was developed in 1991, and was rated as one of the fastest supercomputers then available. Among the many software products developed by C-DAC were an integrated circuit chip called GIST (Graphics and Intelligence based Script Technology) and a standard Indian Script Code for Information Interchange (ISCII), which together could process the content in Indian languages
1990	The Software Technology Parks of India (STPI) scheme was launched by DeitY, GoI, and its first unit was set up in Bangalore in 1991
1998	GoI constituted a National Task Force on Information Technology and Software Development (with 18 members, representing government and the industry) to make recommendations on a National Informatics Policy. The task force made 108 recommendations (see Appendix 3 for a list of 20 major ones), most of which were accepted and implemented by the government

An educated workforce (able to speak English), available in large numbers at relatively low wages. Bangalore is often mentioned as having an advantage in this respect, because the state of Karnataka—of which it is the capital—has been more active than other Indian states in permitting and promoting educational institutions in the private sector, so that it has proportionately more of such institutions, especially engineering colleges which number over 100.

A cosmopolitan culture, conducive to the Western life-style, and so perceived as comfortable by the foreign employees of MNCs. The development of such a culture in Bangalore is attributed to the relatively long period of direct rule by the British through the establishment of their Residency and Cantonment in the city, as against the indirect rule by the British through tributaries in many other regions.

Early introduction of science and technology-based industries and institutions and the 'modern' transport, communication, electric supply and healthcare infrastructure put in place by the British rulers. The city also witnessed the rare phenomenon of British and US professionals working with local entrepreneurs to found the

Indian Institute of Science in 1909, to develop innovative weaponry—the mine-clearance device called the Bangalore Torpedo—in 1912, and to provide repair and maintenance support to aircraft from the US '84th Air Depot' maintained in Bangalore by the US Air Force during the Second World War.

The Government of India's initiatives in the post-Independence period (1950s and 1960s) to set up high-tech strategic industries and institutions in Bangalore. These initiatives focused on Bangalore because of the city's 'interior' location away from the national boundaries and the political closeness of the State and Central governments. Initiatives in the areas of defence, space, aeronautics and electronics attracted high-quality technically qualified manpower to Bangalore from all over India and beyond.

Promotional schemes for the IT industry introduced by the Government of India during the 1970s and 1980s. Bangalore received a larger share of these because of the high-tech industries and institutions already in place there.

Special schemes of the Government of Karnataka to attract the IT industry to the state. These included: Entry tax exemption for IT equipment; power-tariff concessions; quick clearances by the Pollution Control Board for captive diesel generation sets to ensure uninterrupted power supplies for IT operations; concessions on registration charges, etc. (Karnataka was the first state in India to announce its IT Policy, which it did in 1997 within about 6 years of India's economic liberalization, and it launched its 'Millennium BPO Policy' at the India Business Roundtable in New York in 2002.[4]

Last, but not the least, the moderate weather of Bangalore. A temperature ranging between 13°C and 33°C in the 1970s and 1980s (although it has risen on average by a few degrees since) made it more comfortable, especially for foreign nationals.

9 'Negative Push' for the Positively Inclined

Among all of the above factors, it is customary for researchers to mention the 'low-cost labour' as the critical one that helped the development of IT industry in Bangalore. While this was a necessary condition, it was apparently not sufficient, as such labour was available in plenty in many other cities and towns in India and elsewhere. Even the combination of these factors may not provide a complete explanation, because it seems they were not able to produce any new technologies or substantive innovations in the pre-IT era. The movement of the IT industry to clusters outside its countries of origin is largely due to the 'negative push' at the origins. With the growth of the IT industry, there was a substantial increase in demand for trained professionals, and in the short-term the rate of supply could not be increased at the same pace. The resultant shortage of professionals pushed up salaries, and it

[4] BPO – business process outsourcing.

was natural for the industry to look for cheaper locations where qualified professionals were available at lower salaries.

For an industry like IT, such a move is not difficult, provided there is a data transfer facility from the new location to the parent company. So, when Texas Instruments (TI)—the first foreign IT company to set up shop in India—was considering the offshore options in India during the early 1980s, Bangalore was not initially on its list, because the city did not then have a data transfer facility. TI's options were limited to Delhi and Mumbai (formerly Bombay), each of which had data transfer connectivity as well as an international airport, two factors that TI considered critical for its operation from India. Later, when the company did move to Bangalore in 1984, it realized more acutely that the transport and communication infrastructure was not a major strength of Bangalore; the company was obliged to transport office equipment to its Miller's Road office in a bullock cart![5]

If Bangalore could not provide the critical resources that TI needed for its operation, why did the company move to Bangalore? If its move from the USA to India was due to a series of 'negative pushes' in its home country, similar negative pushes from the more eligible cities of India brought it to Bangalore. The costs of real estate in Delhi and Mumbai were as high as those in the USA. While the New Bombay area was relatively affordable, there were militant nationalist groups in Mumbai who resisted the entry of foreign companies. When the search for a location in India was almost at a dead end, a TI employee who had a Bangalore connection through IISc (his alma mater) suggested Bangalore as a possible choice, and his suggestion was accepted in spite of the city's 'deficiencies' in terms of international connectivity.

The much-needed data transfer facility was made available to TI only in 1989, 5 years after its arrival in Bangalore, and the Bangalore International Airport was not commissioned until 2008. The main problem in creating the data transfer facility was the need for a policy change at the level of the national government, which at that time did not permit private operators to have or provide such links; it was the monopoly of the government company Videsh Sanchar Nigam Limited (VSNL). These and many other issues were, however, gradually sorted out, not only for TI but also for many other companies that followed suit. Many Indian entrepreneurs and corporate organizations also moved to Bangalore and collectively they developed the entrepreneurial ecosystem that has now become a part of the virtuous cycle of entrepreneurs creating/attracting the ecosystem and the ecosystem then attracting further entrepreneurs to the region. Since most studies on clusters are carried out after the cluster is well developed, it is perhaps only natural for researchers to conclude that the ecosystem is responsible for developing entrepreneurship in a region. However, longitudinal analyses of clusters would show that the process is often reversed, and that entrepreneurs are instrumental in bringing about the ecosystem.[6]

The negative push is not within the control of the beneficiary region; it happens outside that region, and may even bypass a particular region. If and when the negative push happens, the recipient region should be prepared and should have the

[5] See: https://en.wikipedia.org/wiki/Software_industry_in_Karnataka.

[6] A longitudinal analysis of the development of the Bangalore ICT Cluster is available elsewhere—see Manimala (2008)

capability to take advantage of it. Bangalore did have such preparation, as a result (as described above) of several centuries of intercultural interaction. Paraphrasing the famous words of Louis Pasteur, 'Fortune favours the prepared mind', one could say that IT clusters flourish on prepared ground, and Bangalore had prepared the ground.

10 Development Through Intercultural Interaction

A fundamental proposition that emerges from this analysis of regional development is that the development of regional capabilities is primarily a function of intercultural interaction, which happens not only through the arrival of outsiders in a region but also through the people of the region going beyond it. Such interaction can be positive (trade, tourism, education, etc.) or negative (invasion, colonization, etc.). The prevalence of 'aspirationalism' in the material world is easily understood. People of a particular level of affluence will hardly think of the thousands of people below their level, but will start worrying about moving up when they observe even one other individual with a higher standard of life. While culture is often associated with rigidities (such that it is almost impossible to change it in the short run), 'cultural aspirationalism' is a fact of life in the long run, and cultures do change by adopting the better features of other interacting cultures. In fact, it may not be wrong to state that all developments happen because of intercultural interaction. The reason for the underdeveloped state of isolated tribes is not hard to find. The rigidities and aspirationalism of cultures may be compared to the centripetal and centrifugal forces in physics, although with the difference that in the circular physical motion the real force, which will be the ultimate winner, is centripetal, whereas in cultural movements aspirationalism (equivalent to the centrifugal force) is a periodic winner and thereby manages to enhance the circle by including many desirable features from other cultures.

Even a superficial examination of the developed regions of a country would show that the more developed areas are those that are in contact with people of other regions/countries. It is strange but true that the developmental impact can be positive in the long run even if the interaction is of a 'negative' type, as in the case of invasion and colonization. As an example, one could examine the developmental history of India. In ancient India, the better developed regions were the places on the borders, especially on the sea coast where there were contacts from traders and other visitors from abroad and on the main travel routes within the country, whereas the interior places remained underdeveloped. Modern development started in India in the places occupied by the British, such as Calcutta (now Kolkata), Madras (Chennai), Bombay (Mumbai) and Delhi. In fact, the city of Bombay would not have been in existence today but for the work done by the British in dredging the sea and connecting the seven fishing villages near the western coast of India to make a harbour in between these islands and the mainland. It is worth mentioning here that the first rail link in India was made by the British in 1852 on this strip of land, connecting it with Thane on the mainland (mainly for moving goods to and from the

harbour), which they later expanded to the whole country, thus facilitating greater movement of people and goods within the country, which resulted in further interaction and development; and Bangalore, too, was a beneficiary of this rail network.

Similarly, there is the case of English-language education in India, which was introduced by the British (through its champion, Thomas Macaulay) in 1835 as an instrument of 'cultural colonization' (to develop loyal servants for the British administration). It was not perceived to be in the best interest of the country, because it was intended to replace the indigenous education through the medium of Indian languages. However, in later years, knowledge of English by India's educated workforce became a major reason for the arrival of IT companies in the country (resulting in the development of the Bangalore ICT cluster), and for the capability of Indian IT companies to do business more easily with Western and other international (English-speaking) clients.

In this context, it is interesting to note that the English language is also a product of an invasion. It was born in the fifth century CE by the hybridization of the Celtic and Germanic languages, when the Germanic tribes invaded the Celtic settlements of the British Isles. This hybrid language was subsequently enriched by the French invasions, and finally it overtook the invaders themselves as the 'lingua franca'. The story of the kingdom is similar to that of the language. The British monarchy traces its ancestry to William the Conqueror, who came from the province of Brittany in France, and the name of the island kingdom (Great Britain) can be traced to the province of the conqueror (Brittany).

These examples may appear unrelated to the Bangalore story, but they are offered here to illustrate the critical role of intercultural interaction in bringing about development through a process of cultural aspirationalism. Returning to Indian history, India has been invaded more than 50 times by various groups, and all of these invasions happened through the Khyber and Bolan passes in the North-West. In comparison, the North-East of India has had a relatively peaceful existence, with hardly any invasions. However, in terms of development, the North-West is far more advanced than the North-East. While there are many more such examples to illustrate the critical role played by intercultural interaction—positive or negative—in developing the human capital of a region and thereby bringing about economic and social development, suffice it here to reinforce this hypothesis with the story of Bangalore.

One reason why I have provided a brief chronological narrative of the development of Bangalore as a modern city, starting with its early history, is to demonstrate the diversity of cultural groups that have moved into the region at various periods and helped to weave a multicultural web. Until India's Independence, the region was never ruled by 'local' chieftains, except for a brief period of 101 years from 1537 to 1638. It was periodically occupied by the Gangas, the Cholas, the Hoysalas, the Vijayanagara Empire, the Wodeyars (whose origins are traced to the 'Yadavas' of Dwaraka in Gujarat and who started ruling the area in 1399 as feudatories of Vijayanagara), the Bijapur Sultans, the Moghuls, the Marathas, Hyder Ali and his son Tippu, and the British. During the period until India's Independence in 1947, the region that included Bangalore was subjected to several invasions, occupations

and colonization, and was ruled by more than ten different 'foreign' groups (most of which may be classified as 'negative' interactions).

These rulers brought their chieftains, soldiers, associates, assistants, craftsmen and labourers with them, all of whom contributed to the diversity of the available human capabilities. They also vied with one another to create institutions and infrastructural facilities, which directly or indirectly contributed to the future development of the region. One such institution that may be mentioned in the context of the ICT cluster in Bangalore is the Indian Institute of Science, which was created in 1909 through a collaboration of three 'outsiders': the entrepreneur JN Tata who hailed from Navsari in Gujarat and belonged to a community (Parsee) that migrated to India from Iran over 1000 years ago; the Maharaja of Mysore (Wodeyar), whose ancestors were also from Gujarat (Dwaraka); and the British (represented by two viceroys, Lord Curzon and Lord Minto), who provided the legal and academic support to the new institute, for which the British Nobel Laureate William Ramsay (of noble gases fame) suggested Bangalore as the location because he had once stayed there, and Morris Travers, Ramsay's research-collaborator, who became the first director. A small but relevant additional fact is that it was an alumnus of this institute who gave the critical 'positive push' in favour of Bangalore to Texas Instruments, which was drifting around in India under the negative pushes from the USA and two Indian cities. It may be a strange coincidence that a foreigner recommended Bangalore as the location for the institute, and 75 years later an alumnus of that institute recommended the same city to a foreign company as the location for its offshore facility. Both of these, however, are instances of development through intercultural interaction.

The post-Independence period in India offered many 'positive pushes' to Bangalore. The capital of the region (Karnataka State) was shifted from Mysore to Bangalore because of the facilities already created there by the successive rulers, especially by the British. This newly acquired status helped the city to be perceived as an alternative to Madras in the south for locating the facilities allocated to the south by the Central Government. Apart from the policy of diversifying the facilities to different places, there was another kind of negative push in favour of Bangalore, which was the fact that the same political party was in power in both Karnataka and the Centre, whereas in Madras it was a different political party that ran the government. Besides, there was an added advantage to Bangalore; it was located away from the national borders and was therefore considered suitable for locating strategic industries in the areas of defence, space and aeronautics, especially the R&D institutions in these and other areas. Thus Bangalore became the preferred location for several central public-sector companies and Central Government institutions of strategic importance as well as for R&D institutions in new and high-tech areas. While the direct benefits expected to arise from these companies and institutions were the developmental work done and the foreign collaborators working with them, they did contribute to the human capital development of the city by bringing the best brains from all over the country through the PSUs' nationwide recruitment based on educational qualifications, competencies and achievements.

The within-country movement of people to Bangalore was also helped by the fact that the city is located on the border of Karnataka State. The state of Tamil Nadu

is about an hour by road to the south-east; Andhra Pradesh is about 2 h to the north-east; and Kerala is about 6 h to the south-west. People from these three states, especially Tamil Nadu and Andhra Pradesh, used to move to Bangalore in large numbers, thereby contributing to its cultural diversity. Many Tamil-speaking people moved to Bangalore, especially during the British rule, because the southern headquarters of the British (Madras) was in Tamil Nadu. In fact, some of the old settlements in the inner-city areas (e.g., Kalasipalaya*m*, the market area, and Malleshwara*m*, where IISc is located) have place-names with non-Kannada endings, probably suggesting that they were originally settlements of Tamil people. Similarly, the inner-city area called 'Shivajinagar' suggests the influence of the Marathas. It was the periodic movement of people from the neighbouring regions, from the rest of the country and from other countries, which helped the human capital development of Bangalore, which in turn prepared it for hosting the IT industry from abroad, when it was experiencing a negative push from its country of origin.

11 The Crystal Growth Model of Cluster Development

I suggested elsewhere (Manimala 2008) that the process of cluster development was very similar to the chemical process of crystal formation and growth. The first crystal is formed in a concentrated solution (prepared by adding the solute under progressive increases of the solvent temperature) when there is a sudden drop in the temperature in the external environment. Once a crystal is formed, it has a tendency to grow by attracting the same solute material from the environment to itself.

The process of cluster development is, I contend, somewhat similar to this chemical process of crystal growth. The preparation of the 'solution' may take a while, and the process is that of integrating diverse types of human capabilities into the region through a flexible and accommodative system of intercultural interaction. (Even when the process of intercultural interaction turns out to be aggressive and negative, it may produce beneficial effects in the long run, either by strengthening the competencies of the existing system or by integrating the special competencies of the 'aggressor' into the existing system). When the human capabilities of a region are sufficiently diversified and developed, changes in the external environment may precipitate a new entity (often by negative pushes) into the region, which it has the capability to accept, adapt and develop further. While the entry of the new entity often depends on a single dominant factor, its survival and growth both depend largely on the availability of the other essential elements of the ecosystem or the internal or external capability to create such an ecosystem as and when required. Perceiving the synergies available with the capabilities of the existing entity and the support and facilitation provided by the progressively improving ecosystem, new entities flock around, triggering the process of cluster development.

While a new arrival to the region is initially welcomed by those already there and by the ecosystem because of the synergies it offers, such a welcoming situation is unlikely to go on forever. Too many players in the region will increase the competi-

tion for resources and will thereby increase costs, which will then act as a negative push in favour of other regions. In other words, clusters will experience 'attrition' in the long run either because of the shifting of activities to other regions or because of changes in the technology or in any of the critical dimensions of the ecosystem. One example of a cluster that has gone through the attrition stage is the textile cluster of Manchester in the UK. Similarly, the automobile cluster of Detroit in the USA is at the declining stage.[7]

The model of clustering described above may be summarized as a four-stage process consisting of: (1) incubation, (2) nucleation, (3) agglomeration and (4) attrition (Manimala 2008). Of these, the longest and the most complex is the incubation period which, in the case of Bangalore, lasted for several centuries. The main process involved in this stage is the development of the human capabilities of the region through intercultural interaction. Nucleation, for the Bangalore ICT cluster, happened when Texas Instruments and a few other foreign companies moved some of their operations to Bangalore, which was also a process of intercultural interaction. In the third stage, agglomeration, there is a flourish of entrepreneurship—an entrepreneurial renaissance—which also occurs through intercultural interaction, as small and large entrepreneurs come—as in the example of Bangalore, from all over India and abroad—and do business with one another as well as with firms outside the cluster, both within and outside the country. Bangalore is currently in the agglomeration stage and at its entrepreneurial peak, although there are occasional signs of 'attrition' trends, as indicated by firms moving out or an entrepreneur deciding to go elsewhere because of factors such as cost and competition. However, these instances are few and far between, and the attrition stage for the Bangalore ICT cluster seems still to be quite far off. Even if the cluster suffers this fate in the distant future, entrepreneurship will continue to thrive in the city through a process of flexible recycling of resources (Bahrami and Evans, 1995), supported by the human capabilities that are being continuously developed through ongoing intercultural interaction.

Appendix 1

Chronology of selected major events in the development of Bangalore, with a special focus on entrepreneurial, industrial and technological (especially IT) initiatives[8]

Year(s)	Events
Second–sixteenth century CE	The region containing the Bangalore area was under the rule of various dynasties: Ganga, Maurya, Chola, Hoysala and Vijayanagara

(continued)

[7] It is somewhat ironic that Osaka in Japan is known as the 'Manchester of Japan' and Ahmedabad in India as the 'Manchester of India' because of their textile clusters, when there are no longer any textile mills in Manchester, England!

[8] A more elaborate chronology of the history of Bangalore is available in an earlier version of this paper.

Appendix 1 (continued)

Year(s)	Events
1537	Kempe Gowda I (Yelahanka's ruler under Vijayanagara King, Achuta Devaraya, whose capital was Hampi in northern Karnataka) designed and built a mud fort with the King's support; within the fort there were two streets (East–West and North–South) and four 'petes' (markets). Kempe Gowda II (grandson of Kempe Gowda I) later built the four watch-towers in the four corners of the town, and a few lakes and temples
1638–1799	Under the rule of: Bijapur Sultan, Marathas, Moghuls, Wodeyars, Hyder Ali and Tipu Sultan, and the British.
1806	The British set up their cantonment in the Ulsoor area of Bangalore (shifting it from Srirangapatna because of the rampant malarial epidemic there), which started the development of Bangalore as a modern city. (With the military settlement of the British came educational institutions, roads, railway lines, water supply, sewage system, hospitals, telephone and electricity supply)
1864	First train from Bangalore ('Bangalore Mail') rolled out on a metre-gauge line from Bangalore Cantonment to Jolarpettai on the Bombay–Madras line
1882	The Whitefield Farm was developed for the Eurasian and Anglo-Indian community in the suburbs of Bangalore by David White. It later became the location for the International Technology Park Ltd. (ITPL)
1898–1905	Bangalore gets telephone, hospital, motor car and electricity
1909	Indian Institute of Science (IISc) was built with an endowment from Sir Jamshetji Tata. The location was suggested by Nobel Laureate William Ramsay who had stayed in Bangalore earlier, and the land (372 acres, ~150 ha) was donated by the Maharaja of Mysore
1912	The 'Bangalore Torpedo' (a mine-clearing device) was developed in Bangalore by Captain McClintock of the British Indian Army unit (headquartered at Madras)
1940	First flight departed from Bangalore (to Bombay), operated by Hindustan Aircraft Ltd. (HAL), which was set up in Bangalore by the managing agency Walchand-Tulsidas-Khatau Ltd. under the patronage and investment support of the Maharaja of Mysore and with technical support from the International Aircraft Corporation of New York
1947	India's Independence; Bangalore was chosen as the capital of the newly formed Mysore State (later renamed as Karnataka state)
1950–1980	Government of India established various public-sector companies and educational institutions of a strategic and technical nature in Bangalore
1978	Electronics City (an industrial park divided into three phases and spread over more than 330 acres of land) was created in the south-east suburb of Bangalore by Keonics (Karnataka Electronics), Govt of Karnataka
1983	Infosys Limited (now India's second largest IT Services company after TCS) shifted its headquarters from Pune to Bangalore
1984	Texas Instruments became the first IT MNC to establish a unit in Bangalore, which kick-started the 'IT Entrepreneurial Revolution' in Bangalore
1984	Government of India approved the setting up of a National Supercomputer Centre at the Indian Institute of Science, Bangalore, with a grant of Rs. 500 million
1990	The first Internet service in Bangalore was provided by STPI (Software Technology Parks of India), which was then restricted to corporate organizations

(continued)

Year(s)	Events
1993	The Motorola (India) Software Team (located in Bagmane Tech Park, Bangalore) became the first team in the world to attain the Software Engineering Institute's (SEI) Capability Maturity Model (CMM) Level-5 certification
1994	The International Technology Park Limited (ITPL) was set up near Whitefield in Bangalore as a joint venture of the Governments of India and Singapore
1996	WIPRO, a diversified company, with a major portfolio in the IT hardware and software/services businesses (the third largest IT company in India after TCS and Infosys), shifted its registered office from Mumbai to Bangalore
1998	Tata Consultancy Services (TCS) Ltd., established in 1968 with its registered office in Mumbai, started setting up offices (currently 16 of them) in Bangalore. TCS is the largest IT services company in India (tenth largest in the world) with more than 300,000 employees and operations in more than 40 countries
1998	At the Bangalore-IT.Com 1998 Conference, the then Prime Minister of India, Shri A.B. Vajpayee, made a prophetic declaration that 'IT is India's tomorrow'
1999	International Institute of Information Technology-Bangalore (IIIT-B) was established in Electronics City, Bangalore
2000	HP Global set up BPO in Bangalore
2001	Dell set up its R&D Centre in Bangalore
2003	Yahoo set up its first R&D Centre outside the USA in Bangalore
2004	Google set up its first R&D Centre outside the USA in Bangalore
2006	CISCO established its 'Globalization Centre East' in Bangalore
2008	Accenture opened Technology Lab in Bangalore (its fourth in the world after two in the USA and one in France)
2009	SAP's third CoInnovation Lab (COIL) was set up in Bangalore (the first two labs being in Palo Alto, USA, and Tokyo, Japan)
2014	The first free Wi-Fi service in India (Namma Wifi) started operating in the central areas of Bangalore; the service is operated by D-VoiS and is paid for by the Karnataka Government

Source: Compiled from various websites (see References Section: Sources for Bangalore's history).

Appendix 2

Institutions and facilities created by the British after 1799 having a positive effect on the entrepreneurial and technological development of Bangalore (chronological order)

- General Post Office (1800)
- St Mark's Cathedral (1808)
- The Bangalore Cantonment together with its roads, residences, industries and educational institutions (1809)
- A printing press (1840)
- The railway line and trains (1864)
- Bangalore Palace and the Palace Gardens (1864–1884)

- An administrative building for 18 departments, called Attara Kacheri, built in 1867 and currently housing the Karnataka High Court
- Cubbon Park (1870)
- The Whitefield settlement, established in 1882, which today is a hub of technology parks housing high-tech multinational corporations (MNCs)
- Binny Mills (1884), which (though closed down in 1996) laid the foundations for Bangalore's garment cluster (the largest in India)
- The telephone (1898)
- The Victoria Hospital (1900)
- The motor car (1903)
- Connection of electricity supply (1905)—the second in India after Calcutta
- The Indian Institute of Science (1909)
- The 'Bangalore Torpedo', a mine-clearing device, designed and manufactured in Bangalore by Captain McClintock of the British Indian Army unit in Madras (1912)
- Hindustan Aircraft Limited (HAL) and the first flight from Bangalore to Bombay (1940) in collaboration with private entrepreneurs; HAL developed as a major overhaul and repair facility for the US Airforce (1942–1945)
- The City Improvement Trust formed for developing and improving Bangalore (1945)

Appendix 3

National Task Force on Information Technology and Software Development (1998): 20 major recommendations[9]

1. Provision of high bandwidth communication links to IT industries.
2. Zero licence fees to start Internet services.
3. Removal of the monopoly of VSNL (a public-sector company) to provide international gateways for the Internet.
4. Allowing private Software Technology Parks to provide infrastructure to small and medium-sized IT companies.
5. Allowing Public Call Offices to provide Internet services to the public in addition to telecommunication services.
6. Expanding the definition of IT to include IT enabled services (ITeS) and BPO besides software development.
7. Eliminating import duty on disks, displays and many other items.
8. Eliminating import duty on capital goods used to manufacture IT products.
9. Freeing software companies from inspection by numerous government and local body inspectors, such as boiler, excise, labour, environment/pollution control inspectors, a source of irritation and corruption (realizing their irrelevance to the IT industry).

[9] Adapted from Rajaraman (2012).

10. Enabling state-controlled banks to provide venture capital to IT industries without collateral.
11. Requiring nationalized banks to provide working capital requirements to the IT industry on concessional terms, treating them as priority industry.
12. Allowing 'sweat equity' and 'employees' stock option plans', which were alien to other industries in India. (This required change in company laws.)
13. Easing the use of foreign exchange earned by software companies for business purposes without getting prior approval from the Reserve Bank of India.
14. Providing government subsidies for IT companies to participate in international trade shows.
15. Setting up a National Council on IT education to improve education standards and to create a pool of good educators.
16. Setting up one Indian Institute of Information Technology (IIIT) in each state to increase the availability of pools of IT-trained human resources.
17. Providing Internet connectivity to all universities, colleges, hospitals and selected high schools.
18. Stipulating IT literacy as an essential requirement for all future jobs in the government and providing training for existing staff in government departments.
19. Framing of a national policy on information security, privacy and data protection.
20. Enactment of cyber laws by Parliament.

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Chapter 4
Tel Aviv: A Renaissance Revival in the Making

Edna Pasher, Guy Pross, Uri Kushnir, and Yarden Neeman

1 Tel Aviv: The Spring

Tel Aviv was established in 1909 by a Jewish group from Jaffa who gathered to form the 'Ahuzat Bayit' (literally 'Homestead') society. The society's goal was to form a 'Hebrew urban centre', inspired by Western cities, outside Jaffa's walls. 'Tel Aviv' is the Hebrew title of Theodor Herzl's Altneuland ('Old New Land') translated from the German. The name was chosen in 1910 from several suggestions: it was thought fitting as it embraced the idea of a renaissance in the ancient Jewish homeland. 'Tel' is a man-made mountain accumulating layers of civilization built one over the other and symbolizing the ancient; and 'Aviv' is Hebrew for 'spring', symbolizing renewal. Thus in its name Tel Aviv evokes the renaissance of the Jewish people in their historical homeland. It is the first Hebrew city in the new age.

Tel Aviv embodies the essence of renaissance, from its beginning until the present day. Its progress has been driven by different waves of *aliyha* (Hebrew for 'moving up', and used in the context of immigration from across the world to the Holy Land). Each wave has brought to the city new ideas which have influenced its development. The most important of these waves was the fifth: one-third of immigrants came from Germany and they brought with them Bauhaus architecture, a style of building that led to UNESCO's designation of Tel Aviv as the 'White City', because it has the world's largest concentration of Bauhaus buildings. In its *World Heritage List*, UNESCO describes it as follows:

> The White City of Tel Aviv can be seen as an outstanding example in a large scale of the innovative town-planning ideas of the first part of the twentieth century. The architecture is a synthetic representation of some of the most significant trends of Modern Movement in architecture, as it developed in Europe. The White City is also an outstanding example of

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> the implementation of these trends taking into account local cultural traditions and climatic conditions. (http://whc.unesco.org/en/list/1096)

The White City is based on an urban master plan drawn up by Sir Patrick Geddes and reflects his pioneering insight 'into the nature of the city as an organism constantly changing in time and space' (http://whc.unesco.org/en/list/1096). These extracts from UNESCO's description of the city indicate how innovation has been and continues to be an important part of Tel Aviv's DNA.

Over the years Tel Aviv has made a significant effort to preserve its heritage and to date is obligated to preserve all the 2000 buildings that are part of the White City. The city is also working on the preservation of several neighbourhoods, including Neve Tsedek, Old Jaffa and Sarona. This policy embraces the spirit of urban renewal which in itself represents a Tel Aviv renaissance, as it cultivates the past and looks to the future through the creation of new modern neighbourhoods based on refurbished remnants of the past. It is exactly this co-existence of past and present that enables Tel Aviv entrepreneurs to build their creations on a heritage of 3000 years and to develop a reality unique to the city.

2 In Tel Aviv, Questions Are More Important Than Answers

Challenging and questioning the status quo is the key to constant improvement. Without this sense of enquiry, innovation is not possible. However, asking the right questions is not a simple task. Since ancient times we have evolved and developed through observation and enquiry—indeed, this approach is the very basis of modern science and why enquiry is the first step towards progress and innovation.

The Haggada is one of the oldest, most famous texts in Jewish culture. It is read during the Passover *seder* (the holiday feast) as a fulfilment of the Scriptural commandment to each Jew to 'tell your son' the story of liberation from Egyptian slavery. In one chapter of the Haggada, there are 'The Four Sons': one wise, one wicked, one simple and one who does not know how to ask questions. The last son is notable because in Judaism questions are more important than answers; it is more important to ask than to answer. In the Talmud, another important text, there are questions and answers rather than stories and tales. The emphasis is on debate—hence the joke that for every two Jewish people you will find three opinions. Behind the joke is the fact that in Judaism the spirit of debate is a central social theme. There is an anecdote about a President of Israel telling a President of the USA that, while the latter was President of 240 million citizens, he was President of five million presidents. The anecdote is telling and relates to the complex set of opinions held by every Israeli, which creates a unique blend of curiosity, discussion and debate.

In the complex post-modern world there are no right answers, there is no one truth. We live in an uncertain environment subject to rapid changes which force us to adjust. The Jewish culture is known for its patience in the face of uncertainty and opacity; this culture was not developed from nothing. Since ancient times, the

Jewish people have lived under constant threat and Israel remains under threat even though it is today an independent state. This has led to a way of life based on survival and adaptation: to survive and prosper in an unstable geopolitical environment, creativity, innovation, flexibility, awareness and initiative are required. Today, these are all part of the Jewish way of life.

The resettlement of Palestine by Jewish settlers began in the nineteenth century. There were six major waves of *aliyha* (described above) before the establishment of the state of Israel. After that, there were several more waves. The decision to leave what was for many a comfortable way of life in Europe and to emigrate to Palestine was not an easy one. One reason so many decided to do so was the realization that Europe was no longer a safe place for Jews: those who had the courage to take the risk were saved from the eventual Holocaust of World War Two. These pioneers can be regarded as an early version of entrepreneurs and this immigration was one of the main motives for the establishment of the state of Israel. Many consider it as a renaissance of the Jewish people in their historical homeland.

As Weiner (2016) notes, the Renaissance in Florence blossomed only a few decades after the Black Death had decimated the city, and is partly attributable to that catastrophe: 'Horrible as it was, the plague shook up the rigid social order, and that new fluidity led directly to artistic and intellectual revolution' (Weiner 2016). Like Florence in the fourteenth century, Israel in general and Tel Aviv in particular were built on the ashes of the Holocaust. Fear of another Holocaust was the key incentive for building a strong and prosperous country, but the process of building Israel as a country was a long one. Each wave of *aliyha* brought different people from different parts of the world, and once they came they started to innovate, bringing with them new ideas. The mix of old inhabitants and new immigrants resulted in an innovative and advanced society.

Tel Aviv was the first Hebrew city, and most of the immigrants entered through the port of Jaffa. As a result, the first Hebrew school and the first Hebrew theatre were founded in Tel Aviv, positioning it as the most advanced city in the country and ultimately as a city of pioneers.

3 Tel Aviv Education: A Breeding Ground for a Citywide Innovation Renaissance

Tel Aviv has a long educational tradition. It is home to the first Hebrew high school in the world (Herzliya Hebrew Gymnasium) and it also has the largest research university in Israel (Tel Aviv University). Overall, the city has 163 schools in which 54,000 pupils are studying. In 2015 it scored 68 out of 100 in the Maytsav test, a national educational test that measures the quality of schools and provides their principals with an objective set of pedagogic data that helps them to improve performance.

Back in the 1980s Tel Aviv suffered from a decline in the number of students due to the aging of the city's population. Through the development of a comprehensive strategic plan, the city attempted to overcome this trend. To formulate the plan, it gathered together specialists from a wide spectrum (Dr. Edna Pasher, one of the authors of this chapter, was a member of the panel that focused on educational factors). The plan was successful and the city now enjoys immigration that includes many young families.

Tel Aviv University (TAU) is the most important educational institution in the city. Founded in 1956, it has 125 schools and departments covering the sciences, humanities and arts, Israel's largest biomedical research complex, and 130 research centres. Recent independent surveys have shown that TAU leads the nation in the popularity and prestige of its study programmes, and in the psychometric test scores of applicants in the toughest fields. TAU is ranked first in Israel for the number and impact of research publications, and it is also highly evaluated in international university rankings, located at 151–200 in the 2016 Shanghai Ranking (THE 2016a); 201–250 in the *Times Higher Education* World Universities Ranking for 2016–2017 (THE 2016b); and 212 in the QS World Universities Ranking for 2016–2017 (QS 2016).

Building on these strengths, Tel Aviv University has targeted three areas for further growth: interdisciplinary research, international scope and interactive community ties. These are outstanding examples of how TAU has embodied the renaissance spirit, showing the revival of education.

Interdisciplinary research is a core value of the academic culture. The breadth of expertise—combined with the university's location in Tel Aviv, nerve centre of Israeli industry, business and culture—creates ideal conditions for cross-disciplinary research programmes. This approach resonates with one of the best-known features of the Renaissance era, when prominent figures mastered several fields of knowledge, such as painting, sculpture, engineering, philosophy, and so on.

The university's international scope is reflected in the extent of its academic collaboration. TAU has links with the world's leading research institutions, ranging from the NIH (the US National Institutes of Health), NASA and Harvard University to CERN and the Sorbonne. This cooperation with other major institutions enables innovation to flourish, as during the Renaissance innovative ideas came to life through an exchange of knowledge between original and creative minds.

With its focus on interactive community ties, TAU is committed to staying responsive to the needs of its students and the community at large. The university is leading a nationwide revolution in the perception of—and accessibility to—university studies. Through its many scholarship programmes, it brings disadvantaged, minority, new immigrant and periphery youth to the academy, provides them with mentors and financial aid, and offers them every chance to succeed and inspire others. TAU is a prime example of an institution that involves the community in academia and does not exclude one from the other.

In order to stay relevant, one must be flexible and able to adjust to rapid change, and so the educational system must embrace new ways of teaching. Tel Aviv is currently leading the way in online teaching, specifically through online classes.

Tel Aviv's plan is to make the education system more digital, and to achieve this end the city is investing in new methods of teaching using modern technology.

In addition to these efforts there is an additional factor that helps us distinguish Tel Aviv as an educational renaissance city from other similar global innovation and educational leaders. This factor goes beyond the development of the required institutions and resources and is to be found in the fabric of Israeli society, woven over thousands of years as part of a national Jewish way of life.

In fact, when further comparing TAU with other international institutions of the same scale, its key distinguishing characteristic is ultimately attributable to the human factor of students and teachers. Specifically building on the cultural notion mentioned earlier, that questions are more important than answers in Jewish society, students at TAU are driven to a deeper level of enquiry: it is typical for Israeli students never to be satisfied with the 'textbook' explanation or the lecture notes, and there is often more discussion and questioning than might be the case in other cultures.

Interestingly, the educational renaissance is more pupil-driven than teacher-driven. Because the students have grown up with such a strong history of challenging and questioning authority, a unique environment for learning has emerged—in fact, it constitutes a learning paradigm shift that makes institutions like TAU stand out.

In his inspirational bestseller *Good to Great*, Collins (2001: 42) suggested that a 'Great vision without great people is irrelevant', and it could be said such institutions as TAU are built on this premise, with a foundation of teachers who look to inspire rather than teach and students who look to understand rather than learn. It is this educational foundation that creates a breeding ground for innovation in every area of life.

4 A Legacy of Winning Against All Odds Makes the Tel Aviv Story a Miracle of Modern History

Discussion of Tel Aviv's historical context provides an illuminating perspective on how this seemingly new city is actually built on a heritage of 3000 years and a past crowded with famous battles—in fact, this was the site of one of the very few battles in which Napoleon Bonaparte's army was unsuccessful.

What, then, is the link between the ancient history of this area and modern Tel Aviv, a city founded as recently as 1909? To answer this question, we must look at Tel Aviv in the context of its people, previously described in this chapter as pioneers who built the city from scratch in what was originally a combination of sand dunes and swamps just south of the port of Jaffa. In fact, the story of Tel Aviv is in many ways the story of modern Israel and of the Jewish people in their struggle for a motherland.

In many senses, Tel Aviv emerges from a cultural narrative of 'winning against all odds'—a narrative that has its roots in the conflict between David and Goliath, in which the unlikely becomes a reality and this reality is the foundation of a nation. In today's context, many Israelis see themselves as the Davids of the world, looking to take on global giants with the dream of following in the footsteps of their historical forebears and achieving victory against all odds.

This cultural background is perhaps the key explanation for the speed of development and the success of the city of Tel Aviv as the centre of Israel's economy. Considering its short history, its lack of resources and the regional tensions it faces, it indeed seems like a modern-day miracle that Israel has built a leading economy that has ranked highly in world competitiveness ratings (see, for example, IMD 2016; WEF 2016). Furthermore, Israel has the largest density of start-up ventures per capita—second only to Silicon Valley in the total number of start-ups—and many of them have been in Tel Aviv.

As the centre of Israel's business community, Tel Aviv was ranked the second best innovation ecosystem globally by the Startup Ecosystem Report (2012). The city's problem-solving orientation is built on an immigrant society with a high tolerance for failure and is backed by the Government of Israel, which supports technology generation with some of the world's most aggressive incubation policies. In the 1980s the government developed a unique support structure for start-ups that provides an 85% capital injection into new ventures, making it a centre for ideation and the incubation of technology.

One other important aspect of Tel Aviv's success has been the Israeli military. Very much like its people, the Israeli military has built a reputation based on its David versus Goliath victories against larger armies. The need to survive has created one of the most advanced armed forces in the world. In addition to its tactical and strategic strengths, the Israeli military has the ability to create breakthrough innovations to outsmart enemies. The challenge for the Israeli army was to create a structure that would enable flexible and creative thinking built, nevertheless and paradoxically, on a rigid and robust military platform. Every year many army engineers complete their military service and move to Israel's technology sector to innovate and create new civilian ideas and inventions.

5 Tel Aviv's Smart City Evolution as a Twenty-First Century Renaissance

Its particular history, economy and background take the Tel Aviv context beyond that of an Israeli city looking to become modern and domestically successful: the city's aspirations are international and the thinking is global. Tel Aviv's start-ups are targeting global players, investors are coming to see and learn about its ecosystem, and innovation is thriving.

When a Tel Aviv developer looks to solve a problem or create an invention, the mindset is always global. It is clear that the Israeli market cannot provide scale, and so it has become a Beta-site of experiments and ideas. This is illustrated by the recent development of Tel Aviv's digital engagement platform, 'Digitel'. While Digitel was built for Tel Aviv, a city of about 400,000 people, it was developed as a robust platform that could be scaled to fit the world's largest cities. The aim was to develop a system that would be more advanced and complex than any other city engagement tool in the world—and consequently Tel Aviv won the World's Smartest City Award for its 'Digitel' programme at the Barcelona Smart City Expo in 2014 (see Morag 2014).

This type of global thinking is only further stimulated by the success stories it generates. The success of WAZE, the Israeli company that took on the challenge of reducing the global pain of traffic by creating a crowdsourced traffic solution—recently bought by Google for US$1.3 billion—is but one example of this process.[1]

The basis of the modern smart city has shifted in recent years from a technology focus to a resident focus. While a smart city was once measured by the number of electricity meters, cameras and sensors, today, for a city to be smart, it needs to engage, connect and become resident-minded. Thus a city without a modern forward-thinking population will struggle to become smart, given that most of today's smart city concepts are built on public participation and the ability of the public to communicate and engage with the city digitally. Again, Tel Aviv has a huge advantage in this area thanks to its population: it is well-known for its open-minded and technology-driven citizens, and this advantage makes its continuing aspiration to be the world's smartest city a plausible target.

The other side of this coin is the ability of the city to build systems to support a new way of communicating with its residents, moving away from the traditional municipal one-to-many methods and attempting to create a platform that will support openness, equality, trade, tourism and culture. This is very much in line with the global vision of the municipality of the twenty-first century, which is expected to deliver far more than efficiency and excellence in services for residents. The new vision prioritizes a deeper engagement with the community, involving open dialogue with and between residents, the creation of new models for trading and sharing goods and services (a modern version of the traditional marketplace) and, most importantly, making cities liveable and equitable.

This is how Tel Aviv has approached the objective of becoming a smart city, and on this basis it will develop and build new systems that will enable a new way for cities to grow, for citizens to communicate and for the culture to evolve. While the original Renaissance was the bridge period between the Middle Ages and modern history, Tel Aviv's renaissance will mark a shift from old municipal thinking to a new vision of modern urban life.

[1] See, for example, http://uk.businessinsider.com/how-google-bought-waze-the-inside-story-2015-8.

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Chapter 5
From Self-Made Entrepreneurs to the Sharing Economy: Milan as a Laboratory for a New Collaboration-Based Approach

Federico Guerrini

1 Milan: Aces Up Its Sleeve

There has probably never been a better time, in recent years, for the city of Milan. In a country that has just started to leave behind the consequences of the 2008–2013 economic recession, the city has been successfully carving out for itself a leading role in Italy as the guiding light in a quest for a social and entrepreneurial renaissance.

The Universal Exposition in 2015 (Expo 2015), which attracted more than seven million visitors from abroad (and 21 million overall), helped to turn the global spotlight on Lombardy's capital: there was something going on here, a vibrant atmosphere that seemed in sharp contrast to the prevalent narrative of Italy as a depressed and struggling nation. Journalists and investors took notice.

Side-by-side with the sectors for which Milan has long been known as an international powerhouse, such as fashion and design, and its stock exchange, Piazza Affari,[1] there are start-ups, cutting-edge firms, co-working spaces and industrial and innovation districts, which have been and still are reshaping the city's identity.

While Milan comes second in Italy, after Rome, for the total number of enterprises, its metropolitan area hosts the highest number of digital start-ups (802, or 14.8% of the national total), together with 8 incubators and accelerators focused on innovative enterprises, 87 co-working spaces, and 10 Fablabs and Makerspaces. The city was also shortlisted as one of the nine finalists of the 2016 European Capital of Innovation Award and always tops the national smart cities rankings such as the iCity Rate[2] or the Smart ë Index.

[1] https://it.wikipedia.org/wiki/Borsa_di_Milano

[2] ICity Rate 2015: Milano in fuga, Firenze rincorre, Bologna frena. See http://www.forumpa.it/smart-city/milano-in-fuga-firenze-rincorre-bologna-frena-ecco-icity-rate2015.

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Sustainability, quality of life and transportation have been improved in the last 5 years, in many cases using the funding allocated for the Expo preparations. Improvements have included the revamping of previously neglected areas, like the 'Darsena', the city harbour and ancient port where two rivers (the so-called Navigli) meet, which was restored and renovated, making the quarter one of the city's hottest nightlife spots. In addition, a new underground transit line was constructed and car-sharing and bike-sharing schemes have been introduced.

Entire urban areas, like the Porta Nuova district,[3] have been rebuilt and renovated, giving the city's skyline a more modern flavour. All of these enhancements have not only improved the quality of life for residents, but have also helped to make Milan more attractive for foreign students, skilled workers, entrepreneurs and investors looking for a friendly and bustling place to live.

All of this, of course, cannot be achieved without drawbacks and collateral effects. Rents in the city have been steadily increasing and are now the highest in urban Italy. The gentrification of some central areas has sparked controversies, forcing cash-strapped residents and students to move to cheaper, more peripheral neighbourhoods. Scandals and corruption are by no means memories of the past, continuing to emerge with unnerving regularity. Milan's pollution level, above all, is one of the worst in Europe, and represents a major challenge that could have a negative impact not only on health but on how the city is perceived by foreigners.

Overall, Milan does seem to have some aces up its sleeve: established companies operating in traditionally strong areas like banking, fashion and design have started to understand the importance of collaborating with younger firms to innovate their services. The entrepreneurial tissue is strong and growing.

The municipality has been encouraging experiments in 'social innovation', in search of new ways of offering services (related to housing, transportation, medical care) which are essential for citizens, but which the public administration now struggles to provide.

Nevertheless, whether the future of the city will continue to look bright remains an open question. Will Milan's vitality stretch to the rest of the country? Or will Italy's current economic weakness curb the northern city's aspirations? Will the new mayor (elected in 2016) continue to support innovative firms and entrepreneurs like his predecessors?

The next few years will be instrumental in telling whether Milan's boom is just a meteoric rise or has indeed strong foundations.

2 First Expos and Self-Made Mentality

For those who know the role historically played by Milan in the Italian context, the current blossoming may not be completely surprising: due to its favourable geographical location, in the middle of the Lombardy plain (from which it took its

[3] https://en.wikipedia.org/wiki/Porta_Nuova_(Milan)

original Latin name of 'Mediolanum')[4] and at the centre of the road network of northern Italy, the city has always been a hub, a crossroads for people and goods.

This was true during the Roman Empire (the Western part of which, for a brief period, it was the capital) and throughout the Middle Ages, the Italian Renaissance and the Austrian domination up to the present day, with the partial exception of the 170 years of Spanish rule that began in the sixteenth century and saw the city neglected and humiliated.

Apart from that period, Milan has always been a proud, rich and vibrant urban centre, particularly under the Sforza family's rule in the Renaissance (from 1450 onwards). The magnificent cathedral, the Duomo, the Castello Sforzesco and the Church of Santa Maria delle Grazie, among other monuments, still bear witness of the grandeur of the Sforza, who succeeded in attracting some of the greatest talents of the time, Leonardo Da Vinci being the most famous and brilliant of them all.

Such credentials help to frame the city's role in Italian history; but the foundation of the current entrepreneurial mindset, the hard-working, no-strings-attached attitude which characterizes its residents and has earned Milan the title of 'moral capital of Italy',[5] is probably to be found in more recent developments, in the flourishing of the 'self-made-man' ideology which started to spread in Milan in the second half of the nineteenth century.[6] It was in those years that the local middle-class began consciously to distance itself from both the easy-going, carefree attitude of the typical landowner, happy simply to reap the fruits of his tenants' labour, and the easy career progress and safe harbour offered to those employed by the nascent State. The local bourgeoisie, on the contrary, stressed the importance of discipline and hard work, of competition, tempered by the first structured forms of welfare organization, of Catholic origin.[7]

It was in this period that the Polytechnic of Milan was founded and it was the time of entrepreneurs who left a mark on the city, like Ferdinando Bocconi (who later went on to found the famous university in memory of his defunct son Luigi), Edoardo Sonzogno, Giovanni Battista Pirelli, and many others.[8] They were often educated, well-travelled businessmen, willing to accept that there was some truth in the foreigners' stereotype of Italians as lazy and inefficient, but believing that Milan was different, had a superior moral standing and, given the right conditions, could compete on the same level as other European urban centres.

This was also the time when some of the oldest parts of the city, like the area of Brera and Corso Garibaldi, historically the location of artisan workshops and the

[4] https://en.wikipedia.org/wiki/Mediolanum

[5] 'Quando nacque il mito di Milano "capitale morale"'? http://www.linkiesta.it/it/article/2012/10/14/quando-nacque-il-mito-di-milano-capitale-morale/9747/.

[6] See Rosa (1982), and http://www.liberliber.it/mediateca/libri/r/rosa/il_mito_della_capitale_morale/pdf/il_mit_p.pdf.

[7] http://secondowelfare.it/terzo-settore/enti-religiosi/dame-della-carita-milano.html

[8] 'Milano e la borghesia degli imprenditori'. http://www.treccani.it/enciclopedia/milano-e-la-borghesia-degli-imprenditori_(Il-Contributo-italiano-alla-storia-del-Pensiero:-Tecnica)/.

houses of wealthy families, began to attract even more craftsmen, storerooms and emporiums. What would become known as the fashion district started to acquire its culture-oriented, bohemian flavour, and the trend would continue at the beginning of the new century, with the opening of art galleries, bars and cafes.[9]

The culmination, the tangible and visually identifiable evidence of this new ethos was, perhaps not by chance, a forerunner of the 2015 World Expo: the Universal Exposition of 1881, the first great exhibition hosted by the city of Milan.[10]

More than a simple trade fair, combining an Industrial Exhibition with a Fine Arts Exhibition, the 1881 expo was a celebration of the new entrepreneurial spirit of 'the most citified city in Italy', as novelist Giovanni Verga wrote, and helped both foreigners and Italians themselves to discover the nascent industry of the nation. For 6 months, 7000 exhibitors from all over country showcased their products in the Public Gardens area, in outlying annexes and at the Palazzo del Senato. Over one million people visited the attraction, with peaks of 25,000 visitors a day.

Another exposition, this time of international standing and ambition (hosting exhibitors from 40 nations) was organized in 1906, to celebrate the opening of the Simplon Tunnel that connects Italy and Switzerland. In the same period, between the end of the nineteenth and the beginning of the twentieth centuries, some of the most important Italian banks, including Banca Commerciale Italiana and Credito Italiano, were started in Milan, fostering the growth of Piazza Affari, the city's bourse. Stocks listed on the exchange rocketed from 23 in 1895 to 160 in 1913[11] and, thanks to its role of mediator between the needs of the new industrial and financial activities, Piazza Affari soon became the most important exchange in Italy.

3 Rise and Fall of the 'Moral Capital'

In spite of all their burden of destructions and sorrow, Fascism and the two World Wars failed to leave a permanent mark on Milan's spirit. They did, however, change the urban landscape, with some important public works, like the Fiera Campionaria and the Central Station in the 1930s and with the damaging or demolition of one third of the buildings during the Second World War due to bombings and fires. The 1930s also saw the construction of the first highways, connecting Milan to other parts of Northern Italy.

The reconstruction and the economic boom of the 1960s consolidated Milan's role as one of the main driving forces of the nation's progress. Together with Turin and Genoa, the capital of Lombardy became part of the so-called 'industrial

[9] http://www.storiemilanesi.org/approfondimento/prima-milano-bere-artigiani-artigianato-montenapoleone-brera/

[10] http://www.rivistainnovare.com/istituzioni-pmi/lexpo-di-milano-del-1881-nasce-litalia-industriale/

[11] https://it.wikipedia.org/wiki/Borsa_di_Milano

triangle', where automotive (Fiat and Alfa Romeo), mechanical, chemical (Eni) and textile companies flourished at an unprecedented speed.

The hope of a better life and decent employment attracted hundreds of thousands of workers from the south of Italy, changing the social composition of the city and leading to the creation of new dormitory towns in the hinterland. The first Italian fair specifically focused on innovation in the workplace, SMAU, also dates back to these years (1964) and took place in Milan.

During the late 1960s and most of the 1970s, Milan continued to grow in spite of social and political tensions that affected the country (as they did most Western nations) and of which Milan was one of the epicentres. The economy started to shift from being mainly industry-based to the development of new sectors: services, finance, publishing and, above all, design. These were the years of widespread student protest and terrorist attacks that left the inhabitants deeply shaken.

As a reaction, in the following decade the city seemed to take a pause from any kind of civic commitment and to seek shelter in the cult of pleasure and hedonism. The cult of the individual celebrated by the nineteenth century bourgeoisie turned into individualism, and the fashion industry, of which Milan in the 1980s became one the world's capitals, is the perfect manifestation of a glittering and shiny environment in which appearance is glorified and life is a sequence of aperitifs ('la Milano da bere', literally 'Milan to drink', is the catch-phrase of a well-known TV advert).

The party ended when, at the beginning of the 1990s, a widespread system of bribery and corruption was discovered in Milan, significantly undermining its image as the 'moral capital' of Italy. The subsequent investigations, which soon spread to the rest of the country,[12] swept away a significant part of the political and financial establishment.

The rest of the decade and the first years of the new millennium were years of confusion and fragmentation. While continuing to grow and attract the interest of multinationals operating in several sectors, from pharmaceutical to biotech, from insurance to software, the city tried hard to reinvent its identity, the myth of the moral capital wounded by too many scandals.

So, what is the secret behind Milan's newly found confidence? It partly has to do, for sure, with the successful bid it made in 2008 to organize the World Expo. This victory helped administrators focus on long-term planning for the city and to relaunch its international image. At the same time, the appearance of new collaborative, innovation-related models allowed entrepreneurs and officials to go beyond the old, discredited individualistic approach and bet on the potential of the network effect.

[12] https://en.wikipedia.org/wiki/Mani_pulite

4 The Reinvention of a Metropolis: From 'Me' to 'Us'

For many years Milan was described as a grey, foggy, industrious city. People would travel from point to point by underground transport. They disappeared into a hole near their home and emerged in some other place close to the office, ready to face a hard-working day. Life—shops, parks, bars, idle conversations—went on somewhere above ground, above the subway lines, but for the average person it was not part of the equation (except, maybe, for the evening *aperitivo*).

'Lately, it seems like the city has gone en plein air', Davide Agazzi, a former policy advisor to the municipality during the Pisapia administration (2011–2016), told me. 'Residents have rediscovered the pleasure of living together and being part of a community which had previously got lost.' This was a response partly to the transformations, at the global level, in the way work was produced (the boom in freelance jobs, which ignited the current boom of new aggregation hubs, like co-working spaces), partly to the economic crisis which pushed people to rediscover a sense of belonging, and partly to a conscious effort by the municipality to implement a new generation of public policies built on sustainable development, innovation and social cohesion.[13]

Instead of fighting change, Milan developed an ambitious programme, aimed at sharing services and facilitating the growth of the biggest start-up community in Italy, as a driver for innovation and job creation. Part of that effort consisted of giving new places to the so-called 'creative class' (see Florida 2002) in which to develop and showcase their skills. Both the city administration and private shareholders moved to regenerate and refurbish old and disused industrial buildings, transforming them into cultural, entrepreneurial and creative hotspots.

5 Starting from the Basics: Buildings and Transportations

This process actually started at the end of last century. In 1994, the Polytechnic of Milan established its headquarters in the former Ceretti & Tanfani mechanical plant in the Bicocca district[14] and in 1997 it expanded into the ex-FBM (mechanical engineering) and Ivi-PPG (paints) plants. During the same decade, the city council took steps to buy the old Ansaldo industrial plant at Porta Genova, converting the disused factories into studios, workshops and creative spaces.

Later, a former factory in the Bicocca district, built in the first half of the twentieth century for the construction of coils for electric motors for trains, was—thanks to the work of a non-profit foundation led by tyre-manufacturer Pirelli—transformed

[13] Part of this chapter is based on the documentation presented by the City of Milan for the 2016 European Capital of Innovation Award. The author wishes to thank city officials Lucia Scopelliti and Rossana Torri for their collaboration and providing useful information.

[14] 'Other districts in Milan and out of town'. http://www.turismo.milano.it/wps/portal/tur/en/scoprilacitta/quartierituristici/altri_quartieri.

into a 15,000 m^2 space, Hangar Bicocca, where concert and exhibitions take place. The project began in 2004, but was completely revamped and relaunched in 2012. More recently, in 2016, another 6000 m^2 of Porta Genova's Ansaldo were opened to the public as part co-working space, part incubator for innovative projects in the cultural sector and artistic events.

Another important change, which helped to make Milan more liveable and attractive for residents, tourists and business people alike, was the improvement of the local transport system. A crucial factor, in this respect, was the building of a new underground line, the much-needed M5, in time for the Expo.

The last few years have also brought with them a boom in car-sharing services, partly due to the 'congestion charge' imposed by the city administration, which forced citizens to reduce the use of private vehicles: with 323,000 users, as of June 2016 Milan is the city in Italy with by far the largest number of car-sharing customers. An even more environmentally-friendly alternative is provided by the municipal bike-sharing programme, which offers some 3500 bicycles strategically allocated in the more densely populated and attractive parts of the city.

6 Embracing Collaborative Economy

On top of creating the necessary infrastructures for encouraging and smoothing the flow of people and ideas across the urban jungle, Milan developed a set of initiatives aimed at promoting an integrated innovation ecosystem, with a specific focus on sharing-economy related activities.

In the wake of the spontaneous flourishing of fablabs, co-working and makers' spaces, including Talent Garden, the largest European network for co-workers, an official registry was created by the administration to certify the respect of a minimum set of conditions and therefore boost their credibility. Those that were deemed to fulfil the conditions were also entitled to a number of economic incentives, intended to cover part of their costs.

A similar approach was taken in the mapping of the sharing economy platforms active in the city, which, together with the Milano Social Innovation[15] initiative, was conceived to support young enterprises able to address urgent social needs like housing, education and health care, blending public and private resources.

A significant step in this direction was the launch in 2014 of the first publicly owned business incubator dedicated exclusively to businesses with a social vocation (FabriQ); yet another scheduled development is the creation of a 'sharing economy micro-district'. Its first implementation was the opening in March 2016 of 'Co-hub', a 'house' for the study and promotion of all initiatives of collaborative consumption taking place in the territory.

[15] Milan White Paper on Social Innovation: http://www.milanosmartcity.org/joomla/images/white%20paper%20mi_social%20innovation.pdf.

7 Start-Ups as the New Rock Stars

The start-up 'addiction', with technology entrepreneurs celebrated and proposed as role models for the new generation,[16] came later to Italy than to other Western European countries and the USA. However, the economic crisis, which lasted longer in Italy than elsewhere, forced many young people to try to found their own innovative company, taking advantage of the low bootstrapping costs enabled by new technologies. Milan, thanks to the abundance of skills, infrastructure and innovation-related private companies and institutions, was well-positioned to take advantage of this trend, and quickly established itself as Italy's leading hub in this field.

As previously mentioned, not only does Milan's metropolitan area host the highest number of digital start-ups in Italy, but also innovation-related events are held almost daily in one or more of the many locations for 'start-uppers'. New incubators and accelerators are constantly emerging and some of the largest venture capital funds active in Italy, such as United Ventures, 360 Capital Partners and Digital Magics, have their headquarters in Milan.

The academic world is also contributing to this digital entrepreneurial renaissance: PoliHub,[17] the start-up incubator of the Polytechnic, recently came fifth in a ranking of the top university incubators in the world; and the Bocconi University has its own incubator, Speed Mi Up.

The city could also become a reference point for foreign investors looking for interesting Italian start-ups: some private and public initiatives in this respect have already been launched. ScaleIT, for instance, is a one-of-a-kind privately-managed event which aims at shining a light on the most promising national 'scale-ups'.

On the other side of the spectrum, in May 2016 the municipality signed a 2-year agreement with the Economic Development Corporation of the City of New York (NYEDC) to promote business opportunities for Italian start-ups willing to enter the US market and American start-ups that aim to do the same in Italy.

8 Merging Old Strengths with New Skills

Taking advantage of the traditional strengths of the city, in sectors like fashion, food and banking, in the last few years the number of vertical accelerators focused on these specific niches and dedicated events has increased exponentially. For example, the newly-born Fashion Technology Accelerator (FTA) aims to exploit the abundance of talents in the field of fashion to adapt new technology to old businesses. On a similar note, Milan is home to one of the Decoded Fashion summits,

[16] 'Are entrepreneurs the rock stars of today?' http://www.forbes.com/sites/dinagachman/2013/01/10/are-entrepreneurs-the-rock-stars-of-today/#783ecc7577d5.

[17] http://www.polihub.it/en/

one of the leading international conferences addressing disruptive innovation in fashion and technology. Fuorisalone, Milan's Design Week, which every year attracts hundreds of thousands of visitors from all over the world, is also increasingly becoming a privileged venue for technology companies to showcase their latest futuristic or classy products.

As for food, the municipality is co-financing, in the nearby Parco Tecnologico Padano of Lodi, Alimenta2Talent, a technology and business acceleration programme for start-ups with projects in the agrifood or life sciences sectors.

Milan, on the heels of the 2015 Expo (whose slogan was 'feeding the planet, energy for life'), has also drafted the first version of an urban food policy which should ensure the sustainability of the local nutritional system (promoting, among other things, food security through urban agriculture). The recommendations will be implemented over the next 5 years, and this is likely to open exciting business opportunities for start-ups promising to streamline the current processes of food supply and distribution, or able to find alternative means of production.

Last but not least, being one of main European financial centres and the place where some of the largest European banks, like Unicredit, have their headquarters, Milan is a growing hub for anything related to fintech. In 2014, Unicredit itself launched the Fintech Accelerator for companies trying to compete in the banking sector. Banca Sella, another important if smaller operator, is doing something similar with its Fintech Open District, and Che Banca, Mediobanca Group's retail bank, is sponsoring the Italian Fintech Awards to be held in the Lombardy capital. A parallel scene is being developed around blockchain and cryptocurrency solutions, with think-tanks such as the Blockchain Lab hosted in the offices of the Copernico Milano co-working space and the Blockchain and Cryptocurrencies Lab also promoted by Banca Sella.

9 Solid Growth?

Judging only from the number of initiatives currently brewing, it might seem that Milan is bound soon to become an international innovation powerhouse. Unfortunately, however, while exciting and unique at the Italian level, the city's entrepreneurial spring looks more problematic in a wider context. One of the main problems of innovative companies launching in Italy is the lack, or scarcity, of access to the significant amounts of capital needed to scale a business. In this respect Milan is no exception; and so, while certainly offering many opportunities for start-ups in the bootstrapping or seed phases, it is still not as attractive as other, richer cities, such as Berlin or London, or perhaps even newcomers to the start-up space like Lisbon and Amsterdam.

It is also hard to tell, at present, how many of the seeds that have been sown by the municipality and by private stakeholders—co-working spaces, incubators, innovation labs—will survive into the near future and how many will have to close once

public incentives come to an end, and once the inevitable and understandable hype of the 'new big thing' is over, and a process of consolidation begins.

Some critics also take issue[18] with the high level of public support—and the large sums of money from private sponsors—which have fuelled the renaissance of recent years. One argument is that this top-down approach might not be the most appropriate in the long run, vulnerable as it is to political and financial turmoil (what will happen, for example, if a council with different priorities is elected?). Another reservation is that the renovation and restoration of deteriorated areas like the Isola, Porta Nuova and Garibaldi districts, have been at the expense of experimental and avant-garde artistic and cultural projects which had their roots in those parts of the city and have been displaced in the name of homogenization. The poorest residents, too, were forced to move elsewhere by rising rents—the highest, on average, in Italy: gentrification, while maybe not as rampant as in some other European capitals, is also on the increase in Milan.

A further threat to the quality of life in Milan, and therefore to its ability to attract and retain talent, is pollution. The air quality is among the worst in Europe, so much so that in December 2015 authorities were forced to ban all cars for 6 h a day for three consecutive days[19] in order to reduce the levels of smog. While this might be a short-term solution, it is clear that without a major effort and a clear strategy (hard to discern at present) the problem is not going to disappear anytime soon.

Finally, for all its success and positive effect on the local economy, Expo 2015 has also shown that corruption and bribery[20] are still a gloomy reality, taking not only a financial toll but also causing a loss of credibility which might undermine the city's reputation internationally.

10 Plans for the Future

While there are indeed many challenges yet to be addressed before Milan can once and for all establish itself as an international innovation powerhouse, there are also reasons for hope. The site of the Expo, according to plans laid out by the government,[21] is to be transformed, over the course of 10 years, into a 'Human Technopole', an international hotspot for science and technology, home to 1600 researchers. The plan is to provide €150 million annually for 10 years for the campus. The project, however, has already stirred controversy, as critics point to the relatively opaque funding procedures: the budget is supposed to be managed directly

[18] http://www.internazionale.it/opinione/vincenzo-latronico/2016/05/31/milano-elezioni-amministrative

[19] http://www.bbc.com/news/world-europe-35188685

[20] http://the-view-from-rome.blogautore.repubblica.it/2014/05/17/bribery-scandal-hits-milan-expo/

[21] http://www.sciencemag.org/news/2015/11/italy-plans-turn-expo-2015-site-milan-research-campus

by the International Technology Institute of Genova which, although established and funded by the state, is, from the legal point of view, a private law foundation.[22]

Milan has also joined a number of projects that will be taken forward, regardless of any negative development in the political or financial environment. In the context of Expo, for instance, the municipality joined the E015 Initiative, which aims to improve the urban ICT innovation ecosystem, bringing entrepreneurs,[23] students, researchers and companies together to foster innovation-driven entrepreneurship and to empower ideas. Taking advantage of EU funding opportunities, the city will also experiment with innovative tools to engage citizens in the improvement of energy consumption and personal mobility.

Young, cash-strapped creative professionals, displaced by gentrification from the Porta Nuova area, are flocking to other parts of the city in a process of internal urban mobility common to every metropolis in the world. The area just north of the Loreto district (aptly renamed as North of Loreto,[24] or NoLo by citizens), where rents are still affordable, is quickly becoming the new hub for creativity and the 'hipster' culture.

Milan is changing rapidly. It remains Italy's flagship city for business and entrepreneurial activity internationally. However, in some areas—the density of capital for start-ups, the air quality, the overall quality of life—it still lags behind other similar European and global cities. It will also have to find a way to combine financial growth with social cohesion, and it is perhaps in this respect that its more lasting contributions to the global innovation landscape could emerge.

Social innovation, co-creation, collaborative consumption and food security are all being actively supported by the municipality and could find, given the city's history and its newly-found sense of community, fertile ground on which to flourish, thus transforming Milan into a lab for best practices in a sharing economy. Meanwhile, by exploiting its worldwide reputation as a fashion and financial powerhouse, it could strive to establish itself as an innovation hub in these sectors—an effort which is indeed already partially in progress.

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Chapter 6
Knowledge City Stockholm @ the forefront

Leif Edvinsson

What is a knowledge city? Where does it reside? What is the unit of analysis? What aspects of the city will enable and accelerate the process of renaissance for societal and social renewal? What features of urban design will lead to future wellbeing, and for whom? Where is the wisdom city? In what way is Stockholm, one of many cities known as the 'Venice of the North', at the forefront?

1 The Knowledge City as a Tool

The knowledge city can be viewed from many perspectives. According to an early definition it is a city where the flow of knowledge is vital. Thus one perspective might be to see the city as a knowledge tool. In the knowledge economy, it could be argued that one of the essential dimensions will be urban design, for the flow of knowledge or migration of intellect.

The city is the larger context, the structural capital surrounding the human capital, with regard to the dynamics of value creation. From this perspective, a knowledge city can be seen as deliberately designed to encourage and nourish collective knowledge—that is, intellectual capital—so that insights and capabilities will, over time, shape efficient and sustainable actions for social welfare. As noted above, the city can be seen as the structural capital surrounding the human capital, but it is also the relational capital connecting the human with the structural capital to yield higher value-added for the knowledge worker. This also implies that the city of tomorrow will be a multidimensional complex concept, set in a highly dynamic knowledge context as well as drawing on a particular historical heritage for its renaissance.

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The knowledge city is a city that is 'purposefully designed to nurture knowledge' (Edvinsson, 2016; in Dvir and Pasher, 2004): it is a fluid space of exchange and optimism in which everyone can devote themselves to personal and collective projects and aspirations in a climate of dynamism, harmony and creativity. In 2003, the late Dr. Debra Amidon, in collaboration with architect Bryan Davis, launched the concept of KIZ—the Knowledge Innovation Zone—with a flow of collective interdependent knowledge at its core. Perhaps the knowledge city might be viewed as a super brain?

In a knowledge city, the 'citizenship undertakes a deliberate, systematic attempt to identify and develop its capital system, with a balanced and sustainable approach' (Carillo, 2004: 34). The term knowledge city is also 'shorthand for a regional economy driven by high value added exports created through research, technology and brain power' (Melbourne City Council, 2002; in Ergazakis et al., 2004: 6). In fact, a knowledge city is 'a region that bases its ability to create wealth on its capacity to generate and leverage its knowledge capabilities through knowledge-based extended networks formed by enterprises and people' (Chatzkel, 2004: 62).

According to Carillo (2004), knowledge cities have an economy driven by high value-added exports created through research, technology and brainpower. In other words, they are cities in which both the private and the public sectors value and nurture knowledge, investing in knowledge dissemination and discovery (that is, learning and innovation), and harness knowledge to create products and services that add value and create wealth.

The city construct and regime are there to support value creation from and for the knowledge workers. The design of the knowledge city is the critical organizational and relational capital of tomorrow for the knowledge worker. The concept of the knowledge city and the new urbanism (that is, migration into cities) are together becoming an increasingly important strategic tool in global competition for knowledge; that is, the 'talent war'. It is essential that the design of the knowledge city incorporates an efficient local–global interface so that the individual knowledge worker can exploit the global opportunity space through the local opportunity space. In the case of urban design for the knowledge economy, this factor may lead us to the need to design a knowledge port for the amplified Internet of Things (IOT) and 'knowledge flow as an exchange design for the intangible flows' (Edvinsson, 2006); perhaps also to an innovative urban democracy?

The new urban design may demand a further concentration on the space between buildings. This can be illustrated in the form of a photographic negative, highlighting that intangible in-between space rather than the buildings, streets and traditional infrastructure. Figure 6.1 is an image from a knowledge project on science and health in the area of Karolinska, Stockholm.

Urban design is critical for the growth of social capital, to encourage citizens to create networks of friends so that a new type of urbanism for the mind develops. The knowledge city design is a unifying factor that will help to integrate the perspectives of economics, urban studies and knowledge management. The design of a 'knowledge harbour' concept is a multidisciplinary task and is now being prototyped in

Fig. 6.1 Identifying intangible urban space. *Source*: Edvinsson and Lidé (2012)

reality. A pioneering city in this regard is Arendal in the South of Norway, which in 2006 started to design its Knowledge Port (http://www.kunnskapshavna.no/praktisk/english/).

2 Stockholm as Capital of Sweden and the ICT Renaissance in Scandinavia

Stockholm is the major city of Sweden, with about 10% of the national population. The political vision is to nurture it as a world-leading knowledge region—a renaissance of the old Viking city, which will be driven by ICT policy and ICT infrastructure investments.

In 2000, *Newsweek* nominated Stockholm as the Internet capital city of Europe, and in 2016 *Monocle* listed it as No. 10 in the world's 25 best places to live (www.monocle.com). There are various explanations for these successes. One is the priority given by the City of Stockholm, starting in 1996, to attracting direct foreign investment in the ICT sector. A special branding project was initiated, called 'TIME-Stockholm', integrating the telecommunications, IT, media and entertainment sectors. Currently (mid-2016) there are about 25,000 IT companies based in Stockholm—around 50% of all IT companies in Sweden—and 18% of the city's working population is employed in technology-related jobs. In 2012 the technology sector in Sweden accounted for 42% of GDP (Stockholm Business Region Development, 2012). People from around the world are attracted to Stockholm to form start-ups: the city is regarded by some as one of the world's best connected cities with, among other things, 3G coverage and the current prototyping of 5G and fibre networks coverage.

Sweden used to be the home country for Volvo, a key player in the automotive industry. However given the importance of intangibles such as relational capital and renewal capital, the drivers for the future of both Sweden and Stockholm will be regional and national intellectual capital.

Table 6.1 High-tech employment and shares by country (2011)

Country	Employment (000s)	Employment change, % (2000–2011)	Share of total employment, %	Share of EU high-tech, %
Czech Republic	669	24.7	13.7	3.1
Finland	331	6.0	13.4	1.5
Sweden	592	9.5	12.7	2.7
Denmark	342	9.0	12.7	1.6
France	3197	25.3	12.4	14.7
Belgium	549	22.3	12.2	2.5
Germany	4782	13.0	12.0	21.9
Slovenia	106	53.0	11.3	0.5
Ireland	198	13.3	11.0	0.9
Slovakia	253	31.5	10.8	1.2
Hungary	392	19.7	10.3	1.8
Malta	17	14.6	10.3	0.1
Netherlands	834	0.3	10.0	3.8
Austria	404	22.4	9.8	1.9
Italy	2229	28.5	9.7	10.2
Luxembourg	21	45.3	9.4	0.1
United Kingdom	2709	1.2	9.3	12.4
Latvia	79	30.5	8.1	0.4
Estonia	48	4.1	8.0	0.2
Poland	1255	[a]	7.8	5.8
Bulgaria	223	[a]	7.6	1.0
Spain	1312	50.7	7.3	6.0
Romania	632	[a]	6.9	2.9
Lithuania	90	2.2	6.6	0.4
Cyprus	23	40.1	6.1	0.1
Greece	247	24.9	6.0	1.1
Portugal	268	20.3	5.6	1.2
European Union (27)	**21,802**	**19.5**	**10.0**	**100.0**

Source: Goos et al. (2013)

[a]Employment changes for Poland, Bulgaria and Romania were unavailable because of insufficient data

A Google-funded report of 2013 showed that Stockholm has the highest share of high-tech jobs in Europe. The report, by Goos et al. (2013) found that the high-tech workforce in Stockholm increased by 15% between 2000 and 2011 to a total of 197,000 people, or 18% of the workforce. Table 6.1 presents employment data from Goos et al. for the 27 EU members in 2011.

Stockholm is also the location of the Nordic regional headquarters of several major technology companies, including Microsoft, Intel and IBM. Perhaps the best known is Ericsson, which has a long tradition of innovation in the telecoms industry,

laying the foundation for a whole cluster of innovative companies in Kista Science City. In fact, a report published by the Stockholm Chamber of Commerce claims that the city is home to 11 global headquarters, among the highest numbers for all European cities (Stockholm Chamber of Commerce, not dated).

There are various ecological and ICT infrastructure initiatives in Stockholm. As the home town of Ericsson, the city got its first public telecommunications system in the late 1800s and by 1880 it was the most telephone-dense city in the world. Prototyping is now underway for 5G mobile systems.

Stockholm today continues to be a city of innovation, hosting successful technology companies such as Spotify, King (Candy Crush) and Klarna. Furthermore, Stockholm was the birthplace of Minecraft, the educational game now with more than 100 million users 7 years after it was launched.

With such a combination of large technology companies and smaller innovative educational entertainment start-ups—mixed with world-class technological universities—this is a case of renaissance through ICT, turning Stockholm into perhaps one of the hottest tech cities in the world. A particular renaissance ecosystem is creating a culture for the birth of new enterprise. This might fall within the European Commission's definition of a 'Smart City'—that is, a city where services are made more efficient through the use of ICT and digital systems. Stockholm shows how those systems can have a formidable multiplier effect on human capital.

In this context, urban renewal and innovation become critical. Seven years ago, Allan Larsson, a retired journalist, former finance minister and past president of Lund University in southern Sweden, noted:

> We've used the phrase 'renewing a new city' to highlight the fact that you can't just build a new residential area or a town and then leave it. It has to be updated. You have to have innovation. You have to test new things. (quoted in ECO Building, 2016)

With regard to new company formation, in 2016 Stockholm has more new high-tech company launches than anywhere else in the Nordic region. To encourage the formation of new tech companies, the city supported the establishment of a new facility known as SUP46 (the name uses the old national phone code for Sweden, 46). SUP46 is a hub that provides a meeting space and world-class ecosystem for 'Start-Up People' of Sweden (see www.facebook.com/SUP46). Projects in progress are ecological and energy saving efforts by the City of Stockholm in alliances with many. This is innovation for sustainable city developments, as a kind of PPP (public private partnerships) or a Pentahelix approach.[1] In addition, a special initiative was launched in 1994 for the National City Park which covers and area of some 27 km^2. From a more academic viewpoint, there is prototyping research work on a 3D graphical design of drivers for a city, region or nation, as illustrated in Fig. 6.2.

[1] See, for example, https://blogg.mah.se/urbinnovate/2015/04/27/penta-helix-conceptualizing-cross-sector-collaboration-and-social-innovation-processes/ for details of the penta helix model.

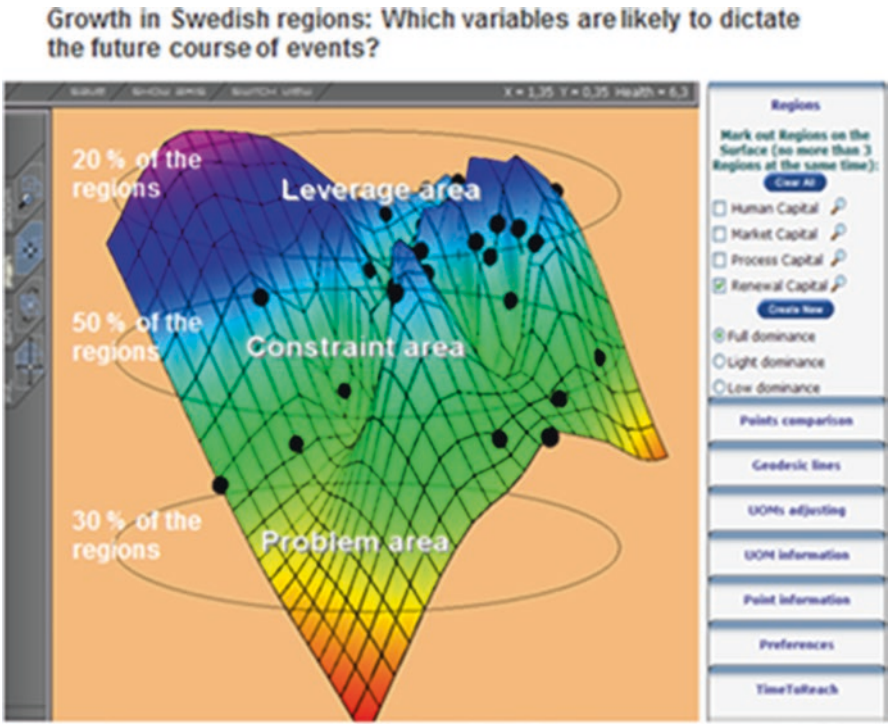

Fig. 6.2 3D dynamic mapping of critical factors to address for the city renaissance. *Source*: Lin et al. (2014)

3 Drivers for Renaissance

In the metrics of National Intellectual Capital (see www.bimac.fi), Sweden ranks among the top five countries in the world: for a small country with only around ten million citizens, this is a very high ranking. It suggests that there may be something beyond the factor of human capital that merits attention. According to research in 2016 (www.bimac.fi) we are moving into a new dimension of the Knowledge City, with ICT as the structural capital impacting digital services.

National Intellectual Capital, or National Intangibles, opens up new perspectives to explain hidden economic drivers. It brings to mind the famous phrase of Leonardo da Vinci, *Saper Vedere*—knowing how to see. By introducing the ELSS production function (ELSS: Edvinsson et al.),[2] a new theoretically and computationally justified method, we have been able to capture and disclose those drivers. By augmenting the Cobb–Douglas production function with a wide range of NIC indicators, we have managed to uncover 77% of hidden economic drivers (TFP—total factor productivity) in developed economies and to calculate the effect of intangible capital on GDP and growth.

[2] The ELSS model and production function is discussed at length in Ståhle et al. (2015).

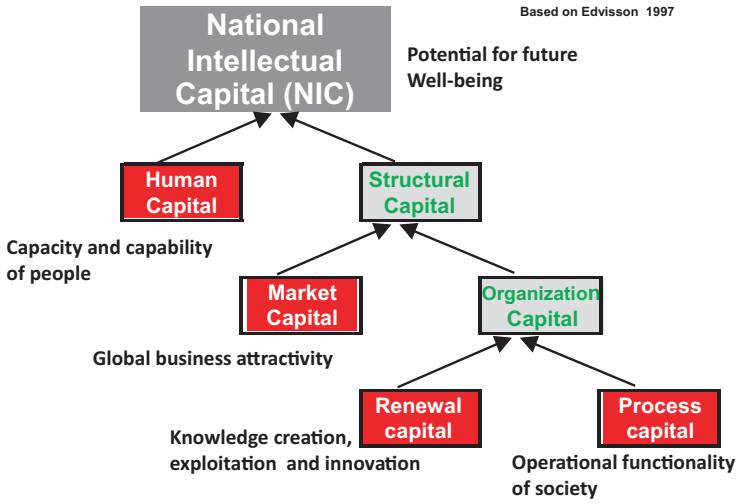

Fig. 6.3 NIC and the economy. *Source*: Ståhle and Ståhle (www.bimac.fi)

The results of NIC analysis show that intangible capital accounts for some 45% of world GDP. The figure for the USA is 70.3% and for the European Union it is 51.6%. The Nordic countries stand out, with 64.7%—NIC contributing to 72.5% of GDP in Sweden, 69.7% in Finland and 67.6% in Denmark (www.bimac.fi; see also Lin and Edvinsson, 2014). Leading the 61 countries analysed were, among others, the top-performing Nordic countries, the USA and Singapore. The ELSS model highlights the drivers for wealth as Human Capital, Market Capital (networks), Process Capital (infrastructure), and Renewal Capital (innovation): through dynamic mutual interaction with Financial Capital these factors of intangible capital affect economic growth (see Fig. 6.3).

4 Ragusa, an Early and Sustainable Forerunner

Perhaps the forerunner of some of these now very hot ideas of renaissance meeting spaces for enterprise was in the maritime state Ragusa, on the Adriatic (today in Croatia, its capital was Dubrovnik) and founded in the seventh century. Between the fourteenth century and 1808 it was ruled as a free state, although it was part of the great Ottoman Empire. Modern law and medical service were introduced in 1301. Latin was the principal language for centuries, combined with, among others, Italian.

The leader of this early knowledge society had the scholarly title of Rector, or Dean. Its wealth and growth over 600 years were attributable to its sea-based trade and diplomacy. Napoleon Bonaparte conquered the city in 1808.

The critical knowledge task force consisted of the Dragomans—a squad of some 80 people positioned around the Mediterranean in critical intelligence hubs. Based on their reporting back to Ragusa, the city state obtained a knowledge advantage that fed into its diplomacy and the avoidance of military conflicts. Today the Dragomans might have been called 'Knowledge Navigators' or even 'Impact Navigators'.

5 A 'Wise Place'

Ragusa is perhaps an early illustration of a city construct that the Japanese today call a 'Wise Place'—a place for studying the future, based on phronesis or practical wisdom, to evoke Aristotelian ethics or the work of today's Professor Ikujiro Nonaka and Professor Noburo Konno.

Hong Kong and Singapore also have very high scores in NIC metrics. It might be that condensed spaces encourage creative interdependence as a context for innovation. Sometimes such spaces are in the form of 'Future Centers'. The world's first such arena or hub was established by Skandia Future Center in 1996, and then replicated globally and connected through Future Centers Alliance (see http://www.futurecenteralliance.com). This initiative for the renewal of organizational regimes has resulted in some 50 similar pioneering efforts in Japan (see https://www.facebook.com/jp.futurecenteraliancejapan/). A special report was published in 2016 on the subject by Future Center Alliance Japan (FCA, 2016).

The Living Lab, another very successful hub design for renewal or renaissance emerged in Finland: now, 10 years after its inception, almost 400 have been set up. Is this a sign of the networked renaissance? (For further information, see ENOLL, the European Network of Living Labs, http://www.openlivinglabs.eu/.)

6 Dome of Visions

The Dome of Visions is a pop-up building, initially making its appearance in Copenhagen and now, at time of writing in 2016, temporarily occupying space in Stockholm. According to the Dome's founders, cities are full of unused spaces—construction sites, vacant lots and neighbourhoods, where there is no vibrant life between buildings. These spaces are opportunities, and we might use them as meeting places and urban 'campfires'—a temporary community centre for renaissance dialogues.

The Dome of Visions is a 'third' space that offers us an opportunity to addresses how we exist together in the world. Located in between indoors and outdoors, it is a space that creates interaction across silos, based on the belief that the most interesting things happen outside categories, in the unknown (see http://domeofvisions.com/).

7 Brainpower Circulation for the Wisdom City

Thus in order to exploit the brainpower of its citizens, a city regime is well advised to look for initiatives beyond traditional financial economics and even knowledge assets: it should address the in-between spaces. A special focus might be placed on 'C&C'—connectivity and the exceptionally important intangibles of 'contactiveness'. The model illustrated in Fig. 6.4 might form a policy component of a city renaissance effort.

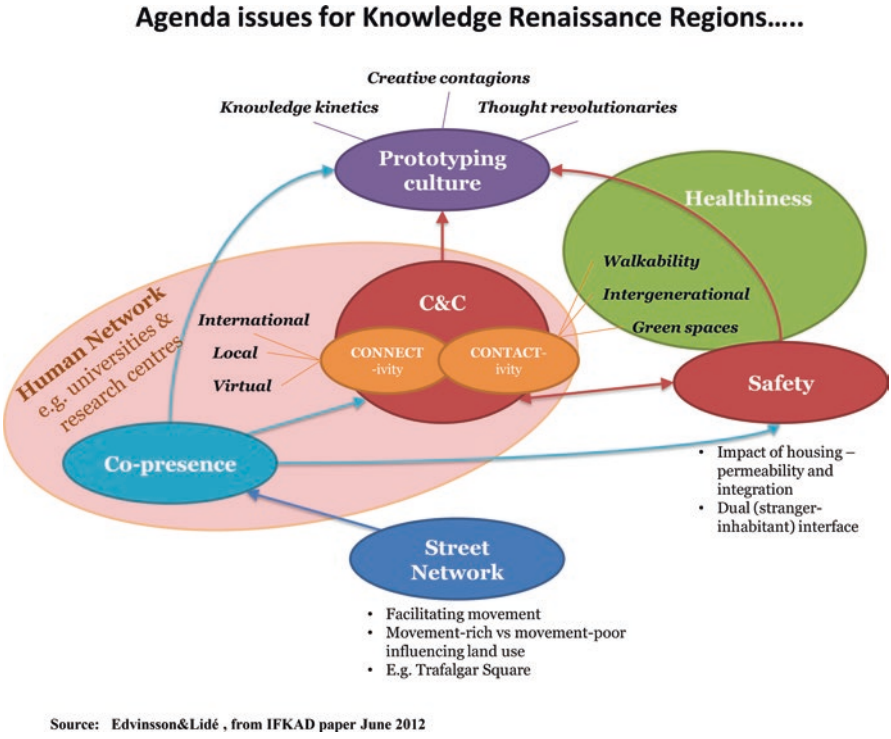

Fig. 6.4 The relationship of human, market, process and renewal capital as contributions to national intellectual capital. *Source*: http://www.bimac.fi

8 SocInn—Societal Innovation

With the facilitating presence of C&C together with ICT, there is an opportunity space for societal innovation and renaissance. Societal innovation involves systemic change in the interplay between the state and civil society. According to *Wikipedia*, 'It is a relative of social innovation, but differs from it in that it takes into account the state as an important co-creator in achieving sustainable systemic change'. Lehtola and Ståhle (2014) also offer a formal definition: 'A societal innovation introduces a novel economic and/or social improvement to people's everyday life. It brings a systemic change (radical or incremental) to society's structures or modes of operation and it is legitimated by the majority of societal stakeholders.' In short it might be regarded as societal renewal in all its dimensions.

There are different types of societal innovation, as viewed from various perspectives, beyond social innovation. Among them are the following approaches (see Edvinsson in EC, 2016):

- It can be seen as a signal and mapping process for the renewal of the societal and social fabric, as in the illustrative Ragusa story, with its Dragomans.
- It can be seen as a new societal rule-making process for a joint co-creative re-framing thrust. Examples include COP21 in Paris in December 2015; civil rights innovations, as in the case of Denmark's ministerial prototyping Mind-Lab; and Malaysia's pioneering urban design with its Super Multimedia corridor and related e-Law making.
- It can be seen as a peace innovation process by triggering reduced friction and conflict resolution among citizens through the innovative harmonizing of citizens' relational interactions. Examples include Finland's ACSI (Aalto Camp for Societal Innovation) and Stanford Peace Innovation's process design.
- It can be seen as a digital dialogue process across borders, generations and cultures (for example, the Living Bridges Planet and Impact Navigators) that will both initiate local social innovation processes and reframe collective perspectives.

Among the most stimulating events of 2015, with regard to societal renewal and renaissance, was the award of the Nobel Peace Prize to the team known as the Tunisian National Dialogue Quartet. The team, under a female leadership initiative, worked in a cross-sectoral approach to achieve a peaceful enactment of societal innovation (for further information, see http://www.nobelprize.org/nobel_prizes/peace/laureates/2015/). A consortium of four organizations, the Tunisian General Labour Union (UGTT), the Tunisian Confederation of Industry, Trade and Handicrafts (UTICA), the Tunisian Human Rights League (LTDH) and the Tunisian Order of Lawyers, succeeded in creating a peaceful dialogue for the transition to a pluralistic democracy.

Social innovation is being cultivated by growing global networks. The first global Social Innovation Hackathon took place in March 2016 in New Delhi, India, with, among others, the Hon. President of India. The online Social Entrepreneurs Club

has more than 30,000 members. The annual SOCAP (Social Capital Markets Conference) event in San Francisco in 2016 attracted more than 10,000 investors and social entrepreneurs (see www.socialcapitalmarkets.net) and included a special Nordic Impact week (see www.nordicsgosocap.org) with strong inspiration from the pioneers behind Living Bridges Planet (see https:/livingbridgesplanet.wordpress.com/) and Impact Journey (now with more than 2300 members).

Robert Putnam's work on the importance of social capital and bonding between citizens, as well as bridging groups of views, is well known. This might set the context for social entrepreneurship and its innovations. A thrust to achieve social innovation is in progress in many countries. Among the pioneers is NESTA in the UK (see www.nesta.org.uk). In Sweden there has been much prototyping (see www.socialinnovation.se), as a Pentahelix Forum strives to develop social innovation and social entrepreneurship with borderless knowledge sharing.

9 Open Questions

The renaissance of a region or city is critical for wealth creation and the wellbeing of citizens. There is need for modern renaissance initiatives beyond appealing architecture! Who is in charge of the in-between spaces of the city? Where will the inverted maps of intangibles be produced and given attention? Perhaps appointing a Chief Conductor of the in-between spaces and brain circulation might be a suitable step? A special Knowledge and Ecology function for the quest for Wisdom Place and its renewal and renaissance, combined with an innovative political city regime, based on C&C and ICT for societal innovation?

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Further Reading

http://new-club-of-paris.org/ or on Facebook site https://www.facebook.com/New-Club-of-Paris-289294509793 (The New Club of Paris is since 2006 a network of some 160 persons exchanging perspectives, information and knowledge on societal innovation aspects)
www.NIC40.org
http://www.routledge.com/books/details/9780415737821
http://www.nic40.org/booklets.aspx
http://new-club-of-paris.org/
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Chapter 7
Bournemouth: Urban Beach Not Urban Jungle

Nick Hixson

1 Bournemouth as a Future Renaissance Hub

Bournemouth's location and urban beach setting are conducive to creativity and are attracting a young entrepreneurial population seeking a more immersive way of experiencing life in terms of both business and leisure. A compact footprint enables businesses to meet and collaborate without competing. There are no legacy industries with related cultural barriers, so people can think differently.

Recently, local government, universities and businesses have developed deeper relationships and a shared mental model with a common purpose, which has produced confidence and willingness to try new things. While other towns and cities in the UK have their own initiatives and local characteristics, few can match the convergence of creative talent, business acumen, political will, environmental beauty and sense of place that could see Bournemouth assert its position and identity as a renaissance hub in the future.

2 Historical Context

The conurbation of Bournemouth, Poole and Christchurch (hereafter 'the conurbation', or Bournemouth) lies in the south-east corner of the county of Dorset, which is in the middle of the south coast of England. It is the largest centre of population in Dorset, with approximately 400,000 out of a total for Dorset of 760,000.[1] Outside the conurbation, the county has essentially a rural and tourism economy.

[1] *Source:* https://www.dorsetforyou.com/statistics.

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The port of Poole has existed for 1000 years, and the small town of Christchurch nearly as long. The 18 km between the two towns remained mainly heathland and beach, populated by a few fishing huts, until 1810 when Bournemouth was founded as a health resort—it now fills the whole area between Poole and Christchurch. So, whilst there have been small population centres in the area for centuries, there has been none in Bournemouth and hence no older renaissance tradition upon which to draw. Artists, writers and scientists have visited and lived in Bournemouth from the Victorian period, but there is no evidence to suggest that they contributed, except incidentally, to any entrepreneurial resurgence.

Making up most of the 155 km UNESCO World Heritage coast, Dorset is regarded by many as one of the most sought-after places to live in the UK, because of its mild climate, beautiful environment and quality of life, and its year-round tourism economy. The conurbation alone has 12 km of beach front, the focal point for tourism and lifestyle activities.

There are five major industry groupings: financial services; tourism; advanced engineering; creative, digital and IT (CDIT); and language schools. The financial sector is one of the largest in the UK, attracting global interest and producing in excess of £1.6 billion (UKTI, 2015) in annual gross value added: Bournemouth is the location of the European headquarters for JPMorgan Chase & Co. (the area's largest employer), amongst others.

Bournemouth is one of the largest coastal tourism resorts in the UK, attracting over six million visitors each year (South West Research Company, 2015), thanks partly to its proximity to the Dorset countryside and coastline, with easy access from London and central England.

The conurbation has two world-leading defence contractors. Cobham plc and Meggitt Engineering plc, and is also home to Sunseeker International Ltd, the maker of luxury motor yachts. Specialized engineering is a large and growing sector, mainly coming from spin-offs from the former BAE production of airliners at Bournemouth Airport.

The CDIT sector, although starting from a small base, has been acknowledged as the fastest growing in the country outside London (Tech City UK, 2015), and currently accounts for over 350 businesses in the conurbation,[2] supported by the two universities and their specializations. CDIT is present in every aspect of life and endeavour and, whilst the sector is small in Bournemouth, it is the transforming agent for many of the other sectors' ways of working and engaging with their markets.

The conurbation has more language schools than anywhere in the UK apart from London, with a throughput of approximately 50,000 students a year.[3]

There is no history of legacy industries, and no large industrial footprint or any notable pollution issues that might have a negative impact on tourism. This brings mixed benefits. Whilst there is no large building space available for conversion, there is also no high unemployment arising from undue reliance on a single vanished

[2] See http://www.siliconsouth.org.uk/.

[3] *Source:* International Education Forum, Bournemouth and Poole.

industry. Crucially, there are no entrenched cultural barriers resulting from legacy issues, and thus new ways of thinking and working are more achievable.

Food and agritech are recognized industry strengths in Dorset, which is already home to many internationally recognized brands, such as Organix, Jordans, Ryvita and Dorset Cereals. The area also has a wealth of local and artisanal food and drink producers. Bournemouth & Poole is a founding member of the international Sustainable Food City Network and has become the world's first Sustainable Fish City.

Bournemouth enjoys better visibility in the rest of the country than its size might indicate, because of its status as a resort town, and also because it has two universities with specializations that draw students from all over the UK and abroad. It is reasonable to suggest that most people in the UK have a fair idea of what and where Bournemouth is.

3 Political and Geographical Considerations

Bournemouth has been regarded as the 'Victorian Las Vegas'—borne out of wilderness and often described as the largest non-industrial conurbation in Europe, without city status. However, the local government wishes to position it as a twenty-first century Garden City by the Sea, as part of a wider regeneration project. Major transport links are the regional airport, motorways north and east towards London and along the south coast through the significant ports of Southampton and Portsmouth. A frequent train service links Bournemouth to London, a journey which at best takes under 2 hours. Communications westwards are slower owing to the rural nature of Dorset and the lack of fast road and rail infrastructures. Whilst this is attractive for tourism, it reduces the opportunity for business growth to the west.

Politically stable, with one party dominating for years, Dorset has a complex set of unitary and district councils plus one overall county council. Bournemouth and Poole are already unitary authorities, meaning they have budget responsibility for most of their own services. The conurbation has already been designated by the UK government as one of 26 key mid-sized cities[4] of importance to the UK economy and in September 2015 a proposal to merge Bournemouth, Poole and Christchurch to create a new South East Dorset Council was announced. Apart from the need to make cost savings due to cuts in local authority funding, the UK government's devolution agenda is one of the main reasons for the proposed merger. A larger authority, it can be argued, would have greater influence and would encourage central government to devolve more power, which in turn would create more economic opportunities.

To encourage local use of funds for economic development, in 2011 the central government set up local enterprise partnerships (LEPs) around the country to bid for and channel central government money into locally approved projects. Most LEPs

[4] See http://www.keycities.co.uk/Bournemouth.

are based on conurbations, or overlap administrative boundaries and hence have competing priorities. Unusually, the Dorset LEP has the county of Dorset as its boundaries.[5]

Historically, the area between Poole and Christchurch grew very rapidly, to the extent that there is now little land available for building, partly owing to the constraints of the physical environment and partly to the need to maintain it both spatially and aesthetically to continue to attract large numbers of visitors.

So, geographically and politically the conurbation has some of the characteristics of a city state in that most of its activities are controlled by local government, and its boundaries are largely fixed.

4 Demographics

Bournemouth has one of the youngest populations in the UK,[6] but that is counterbalanced by a large older population due to its popularity as a retirement location. House prices are relatively high because Bournemouth attracts wealthy retirees with time on their hands—some of whom have an appetite to invest in businesses. In addition, more university graduates are staying in the area as the employment opportunities grow, and many are starting their own businesses, particularly in the CDIT sector.

There is low unemployment in the conurbation. Jobs were not notably affected by the 2008 recession because most of the working population possesses transferable skills, again owing to the lack of legacy industry. The working population is reasonably sector-balanced, and a growing multiculturalism is aided by the presence of the universities and language schools, and also by immigration (mainly from Eastern Europe). This is contributing to a growing tolerance and acceptance of new ways of thinking and ideas.

5 Industries

5.1 Financial Services

The conurbation hosts JPMorgan Chase, two building society head or regional offices (Teachers and Nationwide), several insurance head or regional offices, (Abbey Life, RIAS, LV=, Zurich, Vitality) and numerous smaller entities servicing them. Apart from high employment (JPMorgan Chase alone employs 4000 people in Bournemouth), the financial services industry attracts well-qualified professionals from the rest of the country.

[5] LEPs operate in England only: Northern Ireland, Scotland and Wales have different arrangements.

[6] See http://www.centreforcities.org/city/bournemouth/.

With their skills both in demand and transferable, financial services employees expect to change employer with relative ease. However, some elected to stay in the conurbation when their tenure ended because their families were settled in an environment that provided a good quality of life. This contrasts with the concern expressed by people in other sectors, such as CDIT, who perceive that there are fewer job opportunities, making a move to the conurbation less attractive.

The financial services sector in Bournemouth knows that it has to compete with larger financial centres nationally and globally which offer more job opportunities, and so it aims to make the quality of life and work experience more attractive in Bournemouth. An example is JPMorgan Chase, which competes for talent with its centres in New York and Singapore.

5.2 Tourism

Nearly 50,000 people work in tourism in Dorset, contributing £1.8 billion annually to the economy of the county. Of that total, 11,000 work in the conurbation, which contributes over £400 million (South West Research Company, 2015). Although Bournemouth accounts for more than half the population of Dorset, its lower per capita contribution to tourism spend can be explained by its position as a focal point for the rest of the tourism activities in the county and beyond.

As already noted, Dorset is a year-round tourist destination, with an emphasis on outdoor pursuits, many of which are easily accessed from the conurbation or are located within it. Many businesses expect people to leave work at a time that enables them to undertake some outdoor activity, and then perhaps continue working remotely later. This fits particularly well with the Millennial lifestyle, both for single people and for young families.

The tourism agenda, in making the conurbation as pleasant as possible to visit, also makes it attractive as an inward investment area and relocation destination.

5.3 Advanced Engineering

The conurbation is ringed by reasonably small industrial parks, many of which have developed from the supply chain companies that serviced BAE at Bournemouth Airport, where they built BAC 1-11 airliners. When production stopped in 1984, those suppliers realigned their business models into specialist engineering activities, partly learned from their experiences in supplying BAE. Also, because of the airport development based around the BAE facility, certain larger specialized software and engineering firms, including Schlumberger and Loewy Robertson (now part of VAI), started a small office which then grew. The expertise attracted to the area has allowed these satellites to maintain their footprint long after airline production has ceased—in contrast, for example, to the situation in the city of Bristol, where the supply chain is still centred on the production of aircraft in Filton.

The loss of airliner production at Bournemouth created an atoll effect, with the high-quality workforce in the supply chain wishing to remain in the area owing to the quality of life they experienced. From this desire, highly specialized and world-leading, but mainly small engineering companies have developed. They are quite disparate and have no common voice. However, a combination of environment, ambitious parents directing their children to specialist engineering careers, and some remaining large centres of engineering and engineering software, such as Schlumberger, Cobham, Meggitt and Sunseeker, has allowed the sector to replenish its workforce and thrive.

5.4 Creative, Digital and IT

The now defunct South West Regional Development Agency (one of nine Regional Development Agencies set up by the UK government in 1999 to lead the development of a sustainable economy) wanted to position Bristol in the west of England as the largest CDIT hub outside London. It funded an incubator for Bournemouth Universities' graduates to create CDIT start-ups in Bournemouth and later move their businesses, once established, to Bristol, 120 km away. The incubator was not fit for purpose as it was too small, but the availability of incubator space and the environment allowed graduates to test new ideas, and many remained in the conurbation, creating an embryonic CDIT hub.

There are no significant population centres west of Bournemouth until Exeter, which is some 140 km away, or north-west to Bristol. The large port of Southampton, 50 km east of Bournemouth, is on the road and rail routes from Bournemouth to London. Brighton is 130 km east of Bournemouth and 1 hour from London. Both Southampton and Brighton have CDIT aspirations.

Bournemouth, being 2 hours from London, appears to be far enough for businesses to want to relocate rather than commute, but close enough to travel to London on business. People living in Southampton and Brighton tend to commute daily to London, which has the largest digital hub in the UK based around Tech City in Shoreditch (see Brewer and Rees, 2013). Some international visitors to London regard Bournemouth as almost a suburb of the capital city.

Southampton and Brighton, being commuter towns, are much smaller CDIT centres and their businesses tend to be smaller. Bournemouth, on the other hand, has a greater proportion of larger digital agencies.

Anecdotally, the proximity effect appears to be an important factor in differentiating Bournemouth from those population centres nearer London with CDIT aspirations and a contributing factor to its recent rapid expansion of digital and creative businesses. Generally, people want to live and work where there is a good quality of life, and businesses need to compete both nationally and internationally. Bournemouth, being home to the UK's largest pure fibre-to-the-premises network, fulfils both needs.

Locally, the availability and culture of CDIT in the conurbation have allowed it to pervade other sectors more easily, so that all major sectors benefit from a better

digital understanding. In recognition of the growing CDIT sector, a digital manifesto was jointly created by local government, Members of Parliament, universities and businesses (Dorset LEP 2013). This manifesto set in place plans and commitments to make Dorset and the conurbation an international hub for CDIT industries. It is supported by Silicon South, a digital and creative hub designed to encourage existing businesses and assist inward investment of money and talent. Silicon South is in turn supported by the Dorset Local Enterprise Partnership for funding and infrastructure. Local industry leaders and influencers have facilitated dialogue and created self-organized support networks that have enabled many serendipitous collaborations.

The sector has grown from very small beginnings and there are currently over 350 CDIT businesses in the conurbation.[7] There are established full-service digital agencies with an international presence, such as Emerge Group, Redweb and Bright Blue Day—these are medium-sized business. There are games and app developers like Amuzo and 3 Sided Cube, which also trade internationally, together with the VFX Hub at the Arts University Bournemouth (AUB). Oscar-winning Framestore located their only regional outpost at AUB because its curriculum produces graduates with a blend of technical and visualization skills necessary for the visual effects industry.

In addition, there are digital start-ups such as Nourish Care—a fast-growing mobile and cloud healthcare system developer with an increasingly national reach. It has partnered with Silicon South, Poole Council and Bournemouth and Poole College in creating a Living Lab. This is one of several early start-up healthcare facilities in the conurbation. Nourish Care is solving a modern social problem. By using a combination of technology and people to maintain independence for the elderly, it is providing peace of mind to distant families and helping to reduce costs for local authorities and the health system. Nourish Care would not exist without the blend of creativity and technology needed to resolve this major public issue.

The larger agencies find it easy to recruit graduates because the local universities produce a great many every year, but they find it more difficult to recruit more senior employees, who would have to relocate from, for example, London. Potential employees are aware that if the new employment offered in Bournemouth proves unsuitable an alternative job may be difficult to find. According to local anecdotes, some do not relocate to Bournemouth because of this concern; others do and, encountering this problem or for other reasons, leave their employer and form their own agency. Frequently, they then grow their business to a size at which their work–life balance is where they wish it to be, and then stop growing.

However, most businesses are small niche players who may band together to undertake larger projects, or have specialisms that a particular project needs. The CDIT sector is still small in terms of numbers of people (over 8000) and economic impact (£350 million a year),[8] but it is growing here at a faster rate than anywhere else in the UK (Tech City UK, 2015). Through serendipitous meetings and the abil-

[7] See http://www.siliconsouth.org.uk/.

[8] See http://www.siliconsouth.org.uk/.

ity of businesses to collaborate and create their own networking, both business and social, the sector has evolved to be vibrant and outward facing. Meetdraw, for instance, one of more than a dozen largely self-organized events, attracts over 1000 participants interested in mutual learning and collaboration in a social setting.

Anecdotally, it is thought that at least half of the businesses in the sector have customers outside the area. As a result of this reduced internal competitiveness, people are more willing to share ideas with others in the sector and CDIT businesses are open to collaborating with each other when taking on larger projects. A practical example of the latter would be the facility opened by the developer Base: this is the largest Open Device Lab in the world, which is freely available to other developers to test out their apps on all kinds of smartphones and related technology (see Open Device Lab, 2013). It is this aspect of people and community together which differentiates the conurbation from other CDIT hubs, such as that in London.

Whilst the sector started at a very low base and is still relatively small, it has produced much activity for its size and is now very well known nationally and internationally.

6 Local Government

Until 1974 Bournemouth and Christchurch were in the neighbouring county of Hampshire, at which point both towns became subsumed into an extended Dorset. Tensions between Bournemouth and Poole have persisted since then, although the need to rationalize public services since the recession of 2008 has led to a gradual erosion of boundary perceptions and issues, such that there is greater collaboration and a greater sense of common purpose.

Bournemouth, Poole and Christchurch all have a common, politically stable local government. This has encouraged businesses to invest, because they feel there is some certainty in direction. Both unitary authorities are very business-friendly, and wish to be seen to be supportive and trusted. There is a recognition that entrepreneurs do not care about geopolitical borders—a concept better understood by the growing number of younger elected representatives. Local government maintains an overall permissive environment in that while politicians, whether local or national, may be naturally anxious about new initiatives, the unitary authorities are willing to try unusual initiatives that can have positive ripple effects across sectors. For example, Boscombe, a deprived area of Bournemouth, has been subject to ongoing regeneration. This process started with ribbon development, expanding its facilities along the shore to join up with the Bournemouth town centre, and then moving back into the heart of the area. This development has encouraged an influx of younger, more daring people and has thus brought small local businesses into the area, again improving the overall ambience. At the same time, the tourism footprint has broadened.

The overall mentality is that of a town, rather than a city. The conurbation is small enough to get from one place to another relatively quickly. There are plenty of meeting opportunities, either self-organized, as with the CDIT sector, or facilitated by local government, universities, chambers of commerce and other bodies.

The Dorset Local Enterprise Partnership (Dorset LEP) has close links with national government and has developed a trust model over the last 5 years, so that the national government now expects Dorset LEP to deliver results on time and on budget. As a more trusted LEP, it gets more opportunities to develop the area. It also has strong links with local Members of Parliament who are supportive, involved and business-friendly. The LEP sees itself as an enabler, providing infrastructure and opportunity to allow businesses to develop in ways they find most appropriate.

Local government and the LEP are aware of the various sector skills, and are supportive of growth plans because they wish to retain talent and economic activity in the area. As is usual with government, it did not initiate change but has clearly observed that the conurbation has growth potential in key sectors and is encouraging those directions. Local government has an overall ethos of getting out of the way (removing overregulation, etc.) and allowing things to happen. It wishes to facilitate and encourage a confident culture and to capitalize on the good publicity that tourism and, in particular, the CDIT sector has created.

A good network is critical to digital success for any business sector. Bournemouth is home to the UK's largest pure fibre-to-the-premises network, which delivers reliable speeds of up to 1000 Mbps.[9] Bournemouth Council also employed Fusion WiFi, a small local business beating larger national competitors to install the world's fastest free, outdoor, public Wi-Fi network. Fusion WiFi was funded by the Digital Accelerator, an incubator administered by Silicon South.

Bournemouth won the Digital Council of the Year Award for 2015, exemplifying how local government can engage with the businesses it is seeking to support. There is an overall understanding of how the various elements of the conurbation, such as tourism, education, lifestyle and infrastructure interrelate to form its personality. Local government is clear that this understanding is key to attracting and retaining a vibrant entrepreneurial blend of businesses.

7 Education

7.1 University Impact

Bournemouth University (BU) is a middle-sized university which aims to create a distinctive offer based on specialisms such as computer animation, health and orthopaedics, forensic science, cyber security, tourism and environmental science. Arts University Bournemouth (AUB) is a small specialist university adjacent to BU's main campus. Taking the two universities together, there are graduates working in practically every Hollywood studio due to the industry demand for their unique blend of technical ability and visualization skills.

Apart from the two universities, there is also Bournemouth and Poole College (BPC), a large further education college which produces many apprentices and acts

[9] See http://www.siliconsouth.org.uk/.

as a feeder to the universities' undergraduate programmes. The College has dedicated facilities and specializations in areas such as financial services, marine engineering apprenticeships and other advanced engineering activities, and an academy for young entrepreneurs where half of the course content has to be delivered by business people.

Whilst BU is relatively new, it has some world-class research facilities, and it independently recognized the growth in CDIT, which it encouraged through its course offering. BU has focused on developing its academic standing first and, second, on contributing to the economic growth of the region. Its academic standing has enabled it to attract better-quality academic staff, which in turn has attracted funding, improving its overall offer and footprint. BU is developing satellite centres of excellence around the city which will act as living laboratories for health, finance and tourism. These resources will be close to existing business clusters, enabling those businesses to test innovations through collaborative working.

Separately AUB, a smaller centre of excellence, has designed its physical environment to encourage the mixing of different disciplines so that staff and students can interact and learn from one another by being in close proximity.

Both universities believe in turning STEM (science, technology, engineering and maths) into STEAM, incorporating 'a' for art, because they regard this as the pathway to a truly immersive experience for students that will equip them more effectively for work. The universities manage their resources separately, but provide a complementary offering to the region as a whole.

7.2 Language Schools

This sector contributes £300 million to the local economy annually. It also contributes a multicultural and usually young addition to the population, even if temporarily. There are 50,000 students at any one time in the conurbation studying English. Because the area is geared for tourism, it can absorb large numbers of extra people and accommodate them semi-permanently.[10]

This blend of tourism and language schools provides for a more tolerant society, open to diversity, multiculturalism and an inflow of new ideas.

8 Employment, Business and Demographics

Owing to the fallout from the recession in the UK, the cost of capital is at an all-time low and there are members of the wealthy, retired population in Bournemouth who are willing to assist start-ups with time and money. There is a general willingness to

[10] The source for the statistics in this paragraph is the International Education Forum, Bournemouth and Poole.

engage. Overall, the gross value added in this area is average compared with other UK towns of similar size. However, Bournemouth is dynamic in its key sectors. Unlike the dominant cities and large sector clusters, there is no aggregation at the macro-level, but in specific small areas it is world-leading. In these areas people are well connected internationally.

Whilst some graduates remain in the conurbation, many others leave for the big cities and, after developing their skills, commonly find it difficult to achieve a work–life balance, especially if they start a family. They then look away from the city and often return to places where they have formerly lived, like Bournemouth. Given that most people in the country know where Bournemouth is and many have visited it, there is a general knowledge of the area and this has created both a large diaspora of graduates and repeat tourism. The area thus draws people back to provide the middle and senior managers much needed in some sectors. In addition, relocation by larger employers also brings people to the area who decide to stay.

Empirical data suggests that there are broadly four types of business people: high-potential entrepreneurs who wish to start a business and grow it rapidly, usually with an exit in view; lifestylers who relocate their business to an area which is more pleasant or build it to a certain level and then slow down; those involved with low-growth businesses, which often include engineering and family businesses; and survivors, such as small retail and service business owners who employ just a few people and effectively have a job with rather less freedom than if they were employed.

The conurbation attracts a lot of lifestyle businesses because of the environmental benefits. It also has many survivors, especially in the tourism sector where there are numerous small hotels and restaurants which may have been set up for lifestyle reasons but which have not grown enough to achieve the desired work–life balance. Whilst a high proportion of survivors is common in other parts of the country, Bournemouth has a greater proportion of lifestylers, who generate more economic activity than survivors. The number of start-ups in the conurbation is higher than the national average; some of them are high-potential and some start off as high-potential and then mutate into lifestylers. There are also low-growth businesses in engineering, but the advanced engineering sector is generally more lifestyle-oriented.

The local government wishes to capitalize on environmental and work–life balance aspirations by creating a version of the South East of England economy in a South West environment, combining the vibrancy and growth of the South East with the environmental and work–life benefits of the South West. There is a desire to promote and develop the personality of the area, with reference to Richard Florida (2015), as an outgoing, cosmopolitan, outdoors lifestyle destination.

Good infrastructure, physical proximity and an appropriate work–life balance in a beautiful environment are all motivators for a young working population. Such conditions help them to experiment and give meaning to their work and seem closely aligned with the motivations of the millennial generation, who want a blend of purpose, community and fun.

9 Renaissance Indications

Various characteristics, taken together, point to a small but rapidly growing renaissance movement in Bournemouth:

1. Because of its physical constraints, both in perimeter and size, Bournemouth has some of the characteristics of a city state, in that it is reasonably quick to traverse and it is well connected to other more powerful city states, such as London.
2. The attractive physical environment encourages people to stay. The modern view of a good work–life balance in pleasant surroundings is encouraged and supported by the tourism industry, local government and the natural environment. With the presence of abundant hospitality outlets and high-speed free Wi-Fi, a café society has developed which is used by freelancers and established businesses, adding to the relaxed manner in which work is carried out.
3. The area has the ability to absorb more residents, at least semi-permanently, so that people can enter the area, explore ideas, experience the environment and then stay or leave.
4. There is tolerance and acceptance of a multicultural and diverse population through tourism, the language schools and the universities.
5. The lack of legacy industry means that there are no entrenched cultural barriers to learning new ways of working.
6. The modern 'ruling class'—local government—is stable and supportive of collaboration and investment and facilitates growth in the key sectors it has identified.
7. Entrepreneurs feel that local government in Bournemouth, compared with other large towns in the south of England, is more open to business, and the local universities produce the right type of graduates with the skill sets needed for high-potential firms.
8. The universities have created a blend of research, curriculum design and business involvement that improves student employability. As a consequence, there have been more and deeper student–business relationships, resulting in more graduates remaining in the conurbation to work or start a business. This increase in graduate numbers has deepened the relationships between businesses and the universities.
9. Some high-potential entrepreneurs prefer the local environment and do not feel that London is as conducive to creativity due to its impact on work–life balance and a considerably higher cost base.
10. Older retirees provide mentoring and investment opportunities, acting as seigneurs.
11. Entrepreneurial activity is not constrained by the need to preserve intellectual property because many businesses are non-competitive and may collaborate, with open-source resources.
12. Because some of the sectors, such as CDIT, are quite young, there is no 'guild mentality' and so few firms develop protectionist practices that reduce originality and innovation.

13. Internal self-developed networks have arisen in the conurbation to support specific sectors, in particular CDIT.
14. There is a general feeling of confidence and a willingness to try new things, together with a sense of collaboration and trust, especially in the CDIT sector (and there are some good examples of this in the local government).
15. There is a feeling of self-perpetuation, in that there has now been enough activity and publicity to make the area continue to grow over the next 5 years in key sectors.

Because of its size, the conurbation is and may always be a follower of larger renaissance centres. However, Bournemouth has unique flavours that allow it to show leading characteristics. There is a shared mental model of beliefs, values and objectives among local government, education and business. Its developing personality, coupled with a more immersive way of experiencing life in both business and leisure, makes the conurbation unusual in the UK.

Whilst other towns and cities in the UK have their own initiatives and local characteristics, few can match the convergence of creative talent, business acumen, political will, environmental beauty and sense of place that could see Bournemouth assert its identity as a renaissance hub in the future.

10 Bournemouth: Finding Commonalities and Points of Inflection

In an effort to ascertain commonalities and points of inflection, interviews were conducted with leading figures, in the area from local government, trade bodies, educators and business people.

- Gordon Page, Chair, Dorset Local Enterprise Partnership (DLEP)
- David Ford, CEO, Bright Blue Day (a large digital agency) and Chairman of Silicon South
- Matt Desmier, influencer in the CDIT sector and Silicon Beach conference founder
- Nuno Almeida, CEO, Nourish Care (a high-potential tech start-up)
- Ian Girling, CEO, Dorset Chamber of Commerce and Industry
- Professor John Fletcher, Pro-Vice Chancellor, Bournemouth University
- Chris Shepherd, Economic Development Manager, Bournemouth Borough Council
- Ruth Spencer, Economic Development Officer, Bournemouth Borough Council
- Adrian Trevett, Economic Development Officer, Borough of Poole
- Stuart Bartholomew, Principal, Arts University Bournemouth
- Simon Pride, Head of Marketing and Communications, Arts University Bournemouth
- Bill Cotton, Director of Environment and Economy, Bournemouth Borough Council

- Professor Jim Roach, Business Engagement Leader, Bournemouth University
- Professor Nigel Jump, Regional Economic Development, Bournemouth University
- Various business owners and entrepreneurs from the CDIT and food and drink sectors, including Rad Dougall, Lumiserv; Rupert Holloway, Conker Spirit; Damien Lee, Mr Lee's Noodles; and Mark Cribb, Urban Guild.

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Chapter 8
Dublin's and Ireland's Entrepreneurial Revolution: The Force Awakens

Peter Robbins

1 Dublin Then and Now

In 2016 Dublin celebrates the centenary of the infamous Easter Rising. In 1916 a bunch of schoolteachers, trade-union activists and poets decided to take on the might of the British Empire and declare Ireland a Republic. They seized control of key buildings in the city in an attempt to force the British to deliver the Home Rule Bill that they had for so long promised, but upon which they had invariably reneged. Interestingly, with no military strategists among the revolutionaries, the buildings of which they took possession were not the arteries of government or seats of power; instead, they occupied a post office, a public park, a flourmill and a bakery. British retaliation was swift and emphatic. A century ago, Dublin was in ruins, with English artillery fire having blasted large holes through the city, eviscerating many of its landmark buildings. The insurgents had been court-martialled rather than tried by a jury, and summarily executed. A terrible beauty was born.

Exactly 100 years later, Dublin is a thriving metropolis that is home to many of the world's top companies as well as a magnet for high-potential start-ups. In fact, Dublin has legitimate claims as the start-up capital of Europe. Half of the population is under the age of 30. It is a modern, dynamic, vibrant city which has left that bloody but heroic legacy far behind. On the very centenary of the day the revolutionaries were shot by firing squad, Ireland was named as the EU's fastest growing economy for the second year in a row, according to new figures from the European Commission (2016). Guttman (2015) reported that Dublin's first Commissioner for Start-ups, Niamh Bushnell, believed that the city's start-up scene was set to grow at least 30% in 2016. Bushnell, an entrepreneur herself, was appointed in 2015 to help grow Dublin's start-up community and help boost the profiles of home-grown Irish entrepreneurs whose success stories may not be sufficiently well known. Ireland's

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hosting in November 2016 of the Start-Up Nations Summit in Cork marked the first time the event had ever been held in Europe (see Roche 2016).

In the Good Country Index, which measures a range of impacts and has as its objective the creation of a ranking of how much each country contributes to the welfare of the rest of the world, Ireland is ranked No. 1. The Index's definition of a good country is worth stating: 'a country that serves the interests of its own people, but without harming—and preferably by advancing—the interests of people in other countries too' (Anholt and Govers 2016).

The Global Entrepreneurship Monitor (GEM) Report shows 30,000 new businesses are being set up in Ireland (Fitzsimons and O'Gorman 2014) every year, roughly 2700 per month, and this high level of activity has delivered the ideas, the energy and economic activity to power the recovery in Ireland. According to Bushnell (2016), over $300 million in funding was secured by Dublin-based start-ups in 2015. Over 46% of that funding was raised through international investors, and investments at seed stage represented 10% of the total. The Irish government, through its agency Enterprise Ireland, plays a vital role in early-stage investment in Ireland, and Dublin has a strong and growing venture capital and angel investor community.

Several global surveys and rankings are suddenly finding Dublin coming into view and attracting positive attention. One among them, the City Momentum Index of 120 cities, compiled by global real estate services firm Jones Lang LaSalle (JLL), ranked London first, followed by Silicon Valley, then Dublin, Bangalore and Boston. Dublin and London are the only European cities in the Index's top 20. According to the Index, the current cycle of globalization, urbanization and technological advancement is leading to a major change of the global urban pecking order. In this new era, success revolves around innovation. As if to emphasize this, the title of the report is *The Rise of the Innovation-Oriented City* (JLL Cities Research Centre 2016).

Separately, the 2015 Global Innovation Index (GII) ranked Ireland as No. 8 in the world standings for innovation (Dutta et al. 2015). This ranks Ireland ahead of Germany, Denmark, Australia and Canada—all countries with a deserved reputation for innovation and entrepreneurship. The GII covers 141 economies around the world and uses 79 indicators across a range of themes: it thus reveals a rich dataset to identify and analyse global innovation trends. Ireland scores very well against all the metrics. Ireland's 4.9% GDP growth rate contrasted with the Euro Zone average of 1.6% growth expected in 2016, down slightly from the 1.7% growth forecast in February 2016. The GII is intended to help countries to design policies to facilitate innovation-driven economic growth.

Ireland is also punching above its weight in the rankings for research and development. R&D is said to be the engine room and starting point for most commercial innovation (Robbins and O'Gorman 2015). In its strategy *Innovation 2020*, Ireland aims to be a global innovation leader. This ambition will be underpinned by excellent research activity in key areas; an international enterprise base; a world-class pool of talent; and a vibrant research and innovation ecosystem. Launching Ireland's programme in December 2015, Junior Minister, Damien English said, 'Our success

in delivering on our vision will depend on our people—undertaking the research, working in and creating successful enterprises, and contributing to the society in which we live' (SFI 2015).

A few things are needed to make that happen. The Industrial R&D Investment Scoreboard (Hernández et al. 2015) shows businesses in Europe lagging far behind their international competitors in terms of R&D investment growth rate. Europe's rate was 3.3% while the US registered 8.6% and China over 23%. But Ireland is doing well, with an R&D spend increase, according to this survey, of over 15% year on year. This is largely attributable to significant investment from a number of particular large firms with a high R&D intensity: Medtronic, Allergan, Seagate and Alkermes. Ireland's strong showing is based on a few positive moves; one the change in location of Medtronic's HQ to Galway and some recent and sizeable acquisitions of Allergan.

In short, Ireland is standing tall. Its share of FDI is disproportionate to its size. According to Ireland's Industrial Development Authority (2016), it is home to major hubs of nine of the top ten pharmaceutical companies and nine of the top ten ICT businesses, and most of the world's fastest growing businesses have some presence in Ireland. Its start-up ecosystem is the envy of Europe and some of Ireland's smart young people are behind businesses like Stripe and the Web Summit. It has a thriving R&D environment with substantial links between academia, industry and the state. Underpinned by all this, it is now the fastest growing economy in the EU.

One more thing: Ireland was the location chosen for filming the dramatic scenes of the 2015 film *Star Wars: The Force Awakens*. Film buffs and culturally curious tourists are flocking to see where Luke Skywalker has been hanging out all this time.

One question this paper attempts to answer is: how did all that happen?

To return to history for a moment, following the Easter Rising in 1916 Ireland was catapulted into a long, brutal and pointless civil war. Then, in the mid-1920s, political stability was restored, but the country was a barren wasteland in terms of economic development. Under the ascetic and Catholic leadership of the then Taoiseach (Prime Minister) Éamon de Valera, Ireland pursued isolationist, inward-looking policies in the vain hope of becoming self-sufficient and of not having to engage in international affairs and trade. Ireland was a closed, insular and doomed economic entity. Then came the Great Depression. According to Ollerenshaw (1987), Irish share prices hit a peak in 1898 (when the British were still in charge) and then went into almost terminal decline until 1930, long after Ireland's civil war. The state coffers were similarly affected by the costs of all the violence of the civil war and they were in deficit from the granting of independence until 1931. It was a largely agrarian economy, with only one trade partner, the UK, with whom it traded mainly beef and dairy products. Ireland was facing into a perfect storm: powerful leadership with poor judgment; an anaemic domestic market; no financial system; little innovation; and a closed economy which was, anyway, in recession.

2 Fast Forward to 2000

Several academics and policy makers have analysed Ireland's economic ascent in the 1990s, its subsequent steep and merciless descent from 2006 to 2014 and, finally, its redemption and recovery. Chief among them was Professor Brendan Walsh who, with Patrick Honohan (former head of Ireland's Central Bank), published a seminal paper in 2002 entitled 'The Irish Hare; catching up with the leaders'. The hare metaphor was intended to be a counterpoint to those who were describing Ireland's economic performance in terms of a 'Tiger' economy. Honohan and Walsh (2002) argued that they preferred Aesop's hare—long and somnolent, dashing to catch up with the slow and steady tortoise—as a metaphor for the Irish economy's performance. It was, they argued, more apposite than the widely touted 'Celtic Tiger', which is 'zoologically improbable', whereas the hare is one of the largest wild animals actually native to Ireland.

Honohan and Walsh (2002) describe how Ireland was

> …transformed from a poverty-stricken, peasant economy that had served as a source of cheap labour for booming cities in Britain and North America to an economy that, at the start of the twentieth century, boasted wages—in some sectors of the urban economy at least—close to those prevailing across the Irish Sea.' (Honohan and Walsh 2002: 2)

Commentators generally agree on the fact that Ireland was underperforming its EU neighbours in the post-war period. But in the 1990s various factors conspired to turn the tables and fuelled the long-awaited economic growth for Ireland. According to Datamonitor's *Country Analysis Report* (2008), these factors included favourable demographics, a well-educated workforce, high productivity and a business-friendly environment, a labour force that had signed up to collective pay agreements, an English-speaking population, and, most important of all, low corporate tax rates. All these attributes enabled Ireland to position itself effectively as *the* gateway to EU markets, particularly for US foreign direct investment (FDI).

From about 1995 to 2002, productivity was increasing, the fiscal position of the Irish state was very strong and the unemployment rate fell to around 4%, a level economists consider to be definable as 'full employment'. It was around this time that Ireland earned the epithet of the Celtic Tiger. Its economy was widely seen as one of the most successful in the world; and yet, since then, it has been among the hardest hit by the global financial crisis.

From the mid-1990s to 2007, Ireland enjoyed strong economic growth; but this is a 'tale of two cities' or possibly 'a game of two halves'. The first phase of growth lasted from the mid-1990s until the early 2000s, and can be described as one of 'catching-up growth': after years of lagging behind, there was a rapid convergence of Irish living standards towards those of the world's most successful economies. There were two main factors behind this. First, high birth rates gave rise to an increase in the number of workers entering the workforce market. Second, significant investment and improvement in the educational level of the workforce meant that these new employees had higher productivity and were more suited to the development of the knowledge economy that was emerging.

Other factors also contributed to this story. In particular, the arrival of the EU single market made Ireland an attractive location for inward investment, especially from the USA, and helped to boost Irish exports.

3 The End of the Beginning

From roughly 2002 until 2007, however, this high-growth dynamic changed in fundamental ways. The high growth rates were mainly based on the rapid expansion of credit and an accompanying build-up of personal indebtedness by Irish households. This was fuelled, above all else, by rising property prices. During this period, construction activity increased very strongly, accounting for a much larger share of the economy and employment than had previously been the case. So, although the public finances still appeared strong, this was misleading, because a disproportionate amount of the revenue the State took in was related to the property market. The property-related revenues included not only stamp duty and capital gains tax but, just as important, a large amount of VAT paid by developers as well as income tax paid by workers in the very large construction sector. The tax base was effectively very narrow and dependent to a large extent on the housing boom.

With unkind irony, the beginning of the Irish crash is said to have begun on 17 March 2008. The 'St Patrick's Day Massacre' saw shares in Anglo Irish Bank lose a fifth of their value (O'Hara et al. 2008). A full-scale economic crisis, every government and every citizen's worst nightmare, was being presaged by a banking crisis.

But there was also a public finance crisis, the scale and speed of which was, if anything, even more shocking than in the banking crisis. By July, the budget balance had imploded from a small surplus to a deficit of more than 7% of annual economic output (GDP), as the construction industry and property market came to a dead halt. Three hundred thousand people lost their jobs; the economy was in freefall. Hundreds of thousands of people ended up in debt as the price of their homes plummeted. The effect was exacerbated by a dramatic increase in the scale of debt problems, including significant negative equity issues for homeowners (Whelan et al. 2016). Lawless et al. (2014) reported that, between the first quarter of 2008 and the fourth quarter of 2010, real GDP and real gross national product (GNP) in Ireland fell by 10.3% and 10.9%, respectively; GNP at current market prices fell by 17.5%, while unemployment rose from 4.8% to 14.8% over the same time period.

The government of the day, which had adopted 'light touch regulation', suggested that it had not seen the crash coming. But, of course, economic commentators had been warning that the good times were built on an unsound foundation. However, the government, benefiting from the high taxes that any property boom brings, were unwilling to listen and had allowed the bubble to swell until eventually they had to implore the EU and IMF privately to come to Ireland's rescue.

Generally regarded as the mainstay of a sustainable economy, the SME sector comprises firms that are largely indigenous and employment-intensive. SMEs are

important players in national innovation ecosystems, even if only because they are so numerous and account for the bulk of economic activity in most economies (Veugelers 2008). In 2007, SMEs accounted for 99% of enterprises in the EU, estimated to be 20 million separate businesses, and they provided two-thirds of employment (Robbins and O'Gorman 2016). Similarly, in Ireland SMEs make up a substantial proportion of the enterprise economy, with more than 99% of businesses in this sector and 69% of people employed by them.

4 The Redemption

At the height of the recession, one of Ireland's leading economists—the one who had predicted the economic collapse with such foresight and precision—had another idea. David McWilliams is better known as an author, broadcaster and journalist, but is also an economist. He proposed that, in order to generate novel, creative ideas to help Ireland out of the recession, the help of the Irish diaspora needed to be enlisted, and especially those who had done well and were influential and well connected in business. This was a Design Thinking and entrepreneurial approach—*effectuation* on a grand scale.

McWilliams enlisted the support of the government, which agreed to sponsor a massive 'Irish diaspora, CEO Hackathon' in one of Dublin's stately homes, Farmleigh House. The guest list was extensive and impressive: some 112 people attended from abroad, including 44 from the USA and others from Britain, Europe, Argentina, Australia, Canada, China, Indonesia, Korea, Malaysia, New Zealand, the Philippines, Russia, Saudi Arabia, Singapore, South Africa and the UAE. The overseas participants were joined by the Irish Prime Minister, members of the government, Secretaries General of government departments, CEOs of state agencies and leading members of the Irish business and cultural sectors. The group was called the Global Irish Network and the session the Global Irish Economic Forum (styled as a national version of Davos).

Speaking at the launch, in November 2011, Ireland's Taoiseach, Enda Kenny, said:

> The ingenuity, creativity and success of the Irish diaspora is legendary as is their desire to contribute to their homeland in times of crisis; to help turn times of crisis into opportunities for Ireland. The Government is determined that the success of the Global Irish Economic Forum yields real results, particularly in the area of inward investment and job creation. (Department of Foreign Affairs and Trade, November 2011)

The programme and proceedings were all made public, but two major contributions have made their way into folklore. The first, by Craig Barrett, a former CEO of Intel, advised Ireland to put her eggs in the basket labelled STEM. He said that the future would be an 'ology'. It could be technology; nanotechnology; or fin

technology.[1] With Cloud computing and Internet of Things (IoT) on the way and software as a service becoming more popular, Ireland needed, he said, graduates who were excellent in maths and engineering. His advice was for Ireland to concentrate resources on teaching mathematics better and focusing more on science and engineering.

An opposing view was taken by a leading Irish financial services entrepreneur. Dermot Desmond is widely recognized as one of Ireland's most successful business people. Desmond took a more marketing-led approach. He noted that what Ireland is really good at should be extracted, invested in and amplified so that it became world-class. He proposed that what Ireland is good at is the arts: the nation has more Nobel Prizes for Literature than any country of comparable size; it has world-beating music artists, brilliant playwrights, successful actors and talented poets. Desmond's proposal was to offer a different path to STEM and to follow the arts and create in Ireland a 'Harvard of the Arts'.

In pursuing this idea, Desmond reached out to a number of Ireland's high-profile, artistic community. As one newspaper reported shortly afterwards, under the headline: 'Irish billionaire to create global arts and culture university',

> Dermot Desmond, one of Ireland's leading business figures, has written to major Irish names in the arts and culture asking for their help. Included are musicians Bono and U2, Enya, The Corrs and Van Morrison; actors Daniel Day-Lewis, Colin Farrell and Liam Neeson; directors Neil Jordan and Jim Sheridan; and writers Brian Friel, Roddy Doyle and Sebastian Barry. (Walsh 2009)

The idea was being called the Cultural Odyssey and it is a little unfair or certainly overly simplistic to say that it was totally agnostic about the STEM philosophy. In fact, Desmond said in the letter to Ireland's artistic community that Ireland should 'exploit its deep and world-renowned cultural legacy and talent to establish a global university focusing on culture and the performing arts'. 'As the world economy continues its inexorable shift to becoming knowledge-based, we have many competitive advantages,' he wrote; and, further, 'The combination of our cultural pedigree and our technological leadership suggests to me that we can create a lasting opportunity for Ireland's future generations'.

The project came to be known as OdysseyU, the university of the performing arts in Ireland. The concept itself underpinned the notion that, while STEM is an important capability for an educated workforce, without creativity and novel, original, creative ideas, no amount of technology can drive an economy. The project is now up and running and is part of our university landscape, although it has no campus; it triages elements of M.Sc. programmes from partner universities and is an educational innovation in itself—it's called Uversity.

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[1] Originally, the term [fin technology] applied to technology applied to the back-end of established consumer and trade financial institutions. Since the end of the first decade of the twenty-first century, the term has expanded to include any technological innovation in the financial sector, including innovations in financial literacy and education, retail banking, investment and even crypto-currencies like bitcoin. See: http://www.investopedia.com/terms/f/fintech.asp (accessed 10 November 2016).

Although redemption did not come exclusively in the form of the 'Harvard of the Arts', the project certainly informed the national debate and the rhetoric about creating an enterprise culture that values creativity. Perhaps neither Barrett nor Desmond were absolutely right. The answer lies in the grey area between the two. Curley and Formica (2013) recommended creating the conditions for entrepreneurship in an interdisciplinary environment where the boundaries between the arts and engineering are blurred and where the idea, not the academic disciplines of the team members, is paramount.

5 Case Study of Maynooth University

Ireland is home to seven universities (not including Uversity). In 1592, Trinity College was founded as a branch of Cambridge University in England for the Irish protestant aristocracy. That makes Trinity indisputably Ireland's oldest university. However, Maynooth is both one of Ireland's oldest and one of its newest universities. It was originally founded in 1795, under the name of St Patrick's College, as a seminary for the training of Catholic priests. It was thought that those in training to take holy orders on mainland Europe in the late eighteenth century might be susceptible to the scent of revolution in Europe and, unhelpfully, bring it back to Ireland. Hence, it was decided to open up a domestic priestly seminary and this was Maynooth.

In 1966, the campus was opened up to students from outside religious life, and this development gave it the first growth spurt. In 1997 it became a full member of the National University of Ireland (NUI) family, which includes all the major universities in the country. Maynooth is now Ireland's fastest-growing university, with close on 10,000 students. In 2009, NUI Maynooth was listed as a Top 500 university in the Times Higher Education–QS World University Rankings (Times Higher Education 2016): in 2016, it broke through the next level and is ranked now between 350 and 400. In 2008 it was named Sunday Times University of the Year. In 2011 NUI Maynooth became the first and only institution outside North America to be included in the Princeton Review of Best Colleges.

It was only in 2007 that Maynooth University chose to open a business school. Its orientation towards theology had meant that business was not a key priority, but opening the school showed the university that there was a large demand for undergraduate business courses and for business education in the hinterland. Quite quickly, business became the largest department in the entire university. Maynooth then set up a technology transfer office to try to maximize and harvest the revenue deriving from business ideas that spun out of the university. However, one of the issues that emerged was that the ideas were not as plentiful and certainly not as novel as the university could have wished for. With regard to how business was taught in the university, it was very conventional—teaching students how to pull the

levers of existing businesses. There was a strong focus on accountancy, economics, supply chain and project management and less on the right brain, creative elements. The Princeton Review also coincided with two other elements; the EU report on the teaching of entrepreneurship (European Commission 2007) and the spectacular rise in the theory and practice of Design Thinking. As a result, a decision was made to set up a small centre for entrepreneurship and design innovation within the university. The acronym EDEN was chosen.

5.1 Building an EDEN

Professor Piero Formica was consulted widely in the design of EDEN. His strong belief is that the entrepreneurial process is not a linear progression from lightbulb moment to successful commercialization, but rather an iterative series of experiments where progress depends on the persistence and resilience of the individuals involved and their ability to learn from failure as well as success. From this premise, he (and his co-author Professor Martin Curley) argue that the ideal environment for new venture creation is a form of 'experimental laboratory' a community of innovators where ideas are generated, shared and refined, where experiments are encouraged, and which in itself serves as a test environment for those ideas and experiments (Curley and Formica 2013). This idea helped to form the blueprint for EDEN.

Creating a more entrepreneurial society remains a top priority for the Irish government. Its entrepreneurship strategy (Department of Jobs, Enterprise and Innovation 2014) has three pillars.

1. *Building the pipeline.* Increase the numbers of entrepreneurs, who will actively engage in creating high-quality business start-ups and jobs across the country.
2. *Building entrepreneurial capability.* Develop entrepreneurial skills among the general population and nurture entrepreneurial thinking and talent.
3. *Building the right conditions.* Nurture and develop an ecosystem of start-ups.

In the 2016 *Policy Framework for Design*, the government committed itself to widening the availability of design innovation across more businesses than merely those in traditional design industries such as architecture, graphic design, etc. (Department of Jobs, Enterprise and Innovation 2016b). In the 2016 *Dublin Action Plan for Jobs* (Department of Jobs, Enterprise and Innovation 2016a: 62), this message is repeated: 'To reiterate—entrepreneurial and design thinking are key to shaping our entrepreneurs and talented workforce of the future'.

It is recognized that education plays an essential role in underpinning these objectives. The Hunt Report (Strategy Group 2011: 56) recommended that 'Creativity and entrepreneurship must be encouraged to a much greater extent'. Universities, in particular, have an opportunity to promote creativity and entrepreneurial thinking and to foreground these skills within their broader curricula. Smart, creative people are in high demand in the private, public and third sectors.

A mandate for universities, though, is not to restrict their enterprise courses to business students alone. If entrepreneurship is, simply, the *conversion of ideas to action*, then it makes sense to target the people with new, original and useful ideas and these are likely to be students in all faculties—not just business students.

EDEN operates according to certain founding principles. Its role is to foreground creativity in the university; to build the creative confidence and competence of the student body. First, it was located separately from the Business School. It is widely thought that novel and original ideas are far more likely to emerge from almost any department other than business. While this sounds like a harsh judgment on business students, it has been a common experience and is part of the EU recommendations on best practice in teaching entrepreneurship (European Commission 2007). The second aspect insisted upon by the university is that courses, lectures and modules on creativity or innovation must be delivered within the curriculum. While part of the role of EDEN can be mediated through evening events, external speakers and workshops, or through campus competitions for innovation, the main metrics for the initiative would be its capacity to persuade other departments of the desirability of integrating greater emphasis on creativity into their degree programmes. It would be measured in terms of 'bums on seats'.

An important element of the EDEN philosophy is the building of a community of people with entrepreneurial mindsets; people who lean forward when they hear new ideas. EDEN should be a community for people with ideas. They will see it as the natural place to go if they want their ideas strengthened and developed. So, while there is a formal element of credit-bearing courses, the greatest impact of EDEN will be in specific, extra-curricular workshops where people with promising, raw ideas can find out how to accelerate their progress into tangible (even testable) innovation assets.

A third priority in the beginning was to empanel an advisory board from outside the university. Like all large institutions, Maynooth needs to avoid being too self-referential and not sufficiently outward-looking, and so it was considered important to incorporate an external perspective into the oversight of the initiative. The Advisory Panel's purpose is to give external perspectives on and insights into the EDEN mission and initiatives. EDEN sought a blend of external expertise covering private and public sector innovation and enterprise as well as third sector and student input. Stakeholders include the University Executive; the University student body; Enterprise Ireland (the state body responsible for job creation); public-sector organizations with an interest in enterprise; private-sector organizations (including individuals responsible for graduate hiring); social enterprises; Maynooth University Commercialization Office; local businesses and industry; and partners from other universities with a complementary ethos and commitment to creativity.

The Advisory Panel meets a couple of times per year and reviews progress on the EDEN initiative. It also provides an external view of what's going on in learning and development generally and helps EDEN to benchmark its activities against comparable national and some international organizations.

5.2 Examples of What EDEN Does Within the Curriculum

In various faculties across the university it seems clear and is accepted that their graduates are likely to be self-employed at some point in their career. At minimum, they will have a portfolio career, with pockets of self-employment. This is true, for example, for law graduates unless they are taken on by one of the big firms immediately. Most likely they will be solicitors or barristers working for themselves or in small practices. Similarly, music graduates will need to craft a salient value proposition for themselves so that they can make a living from their talent.

So, one of the first items on the Eden agenda was to develop appropriate course material for different subject groups. The material for the Law Department was the first to be developed. Working alongside the Head of Department, EDEN developed a module entitled 'Creativity in Professional Practice'. Law was considered especially suitable for this approach, because many commentators believe that the profession is on the verge of considerable disruption. Susskind (2008) has been predicting the end of the legal profession for more than a decade. He believes that automation and technology have bypassed many conventional legal functions and that much of what lawyers can now bill or charge for will soon be expected as a free part of the service. Hence, in his view, the future belongs to lawyers who are creative and willing to adapt. He exhorts legal academics to expose students 'even to the possibility that legal service may be radically different in the future and well within the span of their careers'. EDEN has taken up this call for Maynooth University's Law Department.

An equivalent module has been developed and delivered for Maynooth's music graduates. This time, the curriculum was co-developed by the Music Department, EDEN and a producer from *Riverdance*.[2] Included in this module are many visits to theatres, concert halls and other venues to give the students introductions to useful contacts and, more especially, access to the places where they may eventually perform.

Similar modules have been developed for sociology, engineering and biology, and the ambition is to develop and deliver modules for every faculty and if possible for all of the University's 27 departments.

5.3 EDEN's Extracurricular Activities

Interpreting the EDEN mandate has been an interesting challenge. However, in essence it boils down to making people want to be more creative and to believe that they can be. EDEN runs open evenings, styled as 'Creative Cafés'. While credit-bearing modules in the curriculum are certainly vital for EDEN, its best

[2] Riverdance is a theatrical show consisting mainly of traditional Irish music and dance. See: http://riverdance.com/.

chance to foreground innovation and creativity often lies outside the lecture halls. A hallmark of the operation for the first 2 years has been a heavy emphasis on evening, extracurricular themed events. In March 2016 EDEN began with a workshop on sketching and visual thinking and then followed this up with a 'Business Model' workshop. Later, it ran an 'Ideas Speed Dating' workshop in which people with ideas were invited to meet people who wanted to work on ideas but might not currently have one of their own. EDEN has also held classes on photography, semiotics and ethnography, as well as presentation skills. In this way, those who are passionate about an idea of their own get to meet people who are merely passionate about ideas in general. One group helps the other and a living entrepreneurial laboratory develops.

5.4 Access Earth: A Born-Global, High-Potential Start-Up

One company that has benefited from the presence and support of EDEN is the start-up technology company Access Earth. Wanshel (2016) recounts how Matthew McCann, who has cerebral palsy and uses a walking aid, got the idea to start the company in 2012. For a visit to the London Olympics he had booked, online, a hotel which had advertised itself as wheelchair-accessible, only to find that, in fact, it was not. 'When I arrived, there were three steps up to the entrance and I couldn't even fit my [rolling walker] in the hotel room', he said. McCann asked for a refund and left the hotel, but the experience was a telling one. He discovered that such episodes were all too frequent in the lives of people with a mobility restriction. A hotel website may promise accessibility, but there is often an element of over-claim because the vendor usually supplies the accessibility information itself.

McCann wanted to do something to improve accessibility for people with disabilities because, he believed, the problem lay in how hotels defined the term 'wheelchair accessibility'. 'In some cases you will find a place that provides fully accessible bathrooms down a flight of stairs', he said: 'That's no good to anyone'.

McCann, a software engineer, believed he could do something about the lack of specific accessibility information and so, with some help from other students at Maynooth, he created Access Earth, which won third place in the World Citizenship Category of Imagine Cup 2014, a Microsoft technology competition. The idea was also entered into the Enactus Ireland social enterprise competition, which it won in 2015, and this victory took McCann to Johannesburg to represent his idea, his university and his country in the Enactus World Cup finals. A new app was developed and a website designed (see http://access.earth/). As of summer 2016, the fully-fledged app can be downloaded onto smartphones. The business has been incorporated in Ireland and has already won funding support from Enterprise Ireland, the national development agency. It has also secured offers of investment from a number of sources.

The app focuses on accessibility for people with mobility disabilities, but McCann says that he and his business partner, Ryan O'Neill, are looking to add

sensory and cognitive disability criteria in the future, once the platform has gained traction. This is a big idea and one that will make a positive impact on the lives and welfare of users as well as creating a great start-up company.

6 The Entrepreneurial University

Human capital and creativity—in other words, smart people with promising ideas (and the energy to make them happen)—are the life-blood of innovation and entrepreneurship. The economy depends on a vibrant entrepreneurial ecosystem to facilitate the flourishing of more and better businesses.

Universities have a vital role to play. Maritz et al. (2016) acknowledged that not only have governments around the world accepted that entrepreneurship is the key pathway to economic development, but they have embraced entrepreneurship education as an integral and dynamic component of an entrepreneurial ecosystem. Their point has been echoed by the World Economic Forum, which in 2012 added a seventh domain to its review of the key ingredients for entrepreneurship, the *university as a catalyst*. This domain underscored the role of the entrepreneurial university in providing a significant contribution to priming the pump for entrepreneurship.

Within the overarching concept of a National System of Entrepreneurship (NSE) (Audretsch 2015), the entrepreneurial university is a key constituent. Universities that strive to be more entrepreneurial transform their organizational structures to respond and adapt to the external environment (Sporn 2001) and seek to encourage collective entrepreneurial action at all levels (Clark 1998) in the university. Entrepreneurial universities are centred around innovation and the development of an more entrepreneurial culture (Clark 1998; Kirby 2002). They have a different, progressive managerial ethos in governance, leadership and planning (Subotzky 1999), which includes greater faculty responsibility for finding and finessing external sources of funding (Etzkowitz 1983; Yokoyama 2006).

Ideally, the entrepreneurial university goes far beyond the transactional work of technology transfer. Rather, it needs to offer mentoring, encouragement and support. It needs to make entrepreneurship a legitimate and even a fun aspiration for more students and to equip them with entrepreneurial ambition and skills and the confidence to convert their ideas into action. Coaching and consulting should be provided for business ideas and business plans. Support in areas such as lean start-up, design thinking and business model innovation, business simulations and entrepreneurial tools should be provided (Maritz et al. 2016).

Another pillar of the entrepreneurial university is industry collaboration. The university should have close ties with local and national businesses so that, alongside technology transfer, other forms of collaboration may be developed. Research partnerships, market testing and research, and internships can all be explored through industry collaboration.

In short, the university must promote an entrepreneurial stance in all that it does so that it encourages innovation and novel creative ideas and these, in turn, simulate growth in the local and national economy. Maynooth University is an example of what can be achieved.

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Chapter 9
San Francisco Renaissance: Yet Another Gold Rush?

Sheridan Tatsuno

1 San Francisco's Entrepreneurial Renaissance: Digital Gold Rush III

San Francisco is currently enjoying what AOL founder Steven Case calls the third Internet wave,[1] a phenomenon that is dramatically reinventing 'the City', as local residents affectionately call it. This latest boom is attracting tens of thousands of 'digital gold miners' from around the world—entrepreneurs, start-ups, investors, corporate ventures and regional development agencies—who are tapping this lucrative mother lode to strike it rich, lured by heady visions of 'Unicorns' (billion-dollar companies) and 'Dragons' (ten billion dollar companies) such as SalesForce, AirBnB and Uber dancing in their heads.

San Francisco's third digital renaissance mirrors the dot.com boom of the 1990s and the social media boom of the 2000s, which launched thousands of aspiring start-ups, but ended in devastating market collapses that eliminated most of them in typical Darwinian fashion—an occurrence common in Silicon Valley. Despite these setbacks, a new wave of technologies—cloud computing, virtual reality (VR), cyber security, drones, personalized health, 3D printing and machine learning—has attracted an equally new torrent of start-ups and investors, this time much bigger and faster than the previous two booms. Just in VR alone, over US$4 billion has been invited during the last 2 years, not including billions more by major tech companies. Since 2011, San Francisco has become 'ground zero' for a massive wave of start-up activity and investing, surpassing Palo Alto and Stanford as Silicon Valley's

[1] Steven Case: What Leaders Need To Know About The Next Wave Of Tech via @forbes http://www.forbes.com/sites/danschawbel/2016/04/06/steve-case-what-leaders-need-to-know-about-the-next-wave-of-tech/#c2711da484b2.

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centre of start-up investment.[2] Powered by a new generation of millennials reaching their prime, individuals who prefer the face-to-face dynamism of compact urban neighbourhoods, such as San Francisco's South of Market (SOMA) and Mission Bay 'BioCity' districts, these entrepreneurs and investors are more focused on software and biotechnology than Silicon Valley's traditional strengths in semiconductors, computers and hardware.

However, this instant wealth has not come without serious problems. The influx of tens of thousands of entrepreneurs and billions of dollars of venture funding from around the world has led to skyrocketing rents,[3] urban gentrification, evictions,[4] overloaded transit systems, an exodus of teachers, police and other public service workers, local grassroots opposition to development[5] and growing income disparities. Although the 2016 downturn in venture capital (VC) funding has slowed the growing income gap,[6] San Francisco is now one of the most expensive cities in the United States, struggling with homelessness and the loss of the middle class, the poor and artists[7] who are forced to leave for more affordable housing, while young, highly-educated and highly-motivated entrepreneurs—mostly white and Asian—keep arriving because of the Bay Area's wealth, opportunities, openness, great weather and scenery. The City could become much whiter in the next 25 years, the only Bay Area city expected to do so.[8] It is a model and a warning to other cities hoping to attract and create their own Silicon Valleys while retaining their cultural and economic diversity.

As economists say, there is no such thing as a free lunch. Technology is creating urban congestion and a widening gap between rich and the poor, and growing social and political unrest. Fundamental questions are being raised by San Francisco's current 'Gold Rush':

- Can economic growth continue without adequate housing, schools and public services?
- How will cities be affected by global warming?
- Can these trends be reversed or are they inevitable?
- What policies would be required to address poverty and climate change?
- How should they be addressed by rapidly growing tech cities?

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[2] San Francisco pulls away as leader in venture money: http://www.mercurynews.com/business/ci_27325244/san-francisco-pulls-away-leader-venture-money.

[3] http://www.bizjournals.com/sanfrancisco/blog/real-estate/2016/01/tech-office-rent.html

[4] http://www.sfexaminer.com/san-francisco-evictions-continue-rise-year-since-2010/

[5] San Francisco's progressives don't want any more neighbors. http://bv.ms/1W0QCI1.

[6] http://www.sfchronicle.com/bayarea/article/S-F-no-longer-near-the-top-in-income-inequality-6794731.php

[7] Being a broke young creative in San Francisco http://www.dazeddigital.com/artsandculture/article/29986/1/being-a-broke-young-creative-in-san-francisco.

[8] http://ww2.kqed.org/news/2015/04/24/san-francisco-could-be-a-lot-whiter-in-25-years-predicts-a-new-profile-of-bay-area

2 Gold Rush Mentality

The current start-up boom is not new to San Franciscans. Since the original Gold Rush in 1849, the City has experienced wave after wave of economic booms, followed by calamitous busts. A sleepy Mexican colony of some 20,000 people in 1848, the City boomed with the discovery of gold, reaching a population of 300,000 immigrants within 5 years—gold miners who temporarily camped out in the City before heading to the gold fields.[9] Overnight, San Francisco became a bustling, international city where a hundred languages were spoken. It was much more open, daring, innovative and risk-taking than other American cities, which took decades to emerge. The gold miners were mostly young single men driven by visions of striking it big and returning home wealthy. The City was no place for timid, conservative people who preferred predictability, order and convenience. San Francisco was—and still is—a crowded, wild, difficult and expensive place to live, filled with newcomers from around the world seeking their fortunes while discarding both their 'Old World' thinking and identities in order to reinvent themselves. Most gold miners failed to find their fortunes and returned home empty-handed or set up shop selling goods and services to other newcomers; and women arrived after the City had settled down from its early 'Wild West' days, a pattern we still see today.

Between the 1860s and the 1880s, San Francisco became a major city and expanded in all directions.[10] However, the opening of the Transcontinental Railroad in 1869 led to a flood of cheap products from the East Coast, causing the failure of many California manufacturers during the 1870s recession, civil disorder and the ousting of Chinese with the Chinese Exclusion Act of 1882.

From the 1890s the City attracted new immigrants: however, calamity struck when the 1906 earthquake and resulting fires destroyed most of downtown. Undeterred, San Francisco rebuilt itself under the leadership of urban planner Daniel Burnham, whose bold plan called for Haussmann-style avenues and boulevards radiating out across the City, which called itself 'the Paris of the West.' The City rushed to rebuild itself and hosted the Panama–Pacific International Exposition in 1915 to celebrate the opening of the Panama Canal.[11] Trade grew rapidly and, during the 1920s, the City's waterfront was soon lined with bustling docks and shipyards—until the Great Depression struck. Nevertheless, the City continued to grow by building the Golden Gate Bridge and Bay Bridge during the 1930s to create jobs and connect the region. Many 'Okies' and others came to San Francisco to escape the devastating Dust Bowl in the mid-western states and the grinding Great Depression.[12]

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[9] https://en.wikipedia.org/wiki/California_Gold_Rush

[10] https://en.wikipedia.org/wiki/History_of_San_Francisco#Paris_of_the_West

[11] See: http://www.ppie100.org/.

[12] Migrants from the Dust Bowls of Oklahoma and the Plains. See: http://www.livinghistoryfarm.org/farminginthe30s/water_06.html.

World War II turned the City into a booming military seaport, and this attracted tens of thousands of newcomers from the Midwest and South, all seeking the proverbial California dream of freedom and prosperity. For African Americans, California offered an escape from the harsh Jim Crow segregation laws of the South.[13] After the war, many stayed on to build the Bay Area into a major metropolis which stretched from Marin County in the north to San Jose in the south. In 1951 the United Nations was founded in San Francisco, giving the City its distinctive internationalist, peace-loving ethos.

The City experienced a brief flurry of newcomers during the 1960s with the so-called 'Summer of Love', when young people flocked to the Bay Area as the anti-war hippie counterculture took hold during the Vietnam War. However, post-Vietnam migration to the suburbs, facilitated by the construction of federal highways, led to San Francisco's demise during the 1970s and 1980s when, like other American central cities, it struggled with the problem of dilapidated slums. The rise of Silicon Valley's electronics industry from the 1940s through the 1980s bypassed the City when semiconductor, aerospace and computer companies located in the large industrial parks in the South Bay cities of Palo Alto, Mountain View, Sunnyvale and Cupertino.

3 San Francisco Surpasses the South Bay

The shift to digital media in the 1990s revived San Francisco and set its trajectory as a leading technology centre. CD-ROMs and other multimedia technologies and Internet commerce led to the City's rise as the 'Capital of Multimedia'. The dot.com boom attracted thousands of young college graduates who filled the cheap warehouses in the SOMA and Mission districts. The boom did not last long, however, collapsing with the Wall Street collapse in 2000, when more than 250,000 technology employees were laid off in the Bay Area, leaving SOMA an empty shell for several years.

However, like the rest of Silicon Valley, San Francisco is resilient. In the empty offices and warehouses, new start-ups such as SalesForce.com pioneered new business concepts—for instance, Software-as-a-Service (SaaS)—during the 2000s. Taking advantage of cheap space and available suitable talent, the City attracted social media start-ups like Twitter, Airbnb, Pinterest, Uber and Lyft, making use of cloud computing, as well as hundreds of mobile app start-ups in every possible market sector—food, travel, retail, education, health, fitness, sports, accounting, law, finance and government.

[13] 'Jim Crow law' was …'any of the laws that enforced racial segregation in the South between the end of Reconstruction in 1877 and the beginning of the civil rights movement in the 1950s. The term came to be a derogatory epithet for African Americans and a designation for their segregated life.' See: https://www.britannica.com/event/Jim-Crow-law.

Why, during the 2000s, did these new start-ups come to San Francisco and not Stanford and other South Bay cities as during the pre-1990 Silicon Valley booms? There were many reasons: cheap office and warehousing space, affordable rental apartments, more angel investors, mentors and venture capitalists (VCs) moving to the City, a lively night life and cultural activities, more dating opportunities (Silicon Valley is mostly male), public transportation systems and great scenery. Unlike the South Bay, San Francisco is compact and so it is convenient for entrepreneurs to meet over coffee without having to drive long distances. The rising numbers of co-working spaces, incubators and accelerators, and dozens of cafes downtown, make it easier for entrepreneurs and small teams to network, meet investors and attend the daily professional events and major conferences and trade shows, which enables them to build their start-ups quickly and create supportive communities.

Like Silicon Valley, the City has attracted a wide variety of technical, marketing, business, legal and financial talent—all necessary for establishing and running companies effectively. San Francisco entrepreneurs no longer have to go to Palo Alto for essential services. Hundreds of Meetup.com and Eventbrite.com events pop up every year, covering every conceivable business, technology, social and cultural topic; and the Moscone Convention Center[14] is expected to be fully-booked through to 2025, so there are ample opportunities to meet people. As Bay Area freeways become more congested, the compactness and convenience of downtown San Francisco are appealing to millennials who work long hours on their start-ups.

VC investors followed entrepreneurs to the City.

> In 2005, 34% of the US venture capital (VC) funding directed went to firms in the San Francisco and San Jose (Silicon Valley) metropolitan areas. By 2014, that figure jumped to 44%. The region currently receives US$4,433 per capita in angel and VC funding, outstripping the nation (at US$206 per capita) by a ratio of 21-to-1.[15]

Increasingly, entrepreneurs from around the world, and especially from nations and US regions where angel and VC funding are both scarce, are coming to the City to raise money for their start-ups. European, Asian, Latin American and other nations are opening San Francisco incubators/accelerators, hosting tours of Bay Area tech companies, investors, events and incubators, and organizing investor pitch sessions for their start-ups. These new foreign start-ups are attracting even more investors, both American and foreign. Unlike suburban Sand Hill Road near Stanford, which is dominated by US venture capital firms, San Francisco's investor community is becoming much more multinational because of its popularity among foreign entrepreneurs and investors who prefer the face-to-face dynamism and cultural venues of downtown San Francisco.

[14] See: http://www.sftravel.com/moscone-center.

[15] The Bay Area still dominates venture capital http://brook.gs/1RYdFzg via @BrookingsInst.

4 The Rise of Asia

Another factor driving San Francisco's rise and attractiveness is its large Asian-American population, primarily Chinese, which is attracting large numbers of Chinese real estate investors,[16,17] entrepreneurs, private equity funds, and business services specializing in handling US–China/Asia trade. At a Chinese investment real estate forum held at the University of San Francisco in November 2015, keynote speaker Anton Qiu reported, 'Unilateral trade between China and the US increased from $17 million in 2000 to $12 billion in 2014, and California accounts for more than ¼ of Chinese investment in the US'.[18] The University of San Francisco offers a China Studies programme for business students from China seeking tech-related jobs and works closely with the City's 'ChinaSF' economic development programme to invite Chinese investors and businesses.[19]

In addition, the rise of the software industry is attracting Indian programmers, entrepreneurs and investors, who are moving to the City and linking it with India and the large Indian community in Silicon Valley. The plan of India's Prime Minister, Narendra Modi, to build 100 smart cities has stimulated enormous interest in the Internet of Things (IoT), smart grid, Big Data, machine learning and other related technologies, all of which promise to become major growth opportunities for Bay Area entrepreneurs. San Francisco, the second densest American city (in terms of number of inhabitants per square kilometre), is a good testbed for these smart cities technologies. Together with The Indus Entrepreneurs global network of professional Indians (www.TiE.org), the Indian consulate in San Francisco is expanding its event programming.[20]

5 UCSF Mission Bay 'Bio City'

Healthcare is the second fastest growing industry in the Bay Area due to the rapidly ageing US population and continuing immigration. The University of California San Francisco (UCSF) campus at Mission Bay, the headquarters of the California Institute for Regenerative Medicine and new research campus of the University of California, San Francisco, UCSF Mission Bay, is now one of the major US biomedical centres.[21] Established in 1999, the US$3 billion UCSF campus is a 43-acre

[16] Chinese pull back from U.S. real estate http://on.wsj.com/1MIPQMd via @WSJ.

[17] 'S.F. becomes most sought-after location for Chinese buyers' http://blog.sfgate.com/ontheblock/2015/04/23/s-f-becomes-most-sought-after-location-for-chinese-buyers/.

[18] https://www.usfca.edu/management/news/chinese-investment-california-real-estate-taking

[19] https://www.usfca.edu/management/centers-institutes/china-business-studies-initiative

[20] http://www.cgisf.org/

[21] https://en.wikipedia.org/wiki/Mission_Bay,_San_Francisco

(17.4 ha) life sciences campus for teaching and research.[22] San Francisco start-ups are focused on medical electronic systems, health monitors, wearable technologies, women's health, neuroscience, regenerative medicine, personalized medicine and age-related diseases (dementia, Alzheimer's, cancer, strokes, etc.).[23] In anticipation of increased federal funding stimulated by President Obama's BRAIN programme, which focuses on neurological diseases, UCSF is building a Neuroscience Center.[24] With so many corporate and VC investments coming into the City, UCSF Mission Bay is rapidly becoming the Number One 'BioCity' in the United States.

6 Corporate Gold Rush

San Francisco's renaissance as one of the leading US start-up capitals has triggered an influx of major corporations that are setting up incubators/accelerators, business intelligence (BI) units, events and corporate venture capital (CVC) funds in downtown San Francisco to monitor, find, collaborate with and fund promising start-ups. The fastest-growing sectors are retail technologies, Fin Tech (finances), biomedical, clean technologies, VR and augmented reality (AR), Artificial Intelligence (AI) and machine learning. In some cases, these companies will fund or acquire the start-ups, but most of their efforts are focused on keeping abreast of the latest technology innovations and pursuing collaborative research and development. As a result, San Francisco currently (2016) has the highest office rents[25] and the highest-priced lodging for business travellers. Nevertheless, the powerful allure of San Francisco's booming tech sector keeps people coming in. According to the SF Bay Area CBS news service, 'Despite the high prices, San Francisco reported a record 24.6 million visitors in 2015, an increase of 2.7% from the previous year'.[26]

6.1 The Challenges of Hyper-growth

Despite its enormous success, San Francisco faces a growing number of problems that are already limiting its growth as an innovation hub, as follows.

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[22] UCSF Mission Bay: A San Francisco Success Story http://www.ucsf.edu/news/2013/01/13432/ucsf-mission-bay-san-francisco-success-story.

[23] http://www.ebdgroup.com/bts/program/index.php

[24] UC Regents Approve Preliminary Plans for New UCSF Neuroscience Building http://www.ucsf.edu/news/2016/03/402261/uc-regents-approve-preliminary-plans-new-ucsf-neuroscience-building.

[25] http://sanfrancisco.cbslocal.com/2016/01/11/san-francisco-office-rents-most-expensive-in-the-country/

[26] http://www.latimes.com/business/la-fi-s-f-business-travelers-20160401-story.html

- *Skyrocketing rents*: these have made it difficult for companies, especially start-ups, to open offices in downtown San Francisco, so many entrepreneurs are moving across the bay to Oakland and Hayward along transit lines,[27] south to Los Angeles and San Diego,[28] or out of state entirely to Portland (Oregon), Austin (Texas), and Salt Lake City (Utah). The current VC funding slowdown has moderated rent increases, but rents are expected to increase during the next funding upturn.[29] The global recession is causing more foreigners to invest in San Francisco real estate, making it difficult even for highly-paid tech workers to buy homes, so most end up overcrowding in apartments or commuting long distances.
- *Traffic gridlock:* San Francisco's traffic congestion is growing faster than its population, making it difficult for commuters to get to and from work and costly for the City and Caltrans transit operators.[30] The Bay Area Rapid Transit (BART) district is using special offers to 'gamify' commuting to reduce the number of passengers during rush hours.[31] As a result, many companies are moving out of the City and the Bay Area and into other Northern California cities—for instance, Sacramento. San Francisco is exploring new ways to reduce congestion, such as ride sharing, more bicycle lanes, and higher parking fees; but, despite these efforts, continuing tech growth has only worsened the commute to the point where most freeways are gridlocked half of the work day—clearly not a sustainable situation, which will require much more drastic transit measures and innovations.
- *Gentrification*: San Francisco is becoming a city of the rich, highly educated white and Asian professionals, losing at the same time its artists, non-profit groups, teachers, public service workers and blue-collar workers, all of whom enrich and maintain the City but who cannot now afford the rents.[32] Recently, Bay Area cities have been subsidizing teacher housing in order to attract new teachers who are replacing retiring teachers.[33] Gentrification is accelerating throughout the Bay Area, which makes it affordable only to highly educated, wealthier individuals. With the growing influx of foreign real estate investors, this situation will only get worse since the US is seen as a 'safe haven' for investors, which will force out most American families, young people and retirees.

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[27] http://www.fastcodesign.com/3039164/infographic-of-the-day/the-bay-areas-insane-rents-mapped

[28] Why I moved my startup from San Francisco to San Diego http://tcrn.ch/1StLwDf.

[29] http://www.bloomberg.com/news/articles/2016-03-24/tech-slowdown-seen-in-san-francisco-s-commercial-property-market

[30] http://www.nbcbayarea.com/news/local/Bay-Area-Traffic-Growing-Faster-Than-Population-Study-362995581.html

[31] http://www.munidiaries.com/2016/03/08/bart-wants-to-gamify-your-commute-to-solve-congestion-problems/

[32] http://www.sfexaminer.com/housing-crisis-continues-to-grip-sf-teachers-even-after-bond-approval/

[33] https://ballotpedia.org/City_of_San_Francisco_Housing_Bond_Issue,_Proposition_A_(November_2015)

- *Evictions and displacement of the middle class and poor*: City employees, teachers, blue-collar workers, Latino and African American families, college students and retirees are increasingly being evicted under the Ellis Act,[34] which allows property owners to evict tenants for improvements or sale. San Francisco requires compensation of at least US$5,894 and more per tenant, and more than US$18,000 per unit (as of March 2016) depending on various factors such as age, disability and whether school-aged children are occupying the targeted unit.[35] Due to rapidly-increasing rents throughout the Bay Area, most evicted tenants are, like the entrepreneurs (see above), moving out of the area and, in many cases, out of California to cheaper locales in Arizona, Oregon, Utah and Texas.
- *Recruiting*: Rising house rents and prices are making it difficult for companies to recruit new employees from college and other regions and so higher salaries and salary increases are required to hire and retain employees, especially highly-sought engineers and software programmers who are enjoying record-high salaries.[36] Job-hopping is a serious problem because technically qualified individuals can increase their salaries faster by jumping from company to company, which reduces productivity and the sense of loyalty. Most companies expand by using recruiters to find talent and outsource development to employees and companies overseas—a major growth area, which has attracted foreign recruiters and regional development agencies.
- '*Gig Economy*': In addition to outsourcing overseas, many San Francisco companies outsource non-core operations to the many Gig Economy part-time and freelance professionals who can often earn more money on their own than working for a company full-time.[37] However, many part-time jobs offer low wages. Uber has attracted much recent media attention, lawsuits[38] and opposition from taxi operators, labour unions and some disgruntled drivers for its lower prices and lack of health insurance and other employee benefits, although some Uber drivers have expressed support for the company.[39]

Besides these urgent issues, the City and the Bay Area face longer-term problems; for instance, overall urban density, the revitalization of underutilized factories and warehousing areas, a rapidly-aging population, a shifting mix of immigration, and sustainability issues. However, these rapidly-changing problems require much bolder, longer-term changes in regional policies and programmes by municipalities and regional planning agencies.

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[34] https://en.wikipedia.org/wiki/Ellis_Act

[35] See: https://www.sftu.org/ellis/.

[36] New study shows how Seattle and S.F. compare on tech salaries and job-hopping http://www.geekwire.com/2016/seattle-san-francisco/; http://www.payscale.com/research/US/Location=San-Francisco-CA/Salary.

[37] http://ww2.kqed.org/news/2016/01/12/startups-use-gig-economy-to-outsource-jobs

[38] http://uberlawsuit.com/

[39] http://www.nytimes.com/2016/02/03/business/uber-drivers-and-others-in-the-gig-economy-take-a-stand.html?_r=0

7 Whither San Francisco?

San Francisco currently enjoys the Number One position as the most entrepreneurial hub in the United States in terms of start-ups and VC funding. As the millennial generation and continuing immigration bolsters its workforce, the City promises to become even stronger in software, biotechnology and other emerging industries. By 2025, it could become a powerful global 'incubator/accelerator' capable of tapping investors worldwide to fund entrepreneurs pioneering the 'Next New Thing' in technology—or 'Wall Street West'.

Of course, the future for San Francisco will be complex and any disaster could occur—earthquakes, traffic gridlock, serious pollution, epidemics or recessions. There are many critics who argue that San Francisco has reached its apex, but the region's mild weather, beautiful scenery and cultural diversity still attract people from the world, despite congestion and the extremely high cost of living. Investors from China, Russia, Brazil and other struggling economies are rushing into San Francisco and the broader Silicon Valley as their stock markets and economies slow, because the US remains for many the safest bank. Much of this investment is pouring into Internet, software and biotech sectors due to lower returns on other asset areas. In particular, San Francisco is currently experiencing a strong upturn in the number of Chinese investors. They are willing to pay a heavy 'amenity tax' to live in this proverbial 'Gold Mountain', as did the original gold miners. For as long as China and Asia continue to grow, the prospects for San Francisco look promising indeed.

Author Biographies

Alan Barrell has been for some years Entrepreneur in Residence at the Judge Business School, University of Cambridge. He is Guest Professor in Entrepreneurship at universities in Beijing, Xiamen, Shanghai in China and Sendai in Japan, International Research Fellow at Laurea and Lahti Universities in Finland, and honoured in that country for services to education with the award of Knight First Class of the Order of the White Rose of Finland. He is a winner of the Queen's Award for Enterprise Promotion in his own country. His career spans Chief Executive positions in public and private corporations, venture capital fund management and he is still active with a number of early stage technology companies. He is also deeply engaged and interested in Chinese business, history and culture. Sector focus: principally life sciences.

Martin Curley is part-time Professor of Innovation at Maynooth University, Industry director of the Innovation Value Institute and chair of the EU Open Innovation and Strategy Policy group. Martin Curley is also Senior Vice President at MasterCard and global lead for Digital Practice in MasterCard Advisors. Previously Martin was vice president at Intel Corporation and Director/GM of Intel Labs Europe, the Intel's network of more than 50 research labs which he grew across the European region. Martin also held the positions of Global Director of IT Innovation and Director of IT Strategy and Technology at Intel in the USA and Ireland. Before joining Intel, he held management and research positions at General Electric in Ireland and at Philips Electronics in the Netherlands. Curley is the author of five books on information technology, innovation and entrepreneurship. Curley has a bachelor's degree in electronic engineering and a Master's degree in business studies, both from University College Dublin, and a PhD in information systems from the National University of Ireland, Maynooth. He was awarded European CTO of the year for 2015–2016.

Leif Edvinsson, Professor at the University of Lund in Sweden, is a key pioneering contributor to both the theory and practice of Intellectual Capital (IC). As the world's first director of IC in 1991 he initiated the creation of the world's first public

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corporate Intellectual Capital Annual Report 1994, and inspired the development ever since on IC metrics. He was, parallel to that, prototyping the Skandia Future Center as a Lab for Organisational Design, one of the very first in the world in 1996, which inspired many subsequent initiatives, culminating in today's Future Centers Alliance, with more than 50 Future Centers in Japan. In January 1998, Leif received the prestigious Brain Trust 'Brain of the Year' award, UK, for his pioneering work on IC. He is listed in Who's Who in the World. Also he is an associate member of the Club of Rome. He is also Cofounder and Founding Chairman of the New Club of Paris, focused on the Knowledge Economy initiatives. In 2015 he was appointed to the Advisory Board of JIN—the Japan Innovation Network. In 2016 he was appointed to the Advisory Board of Norway Open Innovation Forum.

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