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Fondazione G. Brodolini
STUDI E RICERCHE

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CITIES AS ENGINES OF INNOVATION AND INCLUSIVE GROWTH

A Transatlantic Journey EU-USA

Edited by

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INTRODUCTION

Innovation in Cities: Actors, Drivers, Outcomes

Fabio Sgaragli, Fondazione Giacomo Brodolini

In the last few years cities have managed to become again the focus of attention by policy makers, as today it is largely agreed that cities *"play a crucial role as engines of economic growth and employment opportunities, as places of connectivity, creativity and innovation, and as centres of services*"[1]. A recent World Bank report[2] shows that improving the competitiveness of cities can help eliminate extreme poverty and promote prosperity for all citizens on the planet. With all this renewed attention to cities and their development, as a chance to improve the wellbeing of their citizens and contribute to sustainable development, much is being debated over if they are equipped to respond to expectations, and how many of them are actually delivering on promises. Besides the undisputed existence of a few "stars" on the global stage, the emerging picture from existing analysis is that the clash of long term trends, such as climate change and demographic shifts, combined with present contingencies like the global financial crises, are putting under enormous stress most cities on the planet, whilst local administrations are called to do "more with less".

At the same time, new technologies are starting to provide us with the opportunity to measure, sense and perceive cities increasingly as complex systems, made of interdependent infrastructures, communities and processes. This new awareness is proving useful to make more intelligent interventions and to facilitate the emergence of innovations that are aligned with the challenges any city in the world faces. Innovations per se though are not enough, they need to be guided and directed, and that is the work of politics. City Mayors and their councils today face an unprece-

1. "Cities of tomorrow – Challenges, visions, ways forward", DG Regio, 2011.

2. "Competitive Cities: A Local Solution to a Global Lack of Growth and Jobs", World Bank, 2015.

dented level of expectations from their communities, and their role is rapidly evolving from ensuring good governance to imagining new possible futures for their cities. It is not by chance, in fact, if cities all over the world have become a playground for policy experimentation in many areas: from welfare to immigration, passing through start up creation and internationalisation. Institutional capacity building is of the essence, as there are programs, also EU funded, designed to incentivize peer learning and exchange[3].

More over, with the recognition that in a networked society, quadruple helix stakeholders' engagement is key to the development of healthy ecosystems for innovation, new actors are joining in the club of social innovation, some with the hope to reinvent themselves and their role in society. We wrote extensively on the building blocks of a local ecosystem for innovation in a 2014 FGB's publication[4].

In the discourse over what drives innovation and growth in cities, differences exist not just in the urban development stage or specificities of the local economic and cultural context, but also in the way that urban development challenges are perceived and faced, in terms of needs, goals, policy frameworks and stakeholders involved.

The US currently places technological innovation and deployment as one of the core elements of its strategy to revitalise post industrial cities, which also serves the purpose of opening up those market opportunities for corporates that the rapid rise of cities throughout the world is fastly creating. The Global City Team Challenge managed by NIST[5] is a clear example of the capacity of the US Federal Government to project globally its vision by creating synergies between cities' development and business development for its corporate champions. Recently the President's Council of Advisors on Science and Technology released its recommendations for advancing innovation within cities. The report "*Technology and the Future of Cities*"[6], which focuses on smart city, technology and infrastructure, is another example of an approach that connects technology with innovation and economic growth.

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3. URBACT: http://urbact.eu/.

4. "Enabling social innovation ecosystems for community-led territorial development", FGB 2014.

5. https://www.us-ignite.org/globalcityteams/.

6. "Technology and the future of cities", President's Council of Advisors on Science and Technology, 2016.

The EU approach to local integrated economic development stresses the importance of a more balanced and inclusive urban development. In the current economic development model, in which economic growth does not necessarily equate to more jobs, the challenge is to generate economic development and at the same time ensure a decent life for those left outside the labour market by engaging them in society. Therefore, if competitiveness has to be combined with inclusivity, then social participation becomes a key component of local economic development. Therefore, in the EU great emphasis is given to participation, co-design and end-user engagement, bottom up processes and social innovation. The name of the game is promoting the diffusion of new social infrastructures aiming at supporting grassroot initiatives and at developing new alliances between bottom-up projects and top-down structures (Murray et al. 2010).

Another key driver for innovation and growth is the creation of qualified demand. Public procurement is still an untapped wealth of resources, and stirring it towards innovative solutions can unlock the potential that still lies within established industries, but most of all can engage start ups and new ventures, skyrocketing them in a virtuous cycle of development and job creation. Public Procurement Innovation (PPI) has been a EU mantra for many of the past few years, and the SBIR Programme in the USA, which we delve into in chapter 2 of this publication, is a great example of an enlightened public policy in this sphere. But a qualified demand for innovation cannot come only from public procurement, in fact today it actually can come from anywhere and anyone in any given territory. This is the reality of the digital knowledge economy, which brings far distant ecosystems from innovation closer together, and breaks the communication barriers between sectors, between actors, and between space and time. So it happens that a coalition of NGOs working in a urban periphery can launch Call for Solutions to problems that affect the local community they work in, and meet solutions that come from the other side of the planet. The growing number of digital platforms for open innovation is the response to the increasing number of innovation processes that start with a clear demand. One interesting recent example is the Global Innovation Exchange[7], a platform created by USAID to foster R&D, but mostly the meeting of demand and supply in innovation for sustainable development. Specialized platforms devoted to urban innovation are also emerging,

7. www.globalinnovationexchange.org.

In our experience working within local ecosystems for innovation, some of the elements identified above are all very important. Technology can indeed be an enabling factor for a more inclusive economic growth. Without digital platforms, we could not create communities of innovators so quickly and effectively, and we could not connect to other ecosystems internationally for knowledge and talent exchange. Digital fabrication technologies are allowing us to explore the application of open source hardware solutions to smart city and urban resilience challenges. At the same time, the application of so called civic technologies can be a powerful tool for entrepreneurship development and job creation, as we observe in our centres devoted to incubation and acceleration services for social enterprises. Innovating new products and processes that address social challenges means at the same time meeting social needs, generating new employment, and creating new business ventures.

Also eliciting a qualified demand for innovation has in our experience proven key in providing the opportunity to accelerate innovations which otherwise run the risk of not meeting any potential market. The capacity to grow and scale of new business ventures depend on the ability to meet real needs and connect to foreign markets.

Lastly, the proven importance of engaging all stakeholders in the process has been a leitmotiv of all the initiatives concerning urban regeneration and innovation processes. The challenge that lies ahead in this area will be the ability to include in the process the excluded targets, as labour market inclusion favours social stability, and diversity brings even more opportunities for innovation.

It is our own experience and the need to turn it into shareable knowledge that brought us to publish this book. Today, innovative and competitive cities use a menu of interventions to increase competitiveness, including policy frameworks and regulations, infrastructures and land, skills and innovation, and enterprise support and finance. This publication intends to explore and model the key enabling factors of cities' capacity to innovate and compete on the global stage, whilst at the same time guarantee that no one is left behind, and to bring together local administrations' officials, experts, corporate and civil society representatives to share their views, models and ideas, in the spirit of mutual learning and exchange. We approached it from the perspective of a "transatlantic journey" between EU and US, as we were interested to find out any differences in approach, which could bring to the table a wealth of opportunities for mutual learning between the two sides of the ocean.

The book is divided in three parts. In the first part we talk about policy, with three contributions that offer a panoramic view from the global to the local. In the second part, we offer six building blocks for stimulating inclusive growth in cities, spanning from culture and creativity to innovation zones. In the third and last part, we host a dialogue between the main actors of this space, the cities. We asked five innovative EU and US cities to answer some crucial questions to address the theme of this book: Milan, Turin. Boston, Austin and Pittsburgh. We thank them for their contributions, as we thank all the authors and the people that provided input along this journey. We hope that this publication will not be an end point, but the start of a dialogue that will include more key players as we move along with our experience.

PART 1
POLICY

Architecting an Innovation-Maximizing Global Economic and Trade System

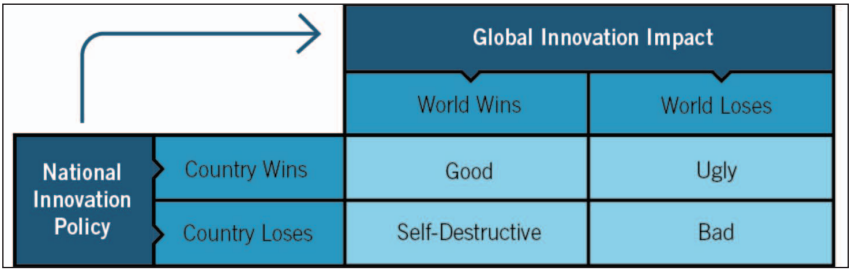
Stephen Ezell & Adams Nager,
Information Technology and Innovation Foundation (ITIF)

Innovation – the creation of new or improvement of existing products, processes, services, and business or organizational models – drives the modern knowledge- and technology-based global economy. For example, the U.S. Department of Commerce *finds* that between one-third and one-half of economic growth in the United States since World War II can be attributed directly to scientific and technological innovation. But the recognition that innovation drives growth is no longer a secret: countries throughout the world increasingly understand that fostering robust levels of innovation in their enterprises, industries, and societies is essential for robust, long-term economic growth and sustainable improvements to standards of living. And, as the Information Technology and Innovation Foundation (ITIF) documented in the book *Innovation Economics: The Race for Global Advantage,* this recognition has spawned an intense race for global innovation leadership. In fact, to date, almost fifty nations *have created national innovation foundations* and/or articulated national innovation strategies.

The State of Global Innovation

Yet the world is still not producing as much innovation as is possible or as is needed. That is because innovation represents a global public good and as such it suffers from common collective action challenges, such as "free-riding" by some nations on others' investments in basic scientific research or underinvestment in other areas. For example, the International Energy Agency *calculates* that the global public investment gap in clean energy research and development (R&D) and deployment is as great as $70 billion per year. The root of this problem is that countries still conceive of innovation policy primarily in terms of how it impacts their countries' own economic growth; they do not recognize that the economic, trade, and science, technology, and innovation (STI) policies they implement in their own quest for growth have significant spillover effects on both other countries and on the broader global innovation system.

Figure 1- The Good, the Bad, the Ugly, and the Self-destructive of Innovation Policy



Yet constructively managing and guiding this global competition for innovation leadership among nations has become perhaps the central economic challenge of our times. That is because, in their efforts to implement innovation-enhancing policies, countries can do so in a number of *qualitatively different ways*, with some designed to add to the global stock of knowledge and innovation, while others are designed to merely shift innovation (and the production or productivity gains it engenders) from one country or region to another.

For example, when countries invest in the basic building blocks of innovation – by increasing expenditures on scientific research, educational attainment, and digital and physical infrastructure or by putting in place better mechanisms to transfer technologies developed in university or national laboratories to the private sector – they empower the innovation potential of their own economies and enterprises while also generating positive spillover effects that benefit other nations. This creates a win-win result for themselves and for the entire world, as Figure 1 shows. In contrast to such "Good" innovation policies, some countries implement zero-sum, mercantilist-inspired "Ugly" policies – such as blocking digital trade, introducing localization barriers to trade (e.g., requirements of local production or forced tech or intellectual property (IP) transfer as a condition of access to foreign markets), stealing others' IP, imposing high tariff barriers, or manipulating currency or standards – that help one country win, but at the expense of all others. Such policies harm truly innovative enterprises and degrade the quality of rules-based international economic competition.

There also exists a set of "Bad" innovation policies that countries have implemented – such as import substitution industrialization policies – thinking that such policies will help their innovation economies, but in reality such policies only end up harming both themselves and the rest of the world. For example, for every $1 of tariffs India imposed on inbound information and communications technology (ICT) products – in the interest of spurring creation of an indigenous ICT manufactur-

ing sector – the country suffered a $1.30 economic loss, because Indian enterprises had to use more expensive or less effective ICT equipment. Such a policy was "Bad" for the global economy because it distorted global trade and harmed the world's most efficient producers of ICT products. Similarly, today, ITIF *estimates* that the additional taxes and tariffs Brazil imposes on imported ICT products cost its gross domestic product (GDP) as much as 2 percentage points annually. Finally, countries can also implement "Self-destructive" innovation policies – which harms themselves while helping others – such as when the immigration policies of countries, such as the United States, make it difficult for high-skill immigrants to enter or to stay in a country.

Thus, given how important innovation has become – and how dramatically one nation's policies to drive innovation affect the rest of the global economy – how nations decide, both individually and collectively, to pursue their innovation-based economic growth strategies has tremendous consequences for the health of the global innovation system. And this matters particularly because innovation industries are distinct from others and so require certain conditions to exist in the global economy if they are to flourish.

The Distinct Nature of Innovation-Based Enterprises and Industries

Truly innovative enterprises and industries share three distinct characteristics. First, innovation – the regular development of new products and processes – is central to their competitive success. Firms in industries such as aerospace, biotechnology, digital content, or semiconductors do not compete based on making the current product marginally cheaper, but on inventing the next-generation airplane, biologic drug, movie, or integrated circuit. The second key characteristic of innovation-based industries is that their marginal costs significantly exceed their average costs. That is, the fixed costs of initial design, development, and testing can cost billions – for example, program development costs for Boeing's Dreamliner reached $32 billion, while the full product life cycle cost per approved new biologic drug in the United States can exceed $3 billion – but incremental copies can be produced at cost. Finally, innovation industries embody and depend more than other industries on intellectual property, both science- and technology-based IP but also the IP embodied in creative works. For example, software depends on source code; content creators depend on copyrights to protect their work from expropriation; life sciences firms depend on discoveries related to molecular compounds; and aerospace depends upon materials and device discoveries.

Because of the peculiar nature of innovation industries, four key conditions must attain in the global economy if the output of innovation is to be maximized. First, companies need access to large global markets – in other words, access to economies of scale – so they can recoup their high fixed costs and so that unit costs can be lower, and revenues for reinvestment in innovation higher. Second, innovative enterprises should not be subject to excess – that is, non-market based – competition. For example, the WTO-illegal production and export subsidies China has provided to a number of its industries, such as *solar photovoltaic cells* and *steel*, have artificially introduced excess supply in those industries, depressed prices by creating production gluts, and forced a number of truly innovation firms, such as Solar World and Sun Edison, to the brink of bankruptcy. Third, innovative industries are harmed when countries impose forced localization requirements that unnecessarily fragment global production systems. For example, when countries require local data centers be used in the provision of digital services, or when a country mandates local production of pharmaceutical drugs as a condition of selling in a market, such policies only needlessly add costs, which both harms innovative producers and means that innovative products and services unnecessarily cost more for businesses and consumers in local markets. Finally, if innovation is to thrive in the global economy, the intellectual property rights of innovators must be acknowledged and protected.

For all these reasons, two things have to happen if the global output of innovation is to be maximized: First, individual countries must implement robust national innovation systems with effective innovation policies. Second, the global economic and trading system must enable innovative enterprises to flourish. Yet this raises two questions: to what extent are individual countries implementing the types of "Good" economic, trade, and STI policies that enable innovation to flourish globally? And to what extent are countries enacting "Ugly" or "Bad" policies that reduce the ability of other nations to innovate?

Measuring Countries' Contributions to Global Innovation and Assessing the Results

To better assess these issues, in January 2016 ITIF released a first-of-its kind study called *Contributors and Detractors: Ranking Countries' Impact on Global Innovation*, which assessed 56 countries on how their economic, innovation, and trade policies (on a per-capita basis) either contribute to or detract from global innovation. The 56 countries assessed include all the leading economies from Asia, Europe, and the Americas and collectively account for over 90 percent of the global economy. The report scored countries on 27 measures, grouped into 14 "Contributions" indica-

tors – covering R&D and technology, human capital, and innovation-incenting tax policies – and 13 "Detractions" indicators – including a range of trade barriers that fragment (or "balkanize") production and consumption markets as well as measures of weak intellectual property protection. (Table 1 lists the 27 indicators assessed; the "Contributions" indicators accounted for 60 percent of a county's final score and the "Detractions" indicators 40 percent.) This methodological approach allowed for countries to be awarded an "Overall" score as well as a score for positive "Contributions" to and negative "Detractions" from the global innovation system. However, the report's primary intent is to help countries rank themselves against peer nations on key metrics of innovation policy and to guide them toward only using win-win innovation policies best-positioned to help both the country and the rest of the world.

Table 1 - Indicators in ITIF's Contributors and Detractors: Ranking Countries' Impact on Global Innovation Report

Contributions Indicators (Weight=60%)	**Detractions Indicators (Weight=40%)**
Taxes	**Balkanized Production Markets**
Effective Corporate Tax Rates	Non-tariff Trade Barriers
R&D Tax Credit Generosity	Number of Types of LBTs
Collaborative R&D Tax Credits	Foreign Equity Restrictions
Innovation Boxes	Currency Manipulation
Taxes on ICT Products	Export Subsidies
Human Capital	**IP Protections**
Expenditures on Education	*Special 301 Report*
Science Graduates	Ginarte-Park Patent Rights Index
Top-Ranking Universities	Intellectual Property Protection
Scientific Researchers	IP and Reimbursement Environment Supporting Life Sciences Innovation
R&D and Technology	Software Piracy Rate
Government R&D Expenditures	**Balkanized Consumer Markets**
"Bayh-Dole-Like" Policy	Services Trade Restrictiveness
National Innovation Foundation	Simple Mean Tariff Rate
Research Citations	Tariffs on ICT Products
Government Funding of University R&D	

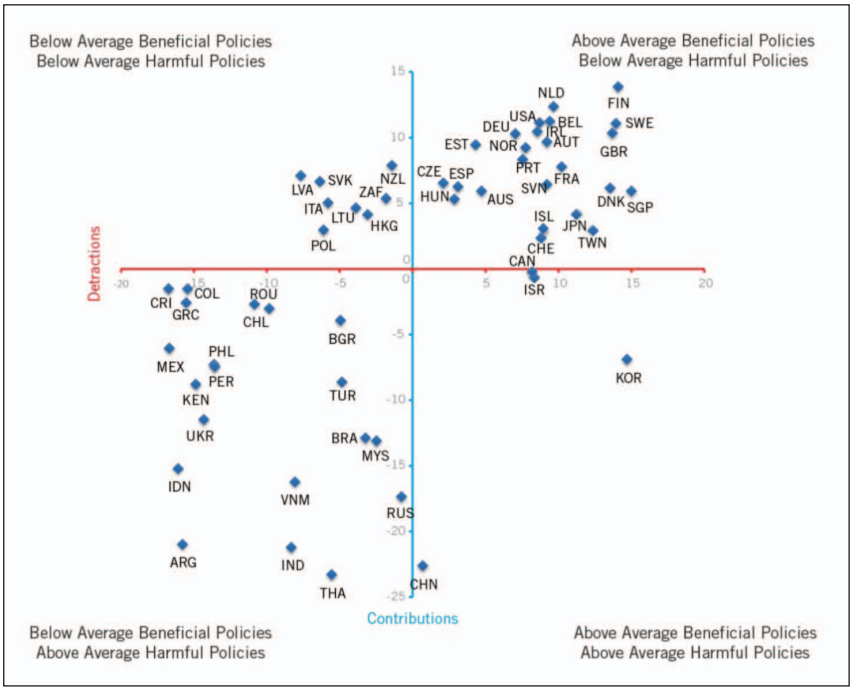
In terms of results, Finland, Sweden, the United Kingdom, Singapore, and the Netherlands led as the countries whose policies do the most, on a per-capita basis, to support global innovation – and the least to detract from it. Ukraine, Thailand, India, Indonesia, and Argentina ranked weakest overall, fielding an above-average number of policies – such as localization barriers to trade or weak protections for intellectual property – that detract from global innovation while having policies that contributed the least to global innovation.

The United States ranked 10th overall in the study. Again, the report is not measuring the absolute, aggregate level of innovation output from a nation (otherwise the United States would most likely rank first), but rather assessing how a country's economic, trade, and innovation policies create an international landscape in which innovation can flourish. The United States scored 6th overall for Detractions but just 17th overall for Contributions. America's pedestrian showing results from having a national R&D intensity (R&D investment as a share of GDP) that has fallen to just ninth place among OECD nations, an R&D tax credit generosity that ranks just 27th in the world, tax policies that are globally uncompetitive (e.g., highest statutory corporate tax rate in the world), and middling performance on key human capital indicators. And of the 56 nations assessed, the United States ranks just 17th in scientific researchers per capita and 16th for scientific graduates.

Italy ranked 33th in the study, placing 39th in terms of how constructively its economic, trade, and innovation policies positively contribute to global innovation, although Italy scored better, 25th, in terms of refraining from implementing policies that harm global innovation. In terms of individual indicators, Italy scored weakest for its high effective corporate tax rate and for ranking just 42nd among the 56 nations in scientific graduates per capita. Moreover, Italy does not have a national innovation foundation or clear national innovation strategy. Italy ranked best in terms of its tax policies in support of innovation (e.g., offering generous collaborative R&D tax credits and lower tax rates on innovative new products) and in terms of not using protectionist trade policies.

However, while considering individual countries' results is interesting, it's also instructive to plot countries' performance relative to others, as the scatterplot in Figure 2 does. Countries in the upper-right quadrant are doing the most to contribute to, and the least to detract from, global innovation, while countries in the lower-left quadrant are doing the least to constructively contribute to and also the most to detract from global innovation. The scatterplot reveals that eight distinct clusters of countries emerge from the analysis, and it also shows that European nations score quite well in ITIF's report.

Figure 2 - Scatterplot of Countries' Contributions to and Detractions from Global Innovation



The report first identifies a group of leading "Schumpeterian" countries, all European, that record both strong scores for contributions to the global innovation system while generally eschewing use of policies that detract from it. These countries – including Finland, Sweden, the Netherlands, and the United Kingdom – embrace what ITIF calls "The Helsinki Consensus," which affirms that governments have an active role to play in bolstering the innovation capabilities of their societies' enterprises, industries, and institutions, and hence commonly employ national innovation strategies. However, these countries simultaneously believe in globalization and market-based trade, and so score well at protecting intellectual property and refraining from introducing barriers to trade or balkanizing production or consumption markets.

Just behind them, the report next identifies a group of "EU Continentalists" which includes countries such as Austria, Belgium, France, Germany, Norway, Portugal, and Switzerland that generally share the same mentality but are a notch below the

Schumpeterians in how intensively their policies contribute to the global innovation system and a notch below in the extent to which their policies do not detract from the global innovation system. In other words, these countries still contribute positively to the global innovation system, but perhaps their investments in R&D and education, as a share of GDP, are a bit below that of the Schumpeterians. Likewise, these generally continental European countries may make occasional use of localization barriers to trade policies (such as French content requirements for locally produced audiovisual media content) or impose significant pharmaceutical price controls that limit global life science innovation (as in France and Norway) that cause them to score slightly lower than the Schumpeterians on their Detractions' scores.

ITIF's report identifies a third group of "EU Up and Comers" which consists of countries primarily from Eastern Europe, such as the Czech Republic, Poland, Lithuania, Latvia, the Slovak Republic, and Slovenia, that score above average for Detractions – in other words, they are generally playing by the international rules of the game and not fielding mercantilist policies – but, largely because they have lower per-capita incomes, they have not been able to invest as much as other nations in scientific research or education, and so score below the mean on these indicators. For example, Latvia, the Slovak Republic, the Czech Republic, and Slovenia rank a highly respectable 15th through 18th in terms of Detractions' scores, but the Czech Republic scores 27th and Poland, the Slovak Republic, and Latvia just 40th through 42nd in Contributions. So these countries score much better on Detractions than Contributions, but they are generally getting the right policy environments in support of innovation in place.

ITIF's analysis places the United States into a fourth group of "Adam Smithian" countries, referring to the laissez-faire, neoclassical economic approach long adopted by Anglo-Saxon nations that endorses a less assertive role for government policy in shaping national innovation capacities. For example, the United States has long been riven by internecine debates about the appropriate role of government in supporting America's innovation system, whether about the appropriate extent of government investment in basic versus applied scientific research or in its initiatives, such as the Manufacturing Extension Partnership or the National Network for Manufacturing Innovation, to support firm-level innovation. Adam Smithian countries – which also include Australia, Canada, and New Zealand – generally field policies that do little to detract from global innovation, but because of their strong commitment to neoclassical economics (with its disdain for innovation policy), they do not score as strongly as the Schumpeterians or EU Continentalists on contributions to the global innovation system.

A fifth group, the "Advanced Asian Tigers", includes Israel, Japan, Korea, Singapore, and Taiwan and consists of countries that "just want to win" in the global innovation race no matter what, and while they make strong contributions by committing to high levels of R&D investment, robust education systems, and competitive tax environments, they also aggressively implement innovation mercantilist policies that detract from global innovation, and have relatively weaker IP protection environments. For example, Korea actually scores second-best in the world for Contributions – it leads the world with a national R&D intensity of 4.7 percent, for example – but it scores rather poorly, 42nd, for Detractions.

A sixth category consists of "Innovation Followers", such as Chile, Colombia, Costa Rica, Greece, Italy, Mexico, Kenya, Peru, and South Africa. These countries score weakly for Contributions, but near the mean for Detractions, suggesting that these countries are generally playing by the rules of the global system and not trying to free ride on the innovation efforts of others.

A seventh group of countries comprise the "Innovation Mercantilists", including China, Brazil, India, Russia, Thailand, Turkey, and Vietnam. These countries score significantly below average in terms of Detractions, indicating that these countries significantly balkanize both global production and consumption markets through a wide range of trade barriers and have generally weaker environments for intellectual property protection than is the global norm, explaining why India, China, and Thailand account for the bottom three nations in terms of Detractions. However, these countries score slightly better on the Contributions indicators. For example, in China's case, this is largely a result of the country's intensifying investments in scientific research (which may surpass the United States in absolute expenditures by 2023 if current trends hold) and also its commitment to improving its human capital through high numbers of graduates in science, technology, engineering, and math (STEM) fields. A final grouping of countries, the "Traditional Mercantilists", consists of three countries – Argentina, Indonesia, and Ukraine – that score very weakly for both Contributions and Detractions.

It is all well and good to argue that nations should enact policies that support and do not detract from global innovation. But does "innovation altruism" pay? In other words, do the nations that rank higher also perform better internally on innovation outcomes? The evidence suggests they do. One measure of innovation outcomes, from the *2015 Global Innovation Index* (GII), includes two components: "Creative Outputs" and "Knowledge and Technology". The Contributions' score is more closely matched to the two GII outcome variables than is the Detractions' score, but each has a strong statistical relationship, with correlations of 0.84 and 0.70, respectively. It's also worth noting that countries' scores on Contributions and De-

tractions are positively correlated, at about 0.60. In other words, countries that do more to support global innovation also tend to do less to harm it.

As noted, European nations generally fared well in ITIF's *Contributors and Detractors* report, and the study identifies several hallmarks of the European Union roadmap for global collaboration. This includes first establishing common markets and lowering trade barriers between countries (including common and low standard tariffs for overall products and ICT goods). It also includes Europe's efforts to establish common labor markets and work toward the free movement of labor and capital. It further references Europe's efforts to establish collaborative scientific research efforts (e.g., Horizon 2020) and to establish a European Union Patent office and implement robustintellectual property rights protection policies. When other nations have sought to emulate these policies, such as in the Pacific Alliance – a Latin American free trade zone that includes Chile, Colombia, Mexico, and Peru – good results have generally followed.

Policy Reforms to Maximize Global Innovation

As noted at the outset, despite some progress, the world is not producing as much innovation as is possible – or as is needed. But in contrast to some who marvel at the innovations appearing almost daily – smart phones, biologic drugs, electric cars, innovative ICT-based service sector businesses such as Airbnb and Uber, etc. – it remains fair to ask: Why do we not have more? As George Bernard Shaw wrote, "Some men see things as they are and ask why. Others dream things that never were and ask why not." Indeed, the real questions are about the innovations that could be here, but are not. Why do educational systems in most nations look the same as they did 50 years ago? Why have we yet to cure cancer or Alzheimer's? Why are not robots much more functional? Why does renewable energy still cost more than coal and oil? Why do not roads last 100 years without degrading? Why can not we desalinate water cheaply? The list of potential innovations could go on and on, for as Joseph Schumpeter once stated, "technological possibilities are an uncharted sea."

But if humanity is to realize this potential, several reforms need to be made to the governance of the global innovation system. The first is that countries should recognize that the types of economic growth and innovation-promoting policies they pursue have significant spillovers on other nations and so therefore they should focus foremost on using only the "Good," win-win innovation policies referenced in Figure 1. In particular, it's high time that the global development and trade community establish a framework that better distinguishes between policies that are

good (e.g., help developed and developing nations) as opposed to ugly (e.g., help developing nations at the expense of global innovation). One of the most important steps policymakers, especially in developed nations, can take here is to more strongly push back against the perspective that developed nation innovation comes at the expense of developing nation economies and that an innovation redistribution strategy is needed.

Further, international organizations such as the World Trade Organization (WTO) and the International Monetary Fund (IMF) should increase their staff expertise on the economics of innovation and innovation policy. For the economics of innovation is something that most conventional economists are not well versed in, and as such it is difficult for them to provide useful policy guidance about what contributes to or detracts from global innovation. In addition, we need better data on how nations' policies affect global innovation. Toward that end the WTO should produce its own version of a Global Mercantilist Index, as ITIF outlined in its report *The Global Mercantilist Index: A New Approach to Ranking Nations' Trade Policies,* which would comprehensively document countries' WTO-violating trade barriers as they relate to innovation, while unabashedly calling out the nations with the most egregious policies.

The world also needs new and more capable international institutions to support global science and innovation. Nations that set aside some of their current consumption to invest in science and research are helping not just themselves but the entire world, but there is less investment in science and research than is globally optimal because many countries enjoy free rides off of others' research investments. Leading nations should therefore establish a Global Science and Innovation Foundation (GSIF). Its mission would be to fund scientific research around the globe on key global challenges and in particular support internationally collaborative research. For any nation to be eligible to receive research funds, it would have to commit at least one-tenth of one percent of its GDP in funding to GSIF and be certified by the GSIF (with guidance from the IMF) as a nation not committed to innovation mercantilism.

Countries that are not committed to innovation mercantilism should work to support more internationally collaborative research. To start, the United States and the European Union should collaborate to build a platform that jointly presents information on basic scientific research projects funded by Europe's Horizon 2020 program and by U.S. agencies such as the National Science Foundation and the National Institutes of Health. This could help connect "like-focused" researchers, expand visibility into the results of ultimately published research, and could well lead to more jointly funded projects, amplifying their potential.

Further, the United States and the European Union in particular, but all nations more broadly, should set informal yet aspirational targets for the share of basic scientific research projects they fund that include international research partners. Only 4 percent of research projects funded by Europe's FP7 research program (the predecessor to the Horizon 2020 program) had U.S. partners, for example. Countries should aspire to raise such percentages closer to at least 10 percent.

Finally, we need to reform global trade rules in support of innovation. One place to start would be with an innovation trade agreement that significantly reduces tariffs on trade in innovative goods. For example, the Information Technology Agreement (ITA), signed by over 80 countries and which eliminates tariffs to trade on hundreds of information technology products, has been a hugely successful trade agreement credited with significantly expanding global trade in ICT products and giving rise to global value chains enabling nations to specialize in certain aspects of ICT production. There has also been discussion about a so-called environmental goods agreement that would eliminate tariffs to trade across a wide-range of clean and renewable energy products. These instruments could be combined and other innovative products – such as aircraft, medical devices, and pharmaceutical drugs – to come up with an innovative trade agreement that would substantially reduce tariffs to the innovative products that are increasingly the lifeblood of the global economy.

Likewise, the international trade community should complete a *Trade in Services Agreement* (TiSA) that updates the previous General Agreement on Trade in Services (GATS) to reflect the reality of the Internet economy and modern global value chains. That is particularly important because the value of international data flows exceeded the value of international merchandise trade flows for the first time in 2015, and new rules envisioned in TiSA can help protect the free movement of data across international borders. And that matters because value in the modern knowledge economy increasingly gets created by extracting actionable insight from data. In fact, it's estimated that half of all value generated in the global economy over the next decade will be created digitally. McKinsey estimates that data analytics (e.g., "big data") alone will add as much as $3 trillion in value to the global economy each year going forward. And the value won't accrue to just large businesses: 60 percent of businesses with fifty or fewer employees in both Europe and the United States report that data analytics are vital to their businesses. TiSA can help ensure the free flow of international data so businesses can effectively operate and innovate.

Lastly, concluding a high-standard *Trans-Atlantic Trade and Investment Partnership* (T-TIP) could *significantly bolster economic growth* on both sides of the Atlantic.

This relationship is important because the United States and European Union together account for one-half of the world's GDP and one-third of the trade flows. In fact, the U.S. Chamber of Commerce estimates that full tariff elimination alone would boost combined EU-US GDP by $180 billion within five years and further estimates that a T-TIP agreement which reduced non-tariff trade barriers (NTBs) by 50 percent would increase both EU and US GDP by 3 percent, generating annual gains of $450 billion for the United States and $495 billion for Europe. Of course, other high-standard trade agreements being negotiated throughout the world, such as the Trans-Pacific Partnership (TPP) or the Comprehensive Economic and Trade Agreement (CETA) between the EU and Canada are also positioned to play important roles in fostering global innovation.

In conclusion, the international community needs to work assiduously to architect a global innovation system supported by innovation-empowering trade rules and well-constructed domestic policies to spur innovation, including public investment and innovation-supporting tax policies. Policymakers need to better understand and more aggressively push back when countries employ policies that try to advance their own interests at the expense of global innovation. And the world's leaders need to articulate a more robust vision of commonly shared global prosperity – predicated chiefly through substantial increases in global productivity levels and greater output of innovative products, services, processes, and technologies. And much greater global collaboration and coordination will be needed to tackle universally shared challenges, particularly health and environmental problems. Grand challenges require grand solutions – and one grand solution is to move toward a more supportive environment that enables global innovation to flourish to the maximum extent possible.

Innovating for the Future: Helping Italian Firms Cross the Valley of Death

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Europe faces the challenge of generating economic growth for more value-added employment. One of the best ways to do this is through more innovation. National challenges in health, security, energy, and the environment require innovative solutions. Meeting these challenges can generate new employment, state revenues, and new products for export.

Small firms often play a key role in developing new ideas and bringing them to the market. The problem is that these new companies often face daunting challenges in obtaining the funding they need to develop a new product, however promising it might be.

Many observers believe that it is the role of venture capital to provide this early funding. Indeed many policy makers around the world think that the secret sauce driving the success of the U.S. innovation system is the fact that we have a large and active venture capital market. In part, this is true. But it is not the whole story. Only too often policy-makers in Europe focus on the role of venture capital rather than looking at their national innovation ecosystem as a whole.

The policy framework inherent in a national innovation ecosystem is a critical source of national competitiveness. Providing substantial funding for applied research in universities that collaborate with industry, ensuring effective intellectual property protection and commercial markets that are actually open to competition are essential components of an effective innovation system. Similarly, bankruptcy laws that enable firms to stand up quickly and exit expeditiously without lengthy legal processes greatly increase the effective use of national resources. Together these types of investments and policies are important interlocking components in an effective innovation-friendly framework.

That said, venture capital is unquestionably a major asset for the U.S. innovation system, both in terms of its scale and the willingness of its managers to take

risks, including investing in entrepreneurs who have founded a firm and failed but have learned a lot in the process.

The scale of the U.S. venture enterprise is remarkable. Venture funding was $29.3 billion in 2013, with just under 4,000 deals. What is not widely understood is that of that total, only $943 million and some 200 deals were in the seed stage. So while venture funding is a huge asset for the U.S. system, especially for scaling the most promising companies, VC investors tend not to address the funding needs of companies in the earliest stage.

As one senior venture capitalist points out, "It is important to get in late, and then get out early." Because the earliest stage funding is the highest risk, it is often avoided by venture firms. The way VC firms operate also works against small firms. The time and management requirements for small early investment are similar to what is required for much larger, later-stage investments. Moreover, those later investment opportunities have seen significant risk reduction, whereas for the newest firms, even those with promising ideas, the risk is substantial.

As a result, even in the U.S., new ideas for innovative products often face what is called a "Valley of Death", a term used to describe the phase between conception in the laboratory or university and the marketplace. Finding the capital to cross the Valley of Death is hard, as seasoned investors often remark "the first money is the hardest". Very often that first money comes from the entrepreneurs themselves, and, surprisingly, it is often followed by a government program that provides awards to support research and product development in high-tech firms.

Many think the U.S. is the paragon of free market activity, and in fact one of the strengths of the U.S. system is that we do rely on market competition and do our best to ensure that markets remain open to new entrants, allowing new ideas to make it into the market. But not all promising ideas make it across the Valley of Death.

A program to address this gap in funding was begun in the late 1970s, when some farsighted National Science Foundation (NSF) officials recognized that much of the promising research they funded remained unexploited in the commercial markets, and therefore unavailable to contribute either to economic growth or the welfare of American citizens. They realized that there were often limited incentives to bring new ideas to the market. And critically, for new and therefore unproven firms, there was basically no capital to develop a product to the point where private investors might both appreciate its potential and be willing to invest.

The program actually began as an "under the radar" effort by NSF officials, notably Roland Tibbets, to begin competitive solicitations to commercialize research. This public option for early stage funding is called the Small Business Innovation Research Program, or SBIR. The program has been formally in place since 1982 and has steadily grown in popularity and reputation. It provides innovation awards in the form of grants or research contracts to companies that propose potential solutions to government and societal needs in defense, energy, health, environment, agriculture, aerospace and manufacturing.

The program started at a very small scale, just 0.2% of agency's external R&D budgets, but the program quickly attracted a constituency among entrepreneurial engineers seeking a means to develop their research. The allocation has increased over the years to 3% as the program has grown in reputation and demonstrated remarkable success. In 2000, Congress asked the National Academies of Sciences to review the program. The study involved substantial original field research over a number of years, with some 7,000 projects surveyed. The summary NAS report found SBIR to be: "Sound in concept and effective in operation" (Wessner 2008).

The scale of the program is often not appreciated. It provides funding to startups (20-25%) and to small U.S. companies (under 500 employees in the U.S.) to develop new products and processes that address mission needs of 11 federal agencies. The top five agencies (The Department of Defense, The National Institutes of Health, NASA, The Department of Energy, and The National Science Foundation) make up 96% of the program. Some 6,500 companies now receive awards annually. The current program is approximately $2.8 billion per year and is funded by imposing an allocation or a "tax" on agencies that have an external research budget over $100 million.[8]

SBIR is now the largest U.S. innovation program for small businesses, offering competitive awards to support the development – and commercialization – of innovative technologies by small private-sector firms. A key goal of the program is to provide government agencies with technical and scientific solutions that address their different missions.

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8. Initially the SBIR program provided for a set aside of 0.2% of funding for agencies with extramural R&D budgets in excess of $100 million. In 1983, the program's first year funding totaled $45 million. Over the next six years, the set aside grew to 1.25%.

Program Goals

The program was created under the Small Business Innovation Development act of 1982, which mandated four goals for the program. It is intended to:

- Stimulate technological innovation;
- Use small business to meet federal research & development needs;
- Increase private sector commercialization of federally-funded research & development;
- Foster and encourage participation by minority and disadvantaged persons [women] in technological innovation.

These goals are pursued by all the agencies through a common program framework. Reflecting the program's administrative flexibility, the individual agency programs often differ from each other in important respects as they seek to address their unique mission needs.

The SBIR program is highly-competitive. As it has gained in popularity, success rates have declined. For example, at the Department of Defense, which accounts for over 50% of the program, only 13% of phase 1 applications resulted in an award (Wessner 2013). Across the department, less than 50% of phase 2 applications were successful. Despite this intense competition, the program attracts companies from the leading innovation centers in the country. There is no "program capture"; over a third of the awardees are new to the program each year.

Innovative Public Procurement

An important feature for the SBIR program at the Department of Defense is that it allows a "sole-source contract." This means that companies that successfully complete their awards can be awarded follow-on procurement contracts with no further competition. This sole-source advantage remains even if the small firm is acquired, and because of this feature, many are. This provision provides a major incentive for small firms to apply for the program.

Importantly, the program also generates choice for public procurement by enhancing competition on price and quality for existing products, as well as through the creation of new products in the Defense Department's procurement system. It is an important means of breaking through the system of oligopoly supply that characterizes the Defense Department procurement system, and indeed, most government procurement systems.

Structure of the Program

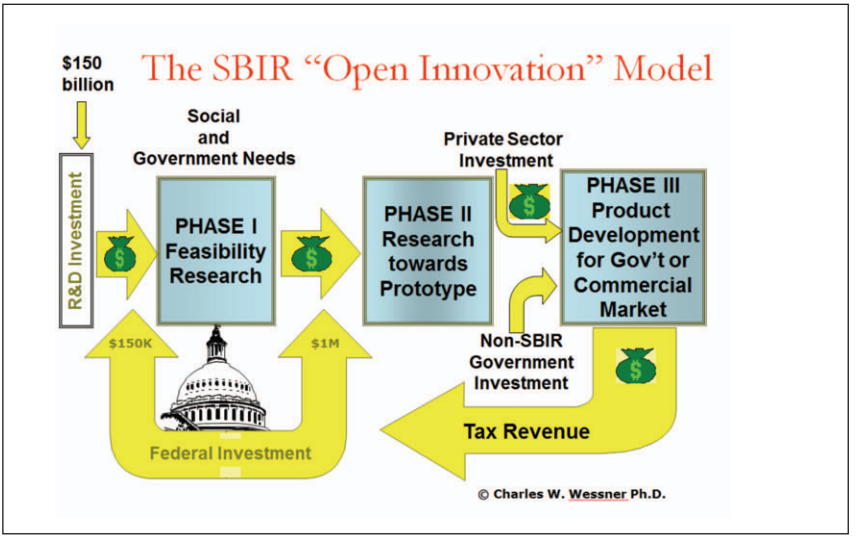
The program provides competitive, phased awards of increasing amounts for increasing levels of development. Phase 1 awards are for proof of principle. The firm normally receives $150,000[9] evaluation awards. Phase 2 awards are for development of a prototype and are normally $1 million, although the amount of this second phase shows considerable flexibility across agencies. Phase 3 awards focus on commercialization, although this is defined differently across different agencies. In the Department of Defense, phase 3 awards often – not always – offer partial SBIR funding to be complemented by funding from a procurement program as a means of winning acceptance for the innovation. At the NIH, the second largest program, substantial additional funds can be made available, sometimes up to $3 million additional dollars in "Continuation Awards". The additional awards funds are made available largely because the NIH has an extremely limited procurement budget, unlike the Department of Defense. Consequently, the NIH awards are used to push promising technologies towards the biosector market. The National Science Foundation also does not acquire products, but rather it uses what is called a "Phase 2B" program, which provides additional funding on the condition that matching funds are acquired from the private sector. In each of these cases, the objective is to provide a mechanism – first to develop and then to transfer, the innovative product to the market.

The flow chart below illustrates how the program works. As it shows, the U.S. government already makes substantial investments in research. The goal is to convert the results of this research into products and processes that can address agency mission needs or simply societal challenges in health, energy, the environment and security. Calls for proposals are issued, with multiple awards often granted on the same topic in order to explore different approaches. If they show promise, Phase Two awards are provided, again in a competitive context. Phase Three in the program has evolved over time. Initially, it did not formally exist. But program managers recognized the need for follow-on funding to push successful products towards the market in the case of NIH and NSF, or to facilitate acquisition by programs at Defense. Importantly, the managers had the flexibility to make these modifications. As noted below, private sector investment was initially not anticipated as part of the program, but it frequently occurs. The tax revenue illustrated in the diagram is important to note. The program does not have any formal recoupment mechanism,

9. This amount was raised at the recommendation of the National Academies Study from $100,000 to $150,000 in 2008.

but instead simply relies on taxing wages, salaries, and profits as they occur – a much simpler and more manageable approach than efforts to recoup state funding.

Figure 3 - The SBIR Open Innovation Model



Reflecting the different mission needs and modes of operation, award mechanisms vary among agencies. While the Department of Defense employs research contracts for its awards, the National Institutes of Health primarily uses grants. The contracting mechanisms also vary. It is important to note that the resources and time constraints imposed by the program are administered in a flexible fashion, with each of the different agencies addressing them in different ways. For example, both DoD and NIH make larger awards than the standard amount, whereas NSF normally makes smaller awards. Similarly, the NIH often provides no-cost extensions to allow time for research to be completed and, as noted, frequently makes "Continuation Awards" that provide substantial additional resources. This flexibility is a key source of the program's success.

Best Practice Features

The program benefits from a number of best practice features. One of SBIR's great strengths is that it is highly competitive and transparent in the selection process, with less than 20% of the applicants succeeding. Another key feature of the program is

that it uses sequential phases for the government investment, which serves to reduce risk while providing information to the market. As noted, the initial award phase, designed to prove feasibility of an idea, is normally about $150K, not a lot of money but enough to get started. If this first phase is successful, then the firm can apply for a second phase (where about half succeed) for significantly more funding. While there is no formal phase three, additional substantial funds can be awarded to promising companies at the program manager's discretion. Indeed, DoD now has a Phase 2.5, which seeks matching funds from procurement programs. And often private investors show up to invest in a company that has, in effect, gone through two rounds of due diligence and is receiving undiluted capital in the form of grants or research contracts from the government.

The program has numerous best practice features. It is attractive to entrepreneurs and company managers because there is no equity position taken. No repayment is required. Rights to the intellectual property remain with the firm and there are no royalty. Moreover as noted, the awards create a certification effect, which serves to attract private investors. The government finds the program useful, not least as a means of increasing competition amongst suppliers on both cost and quality, while also creating novel solutions to government mission needs. Indeed, the program can be characterized as a low-cost technological probe, allowing the government to generate and explore new options with limited resources. The program also serves to pull ideas out of the university and into the market by providing incentives in the form of initial capital and reputational benefits for professors. A significant number of firms are created as a result of applying for SBIR awards, thereby facilitating the conversion of research into products that address societal challenges.

Some of the other best practice features of the U.S. program are that it is stable and benefits from a substantial budget, at nearly $3 billion. Because of its relatively large scale, it benefits from a portfolio effect where the investments in a large number of companies each year increase the opportunities for success. But a key feature of the SBIR program, which is not always appreciated, is that while it accepts risk, it also willing to tolerate failure. A firm that does not succeed the first time, but which has a promising proposal, is encouraged to resubmit. I like to compare public investment with early stage firms to football: you ca not win if you do not shoot. But you can not expect to score every time. Shooting and missing are just part of the game.

Some in the U.S. are not comfortable with the government making grants to small companies, but experienced entrepreneurs know how hard it is to get initial funding, an insight documented by Nobel Prize-winning research[10]. Moreover, some private investors are attracted to a company that has received early operating capital to reduce technical risk and take the first products to market, especially when

there may be a clear government procurement market for the product. Impartial observers rate it highly as well, as with the comprehensive evaluation by the National Academy of Sciences referred to above (Wessner 2013). But the real proof that it is effective in supporting innovation is provided by the companies that generated new ideas, patents and products.

These innovative products often helped meet government mission needs, from low cost instruments on the Mars rover, to better armor to protect troops, to new ideas for drugs and vaccines. Commercially, SBIR investments were instrumental in contributing to the success of leading companies such as Qualcomm, whose products are in your cell phone and which has helped to transform San Diego into a high tech region.

Some might think that the SBIR program is a U.S. idea that cannot be applied elsewhere – except that it is being applied elsewhere. Countries as diverse as Sweden and Taiwan, the Netherlands and South Korea, India and Russia have all adopted and adapted a version of SBIR to meet their innovation needs. For example, at the European level the Commission has created its own version of SBIR with its new SME Instrument (this is a valuable initiative, but not one that can meet the particular needs of each country and region in Europe). In this context, perhaps Italy should consider its own SBIR program? And if not, it would be interesting to know what is the alternative plan to capitalize on investments in research while addressing the financing needs of small firms?

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10. George Akerlof, Michael Spence and Joseph Stiglitz received the Nobel Prize in 2001, "for their analyses of markets with asymmetric information" leads to suboptimal investments.

A Hybrid Space to Support the Regeneration of Competences for Re-indutrialization.
Lessons from a Research-Action

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Since the 1970s, in many European industrialized areas, cities have undergone radical transformations to cope with de-industrialization but also with the new needs of the post Fordistic organization of the factories and their ecosystems: logistics and transport requirements were demanding new functional areas, business services – from individual units up to big service companies – needed different configurations of working spaces, urban sprawling increased to satisfy residential needs. A huge amount of manufacturing buildings has become no longer appropriate for many production processes and the future of the old industrial premises has punctuated the public debate of the past forty years: from their restoring (to keep traces of local socio-technical identity), to their demolition (to provide new appropriate production or living spaces), to their re-use (for hosting new activities). In the somewhat drastic passage from the past industrial era to the future digital economy, medium size cities in industrialized areas present some specific challenges when they have to support the new manufacturing age: not only with new spaces, but also with new skills. In recent years, many public (and also private) initiatives have proposed and implemented the transformation of old manufacturing building in new settings to foster creativity-and-innovation, a condition considered essential, among others, to create new opportunities for growth. Are the re-uses of buildings effective for that goal? Is contamination in hybrid spaces the crucial ingredient for their success in supporting creativity? These questions appear even more critical when we are confronted with the creation of new skills for re-industrialization in areas that are still pillars of manufacturing activities but that are progressively lost the social fabric that reproduced skills. Although their general character is to enable information and communication flows, cities in industrialized areas have lost some important pieces of knowledge on material processes.

In this paper, we address some of those issues by investigating the action-research called "Officina Emilia", which was initiated in Italy exactly with the goal of regenerating competence networks in a manufacturing area. Officina Emilia devel-

oped some distinctive features: the creation of an original space, Museolaboratorio, designed as a hybrid space; the action-research program to introduce changes through the context-based technology education; the intent to build on a large and qualified network, supporting the innovation in the education system at regional level. These features will be discussed below. The rationale for this analysis is to single out which are the agents, the processes and some conditions that may hamper similar initiatives. In this chapter we first introduce, in section 2, the interdependencies between economic system and education system. We discuss a new approach to technology education in context, and the specific characters of what is needed to improve such context-based education. In section 3, we present the education activities produced by Officina Emilia. In section 4, we comment the lessons learned from the action-research that created a hybrid space. Our focus is on the relevant agents, artefacts and interaction processes that can support social innovation in education to enhance significant learning, to meet the changes of the world of production and to address the complexity of concrete situations. Section 5 concludes with some remarks on the lost and missing links hampering the action-research to become action.

The Interdependencies between Economic System and Education System

A re-industrialization of Europe is becoming an imperative to support a path of sustainable development characterized by social inclusion and innovation, as remarked also by the Report on EU competiveness (European Commission 2013, 2014). The main rationale for strengthening the manufacturing sector in Europe is based on the acknowledgment of its being the place of significant innovation, which in turn also provides opportunities for growth in the service sector as well (in particular business services). Although it constitutes a decreasing share of Europe's GDP, the manufacturing sector is still the engine of modern economies. Because of backward and forward linkages (Hirschman, 1958), the development in manufacturing sector has a multiplier effect on the growth of the economy (Berger, 2013): a general increase in productivity of the manufacturing sector makes a contribution to the growth of GDP that is four times higher than that of other inputs.

There are a large number of common features among the skills required (in quantitative and qualitative terms) to support changes in technology and organizational models, either in the companies, in the institutions and in urban spaces. New skills can be nurtured in workplaces and they are needed by the labour force already employed (or seeking employment). But there is strong evidence that it is more effec-

tive to incorporate the development of new skills already in the educational pathway (particularly in the upper secondary level and in the university). Both the companies and all the adult education and training organizations should be better integrated with the general education system.

With regard to Italy, the capacity of the actual education system to create and develop adequate skills does not meet current needs. The international comparisons clearly show that Italian students have lower scores in the standardized tests and a longer school to work transition (OECD, 2014). Moreover, there are substantial differences in performance across the national territory and many concerns arise from the bad results of the immigrant students and of the vocational education and training schools. A similar situation was observed in other European education systems, and this is why in the last ten years the European Commission has pushed on innovation in education toward new skills for new jobs (European Commission, 2008).

New skills are required not generically in STEM, but specifically in understanding the functioning of complex systems, in operating in environments with ill-structured problems and in transferring knowledge and skills in different situations from those in which they were acquired. These capacities are suitable to support the regeneration of the manufacturing sector and to improve the social innovation, but they are very different from those described in the labour studies (Braverman, 1974) and in the classical management theories (Fayol, 1949). Those skills are focused on the technologies and the organization of work according to a Tayloristic and Fordistic production model. In Western countries, because of broad sectoral, institutional and technological changes, rooted in the crises of the 1970s, jobs in many manufacturing industries are no longer broken down into routines and well-defined tasks, with the implication that workers can no longer focus only on a particular subset of tasks and consequently, written rules and procedures are less effective in facilitating coordination and ensuring uniformity. Lastly, work specialisation is no longer the only element producing efficient performance both in technical and managerial functions.

Skills to be promoted in the education system must address not only employability, but also social cohesion, inclusion and active citizenship (European Commission, 2012). The inability of young people to understand the context in which they live may be one of the reasons why social cohesion of several local communities is too often threatened (Cresson, 2003). A considerable amount of evidence leads to believe that these skills are dramatically poor among too many young people (Thomas, 2003).

If new skills and knowledge have to foster innovation and creativity, then the curriculum (i) must cope with the realm of technology and (ii) must build countless connections across economics, sociology and the studies of institutions. Moreover, new curricula must find ways to enhance the capacity to understand the social, economic, historical and cultural heritage, and the concreteness of the actual conditions of life and work. New contents have to be introduced and teachers have to be trained to cope with more subjects, in order to be able to design and manage multidisciplinary teaching-learning actions.

The vocational courses, at secondary, post-secondary and tertiary level, have to be re-designed to cope with the new training needs of mid-level technicians, especially those employed in industrial sectors, and in the mechanical industry in particular, not forgetting for new managerial and marketing skills. The skills of workers in the industry are less and less linked to specific tasks and duties. Conversely, they greatly need to connect the capacity of each professional position with the processes as a whole and with the company's mission and goals.

The demand for new skills pushes the entire education system on several related interventions: to reduce the early school leavers, to support lifelong learning of the adults, to reduce various types of cognitive barriers, to introduce new learning processes. In this section we shall focus on the latter, on which we suggest to ground all the other related interventions. The most important and significant contributions in designing new learning processes derive from Vygotsky (1934, 1978), Dewey (1897, 1915, 1938), Piaget (1974), Bruner (2009), Papert (1993) and Hutchins (1995) who focus on contextualized knowledge, the opening of the learning environments and the cooperative ways of learning and working. During the Eighties and Nineties, in the US and, until now to a limited extent, in Italy and in Europe, some efficient teaching methods have been tested, compared and evaluated to help students to improve their diagnostic skills, when working on "ill-structured problems". Labelled as "problem-based learning", a group of different teaching-learning practices has been described in a structured way (Barrows, 1985, 1986, 1992). This method is greatly considered as a suitable model for training teachers and for being a standard to be promoted in schools. The need to design effective educational activities for new skills finds in the studies of Papert other valuable suggestions. Following a long experimental process started in 2000, in the 2009 the Exploratorium of San Francisco (CA. USA) presented to the general public a prototyping new space called the "Tinkering Studio" (Petrich *et al.*, 2013). These experiences are now documented and supported by an online training free course for teachers. The method introduces hands-on activities and allows teachers to broaden the possibility of a greater number of students to learn effectively very complex topics.

In a companion paper (Mengoli and Russo 2014), we argued that it is necessary to boost innovation in the whole education system, from pre-school to university. In particular, the education system must take on the challenge to provide or to increase the provision of the ability to (1) apply in different environments what has been learned, (2) understand the social, economic, historical and cultural heritage of the context in which people live and work, (3) master knowledge of the core work processes. To reach these goals, the education system should allow students to have experiences in several different environments and to be aware of the concreteness of the material conditions of life and work (Cedefop, 2008; Giarini and Malitza 2003).

Officina Emilia Action-Research

Innovation processes in education must address contents and methodologies, the required structures, resources, materials and competences, as well as institutional settings. It is well known that such innovation processes call for systemic reforms in education. When coming from the centre and spreading in the periphery, they could take a long time to be defined and implemented. In this paper, we argue that, alongside the crucially important national and general reform initiatives in education, there are feasible, faster and incisive changes which must start involving local actors in action-research practices.

An example of such interventions is the one realized through the initiative "Officina Emilia": an action-research supported by the University of Modena and Reggio Emilia that produced meaningful actions with and inside schools, aiming at supporting changes into contents and methods of teaching–learning, linking science, technology, engineering, mathematics and social sciences in a more effective way through the design of relationships, tools, innovative pilot actions (Mengoli and Russo, 2000, 2009).

Officina Emilia sought to support bottom up changes in education through multi-agent and multi-level actions: an open public space was designed to allow students, educators, production and technology experts, policy makers to open their mindset and improve the understanding and practices on the issue of regeneration of competences. Public hybrid spaces are increasingly recognized as loci to foster innovation processes, since they provide a venue in which new ideas and insights can emerge by allowing interactions and interpretative ambiguity. As Lester and Piore have stressed (2004), often, these are the missing dimensions in innovation processes, which are nurtured not only by analysis and problem solving, but also by generative relationships which are based on heterogeneity, aligned and mutual di-

rectedness of the relevant agents, and appropriate permissions to support agents' opportunities of action (Lane, 2011).

Pushed by the results of empirical analysis on the changes in the local manufacturing industry and by international debate (Mengoli and Russo, 1998) on the challenges in supporting the education system, in 2000 the University of Modena and Reggio Emilia (Italy) started the action-research programme Officina Emilia. Built on comparative analyses of education systems, industrial district development and regional policies, Officina Emilia addressed multiple social, economic and technological needs of the region in which the university operates. At that time, the economic debate was strongly influenced by the ICT boom and the manufacturing sector was considered to have lost relevance for economic development, particularly in the more advanced and rich western societies. The Officina Emilia initiative pointed out that not only this sector, and the regional mechanical industry in particular, continued to support the growth of the Italian economy, but that it would cease to do so unless special competences generated and nurtured inside the manufacturing companies were re-generated and supported (Russo, 2015). The action-research was investigating which were the relevant agents to be involved in the competence regeneration and which processes had to be started or strengthened in order to improve the context-based technological education.

Following a period of analysis of the industrial structure of the mechanical industry (Metalnet project[11]; Russo, 2008) and development of projects to outline the action-research (Memo 2001-02[12], Corni80-2001, Rubes 2002-04 and Startup 2005-2006[13]), since 2006, Officina Emilia carried out a coordinated package of educational activities, which included tinkering activities[14] and educational robotics, to be placed in a new and innovative "regional curriculum". The educational activities were realised in collaboration with teachers, schools, training agencies, a significant number of small and medium enterprises (in the engineering sector and

11. "Metalnet" is a research project on the structure and dynamics of the mechanical industry. Documents are available on line at www.metalnet .unimore.it.

12. A video presenting Memo was realized in 2008 by the Italian Ministry of Education to assess the results five years after the end of the project. See https://vimeo.com/55765744.

13. Documents on these projects are available on line at http://www.officinaemilia.unimore.it /site/home/officina-emilia/i-progetti-dal-2000.html.

14. This perspective was embedded in the social practices shared in the pre-primary and primary schools in Emilia-Romagna. A special goal of the action-research was to adapt those practices in secondary school and University.

providing industrial services), as well as the representatives of multinational companies, all the main trade unions and the business associations.

The long experience matured in these activities, carried out within the schools, made clear that: the classrooms were not appropriate to set the hands-on workshops and a virtual space where to share documents on the ongoing practices (as it was since the beginning the official website of the initiative) was not enough to boost and disseminate the expected changes. The need to set up a dedicated physical space to support the action-research found an answer in the proposal of a special Museum-workshop (Museolaboratorio) designed to carry out the activities dedicated to students, the initial and in-service teacher training, and the networking activities at local, regional and national level involving, among many others, companies (particularly SMEs in manufacturing sector) and public administration. The venue of the Museolaboratorio was a factory no longer in use, in the industrial area of the town. It was composed by six main sections: a display of historical machine tools, a tooling workshop[15] with working machines, a true to life video on work in mechanical industries entitled "Places, people, machines and work"[16], the "log book" section[17], the "metrology room"[18] and the "room of the innovations"[19].

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15. In mechanical engineering firms, the tooling workshop is a very important place: for constructing or fine-tuning a prototype, for repairing a component part and, at times, for studying problems and finding practical solutions. In the tooling workshop of OE it was possible to realize hands-on activities with tools and materials to understand properties of different metals and how they are tooled, to observe mechanical parts being made; understand how the tooling machines work; follow some manufacturing processes phase by phase; see how a technical drawing is used to set up and programme a machine. "Safety at work" was embedded in the experience of users as a crucial component of knowing human-machine interaction.

16. http://www.officinaemilia.unimore.it/site/home/officina-emilia/i-progetti-dal-2000/parole-di-lavoro-2008-2009.html.

17. Officina Emilia made tens of visits to mechanical engineering firms in the Modena area. In each visit, a large set of information was collected and many artefacts were donated by the companies: put together, the artefact formed a kind of logbook marked by the motto "Touching is strictly allowed!" (and smell was another experience). Detailed information on the production processes and the producers of those artefacts are available at http://155.185.65.22/oe-imprese/.

18. In mechanical engineering it is essential to carry out checks with the proper measuring instruments. The metrology section allowed using a number of these instruments – both analogue and digital, with various degrees of precision – that have undergone technical changes similar to those that have marked the development of machine tools.

19. The goal was to engage companies, research laboratories, university teams to create their own exhibitions to share meaning on innovation as a technical, social and economic process.

In the design phase, Officina Emilia was open to discuss hypotheses, share methodologies, co-design activities and debate results with academic and practitioner communities in Italy and in international projects[20]. The methodologies adopted to facilitate the diffusion of innovative teaching-learning practices were founded on four pillars: (i) direct educational actions on students to develop innovations to be disseminated and promote change in the way of daily work of the schools; (ii) teachers training with new active practices; (iii) the involvement of the population and the students' families in specific programmes to know the economic, technological and working issues of the fundamental light mechanical industry; (iv) the promotion of a new collective support to the manufacturing development and to the new skills needed by the SMEs.

Focusing on the education activities carried out with teachers and their students, Officina Emilia contrived innovative hands-on activities by using significant artefacts, objects, products, tools and machine tools used in small and medium size engineering companies[21]. The educational activities combined knowledge of production technologies with direct knowledge of life and work experiences of workers and employers, inside their workplaces. Hands-on education activities, using and also producing *ad hoc* educational materials and multi-media contents, were as important as the meeting and the interviews with professionals conducted by students. Guided visits, periods of internship were complemented by activities in the Museolaboratorio and in the school classrooms.

Officina Emilia's tinkering labs for primary school and labs on regional socio-economic history for secondary schools started in 2001, robotics and other tinkering labs for schools of all levels and grade where developed since 2005. The cooperation and the training carried out with teachers, as well as the dynamics of the learning process of the students involved, made it possible to modify and refine the protocols and the materials to be used in the labs. Between 2009 until 2012, the activities realized in the Museolaboratorio premises involved approximately 5,000 students from pre-school to upper secondary education. Nearly 170 teachers have

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20. Over 15 year, more than two hundred people were involved in designing, planning, testing and evaluating the education labs and in design and setting up the museum-laboratory. Most of them were university researchers, school teachers, professionals, staff of the business companies that were partner of the initiative. Over 15 years, the action-research received competitive funds for about 1 million and half euro, from RDF and from local Bank Foundation. A detailed account is available on line.

21. This activity was developed in collaboration with the network of companies partner of Officina Emilia action-research (see Russo, 2016).

been involved in in-service training to promote changes into their everyday work, 12 schools signed a permanent agreement of collaboration on innovative education to be developed with the support of the university, and 3 schools introduced Officina Emilia labs in their official curriculum.

The Officina Emilia educational labs are just one part of the action-research program. Several other initiatives involved adult people were carried out to spread knowledge and awareness among people and the students' families too. These initiatives had always held a large public audience for their originality and because they met several knowledge and skills spread among the population, but without any space in cultural and collective events, despite the social and economic relevance of the highly industrialized areas considered. The Officina Emilia events also enjoyed the novelty derived from the use of little-known at local level new materials such as smart bricks of LEGO Mindstorms® and the electronic card Arduino.

Lessons from the Action-Research

Many lessons emerge from the Officina Emilia action-research and in particular from the Museolaboratorio pilot actions as educational space simulating a working environment of manufacturing sector (light mechanic industry), and as hybrid space that combines educational uses, research and outreach. A selection of those lessons are briefly recalled here.

Competences required a hybrid space like the Museolaboratorio

Groups of researchers from engineering studies, physics, materials chemistry, economics, sociology, communication, pedagogy and didactics were involved in the Officina Emilia action-research program. They were able to create theoretical documents and reports to disseminate experiences and evaluate their results. Beyond the contribution of researchers in different fields, what are the skills needed to design and manage the creation of relevant learning in hybrid spaces? Three professionals are usually involved for their know-how and their experience: the craft-workers, or technicians experienced in traditional methods of production, new makers and teachers of technological subjects in schools and training centres. When these professionals are involved at the same time, their cooperation must not be taken for granted. The differences in experience, career and age count a lot and it is not easy to boost the desired effects. Moreover, time constraints and the rigorous methodologies of the research were often experienced by professionals as im-

positions, hindrance and pitch invasions, and funding a common ground may become challenging.

The design of hybrid spaces generally relies on competences of experts able to transfer practical learning and to design and create products and know-how. The Officina Emilia experience warns in narrowing the discussion only on these professionals. For example, the craft workers and the production technicians (experts in traditional technologies) are able to pass their manual skills through coaching, in a very long time and inside workplaces that no longer exist or that are specific for a particular sector or even a single company. Moreover, present safety standards are not always part of their experience. But, above all, the way they do is no longer supported by the social conditions that created consensus and appreciation for their educational task. Their ability to teach soft skills is too limited, with reference to the communication, collaborative peer relationships, documentation and research needed for a comparison of the technology and the products in situations far in space and in time. Another example is provided by the new "makers". They are still too poorly defined to allow a discussion on their educational effectiveness. How many "makers" are craft-workers, production technicians or traditional craftsmen? How many are *bricoleurs*? How many of them are highly specialized professionals on specific processes, materials and products, with little experience in other workplaces, so with visions and practices too dependent on one specific context? Professional features of the individuals involved are certainly dependent on individual factors, that make their educational contribution rich of variability, but also unpredictable.

Lack of managerial competences strictly devoted to promote the "brand" in the media and policy networks were not overlooked aspects, but missing competences in the area that was impossible to attract (scale matters in attracting those competences!).

Activities of classes in hybrid space

The involvement of schools in activities of the hybrid spaces (such as Fab labs, enterprise workshops or museum workshops) and the introduction of labs with 3D printers inside schools may produce little or not at all significant changes of the quality of learning of the new generations. The simply supply of technologies or making people aware of innovative machines is unlikely to change the actual educational practices. As happened in Italy with the public investment on interactive multimedia whiteboards, interactive projectors and other technological devices (with teachers and schools that still underuse or misuse those devices). Public in-

vestment designed to the Fab lab, especially the commitment to involve schools in their activities, and investments to the spread of other technological tools, have the advantage of focusing attention on the need to connect the information technology with most extensive learning of the production techniques. However, the experiences that schools are carrying out patchy, do not yet found sufficient assessment research. They risk to waste valuable time for the development of an effective strategy to support schools, training centres and enterprises. To develop effective innovations, three main aspects should be fostered: a greater care in the management of change, a better design of both the educational activities and teachers' in-service training, a stronger support to communities and networks of practices.

Creation of ad hoc information in an ad hoc environment

The experience of Officina Emilia shows that hands-on activities, and opportunities to conveniently observe a workplace widen the horizon of thinking, help the imagination, support self-esteem in confronting technological challenges (in particular with regard to girls approaching technologies they consider as largely out of their interest), and open students to new domains (e.g. reconnecting what students do in the labs with their parents' or relatives' jobs, which they generally do not consider of any importance and they learn to appreciate in different perspectives). These processes fail to emerge for spontaneous sprouting inside schools or at least fail to emerge with the quality and the required size. The first and most important reason is that teachers express a strong need for data and tools to effectively introduce their students to the knowledge of the structure of the industrial area in which they live, and which influences their educational, training and professional opportunities.

Fifteen years after: do the critical initial conditions still matter?

At the start of the action-research program, some empirical facts were urging some intervention: the shortage in quantitative and qualitative terms was hampering the growth of SMEs in the mechanical district. What did happen in the following 15 years after?

Until 2008, the high pace of growth of the majority of the regional companies was supported by the growth of international demand: the increase in sales was accompanied by only a marginal increase in employment. Investments in physical capital ensured higher productivity, better quality and the requirements of the international standards. High level competences were shifting across companies, with increasing salaries of high level technicians and managers. Mid-level technicians

were still as scarce as at the beginning of the period, but internal training was allowing SMEs to cope with their needs, at least in the short medium run. Some critical problems were appearing more relevant than in the previous decade: the generational change in the ownership and control of SMEs; the creation of new companies was slowing down, the vertical and horizontal organization of the value chains was largely changed making more acute the need for technical, organizational and managerial skills in a rapidly changing environment (Russo and Whitford, 2009). When in 2009 the crisis affected the mechanical district, its effects were not equally heavy (as discussed in Russo, 2015). Even though the overall effect on employment was significant, opportunities for mid-level and high-level technicians emerged. Not a zero sum game: several SMEs closed and recovery has been accompanied, in many cases, by a radical re-design of production processes; network and power relationships changed greatly across the companies still active in the district. The demand for more qualified workers still remains a challenge: qualitative and to some extent also quantitative.

From Action-Research to Actions: Lost and Missing Links

In recent years, other experiences have developed hybrid spaces. With reference to the Emilia-Romagna region, it is to mention the construction of public funded Fab Labs, in Reggio Emilia and in Modena, and the opening of the private and public partnership supporting Opificio Golinelli in Bologna. Moreover, artefacts to support tinkering labs emerge at the national level, such as the intervention of Federmeccanica on primary schools which is titled "Eureka! It works", which produced an educational kit usable in many different ways.

Why did the University, that in 2000 approved Officina Emilia as one of its relevant projects, decide to close in 2015 to close the Museolaboratorio? Several factors were not favouring a longer lasting of that experience. A positive evaluation plan of the impact of the activities carried on with schools was not enough to support some drawbacks.

First of all, even though the University invested human and material resources for about a decade, also in view of enhancing the quality of learning of incoming students, the absence (or weakness) of its institutional recognition by the authorities in charge of the regional education system, greatly limited the diffusion of the innovative practices produced by Officina Emilia. The initiative was not able to cope with changes in regional policy orientation: at the beginning there was a strong support to exploit innovation potentials in the many related fields in local development, after six years the regional administration was shifting toward a more sec-

toral vision on top down and more controlled intervention from the entrepreneurial side and from the education side. In the last years, the University itself was reducing its strong support: the initiative was outside the primary missions of university: education, research and technology transfer, at that time considered the only relevant activity to support "third mission". Then, when the crisis imposed cutting expenses, there was no longer the financial support for its public engagement, which nowadays is strongly recognized as a crucial component of the university third mission. The economic crisis was an exogenous factor hampering the support from the network of partner companies of Officina Emilia: they cut all supports to any initiative, in a condition of reduction of production, layoff of workers and declining revenues. These processes and conditions highlight that, notwithstanding the many fruitful generative relations both at regional and international level, the lack of some local linkages was marking the initiative as a university lobby: even though it was well known and appreciated for the quality of the innovative proposal carried on by the initiative, the strong branding of Officina Emilia was ignored in the regional media. In a nutshell: missing institutional links have progressively reduced consensus to the action-research, not allowing the progress toward more structural actions. Monitoring of generative relationships is a reflexive perspective on the ongoing processes, but obviously it is not enough to generate the missing links.

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PART 2
BUILDING BLOCKS

Creativity and Culture as a Strategic Tool for Innovation and Economic Development

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In the last two decades, a series of inter-connected socio-economic factors has led to a major change in the character of production and work, contributing to the emergence of the so-called knowledge economy. One of the prominent features associated to these phenomena is the progressive culturalization or symbolicization of traditional economic sectors – i.e. the emergence of the "non-utilitarian aesthetic and semiotic" features of goods and services as catalysts for consumer attraction (Scott, 2010: 116). Changes in the skills required to workers and in the organization of work activities have paralleled the emergence of such a new competitive scenario. In particular, creativity and innovation have been increasingly depicted as critical resources for both the success of companies and the economic development of entire regional and national economies (Florida & Goodnight, 2005; UNCTAD, 2010). In a complex and rapidly changing environment, in fact, companies could achieve a competitive advantage only by continuously generating new ideas, which in turn could lead to innovation (e.g., Amabile, 1996; Stehr, 2002). Similarly, cities and regions could stimulate economic growth and improve the quality of life for their inhabitants by implementing public policies aimed at creating local ecosystems that sustain creativity and innovation (e.g., Florida, 2002; Markusen and Schrock, 2006; Montanari, 2011).

However, how is possible to develop and sustain local ecosystems that work as breeding ground for creativity and innovation is still an open question.

Several scholars and practitioners have addressed this issue highlighting the important role of different factors such as the investment in 'smart technologies' for the cities, the reduced taxation or easier access to credit that could favor innovative start-ups clustering, or the presence of universities and other urban amenities that could attract creative people into one place (e.g. Comunian and Gilmore 2016; European Commission 2010; Storper and Scott 2009). Within this debate, the potential use of culture and creativity as a tool for growth and development has grown

exponentially in attention over the last decades. To this respect, policy makers have invested relevant resources in the so-called creative (or culture) – led policies – i.e. public policies aimed at sustaining the creation of territorialized production complexes based on creative activities. This is the case of many European cities like, for instance, Glasgow, Manchester, Bilbao, or Turin, which have implemented effective creative-led policies that contributed to renewing their image and attractiveness limiting the negative consequences of a decline in the city's industrial activities.

Creative-led policies could be clustered along a *continuum* where, on the one side, we have a 'top-down' approach, which comprehends projects "developed as part of a conscious top-down planning strategy" (Mommaas, 2004: 515), and, on the other, a 'bottom-up' one, which comprehends projects "developed from a contingent coming-together of vernacular tactics" (Mommaas, 2004: 516). According to extant literature, this latter approach seems to be more effective since it favours the development of a 'collaborative atmosphere', which encourages the spontaneous development of artistic and entrepreneurial activities (Power and Scott, 2004). Creative collaborative spaces (hereafter, creative CSs) have recently emerged as an important tool for implementing effective bottom-up creative-led policies (Montanari and Mizzau, 2016). Creative CSs are places that are intended at bringing together different actors (firms, creative communities, entrepreneurs, citizens, etc.) in order to facilitate information exchange, enhance people social networking, and promote collaboration, thus contributing to the development and implementation of new products and services.[22] They could be either regenerated former industrial neighborhoods (brown fields) or projects starting from scratch (green field). In both cases, they are considered an important tool for urban policies aimed at developing local ecosystems that work effectively as breeding ground for creativity and innovation (Komninos, 2009; Skelcher et al., 2005). Thus, local administrations have invested (and are still investing) relevant resources in the creation of this kind of spaces over the last years.

Whereas creative CSs seem to grant potentially several benefits in terms for instance of inclusion, innovation and urban revitalization, it is still debated what is the best way to design and manage this kind of spaces. In particular, the co-localization within the same space of heterogeneous actors (e.g., individuals, groups, associations) with different skills, knowledge and expertise seems to work as a necessary but not sufficient condition for their effectiveness, since it does not guarantee *per se* col-

22. Examples of creative CSs are Friche La Belle de Mai in Marseilles (www.lafriche.org), Mare Culturale in Milan (http://maremilano.org), and Tabak Fabrik in Linz (https://tabakfabrik-linz.at).

laboration, knowledge sharing, and cross-fertilization. Thus, many creative CSs fail to deliver the promise of increased creativity and innovation.

This paper aims at discussing the relational conditions that could contribute to designing effective creative CSs as a strategic tool for public policies aimed at sustaining the development of local ecosystems able to support creativity and innovation. In so doing, we will draw on extant literature on the 'social side' of creativity discussing its potential application to public policies aimed at supporting the creation of collaborative spaces.

Creativity and Innovation: From an Individual Perspective to the Social Theory

Extant literature includes several definitions of creativity and innovation. A widely accepted one states that creativity is the production of novel and useful ideas, and innovation is the development and implementation of new ideas, which could be converted into new products, services, ways of doing things, or even companies (Amabile, 1996; Baer, 2012). Whereas creativity and innovation are nowadays central inputs to economic development, they are also highly risky and uncertain. Indeed, safe and 'one hundred percent unfailing' means of pursuing and implementing new ideas do not exist. Furthermore, new ideas could challenge established customers' preferences and power structures in organizations and industries. Thus, people pursuing new ideas usually have trouble to both gain legitimacy among different stakeholders and harvest the resources necessary for the implementation of such ideas.

For these reasons, it is important to understand what factors facilitate creativity and innovation.

Research on the determinants of creativity and innovations has historically considered creativity and innovation very much an individual activity, thus focusing on the individuals' attributes (psychological traits, cognitive styles, etc.) that make some individuals more creative than others. In the last two decades, however, research has shifted its attention from internal (individual) to external (contextual) determinants investigating how environmental characteristics can facilitate creativity and innovation (e.g., Perry-Smith and Shalley, 2003; Shalley, Zhou and Oldham, 2003; Sosa, 2011). More specifically, in line with the main tenets of social capital theory (e.g., Burt, 1992; Granovetter, 1974) more recent studies suggest that a deeper understanding of creativity and innovation demands that actors (i.e., individuals, groups and organizations) should "be placed within a network of interpersonal relationships' (Simonton, 1984, p. 1273). Networks of relationships, in fact, provide

both the fabric through which actors may tap novel information for creative problem solving and conduits for harvesting relevant social resources to implement them. To understand better the determinants of creativity and innovation, thus, we need to know how the structure of the individual's network of relationships influences her ability to produce creative and innovative outcomes.

Several researchers have followed this stream by examining how different networks of relationships relate to the creation and implementation of creative and innovative outcomes (e.g., Obstfeld, 2005; Perry-Smith, 2006; Rodan and Galunic, 2004). Results suggest that, on the one side, individuals with a large set of contacts that tend to be disconnected from each other (i.e. forming a sparse network structure where single nodes usually have infrequent interactions with each other and show low emotional intensity with counterparts) are more likely to produce novel ideas. These broad-ranging weak ties surrounding individuals, in fact, seem to encourage autonomous thinking and facilitate access to diverse and non-redundant knowledge. On the other side, individuals surrounded by a tight-knit network of contacts, also characterized by frequent and emotionally intense relationships, are more likely to have the social support required to get creative ideas implemented or adopted by others. In other terms, close and dense strong ties can be conduits for mobilizing the social support and the resources necessary to sustain collaboration, risk sharing, and complex knowledge transfer, which in turn support creativity and innovation.

Regardless on which type of network surrounds individuals, this stream of research "conceptualizes creativity as a facet of the social world" (Koppman, 2016: 292). In line with this argument, scholars from different disciplines have highlighted that also the characteristics of the contextual fabric in terms of, for example, social infrastructures and relational dynamics could be conducive to creativity and innovation (e.g., Giuffre, 2013; Montanari, 2014).

Therefore, it is important that local administrators implement effective policies aimed at developing in a particular geographical area (a neighbourhood, a city or a region) a breeding ground for creativity and innovation, which in turn could sustain regional development, urban renewal, and city competitiveness. As highlighted by several studies (e.g., Power and Scott, 2004; Storper and Venables, 2004), policy makers should invest resources in creating the contextual conditions that favour the development of a collaborative atmosphere among the actors operating in a geographical area. In particular, they should implement policies focused on the development of 'soft' infrastructures that facilitate information exchange, enhance people social networking, and promote collaboration among interconnected actors, thus contributing to the development of a collaborative and highly connected environment.

Collaborative spaces seem to play an important role in sustaining the development of the contextual conditions that could be conducive to creativity and innovation (Leminen et al. 2016; Toker and Gray 2008). For instance, they could allow for intense and frequent, often face-to-face, interactions, thus favouring the emergence of trust, cooperation, and cross-fertilization of ideas. However, many collaborative spaces fail to deliver the promise of increased creativity and innovation, since it is still not clear what is the best way to design and manage this kind of spaces. Thus, it is important to understand how to design and manage effectively this kind of spaces.

The Social Foundation of Creative CSs

Creative CSs are places such as co-working spaces, incubators or social innovation hubs that bring together different actors in order to stimulate the creativity and innovation of individuals (entrepreneurs, citizens, etc.), groups (associations, professional communities, etc.), and organizations (companies, public institutions, etc.). They draw on the concept of 'third places' (Oldenburg, 1989), which are distinct from both the work environment and the domestic space of home and family life representing an informal social place where people can enjoy easygoing conviviality and safety. Creative CSs are intended at being places where people could meet to discuss and talk about things that matter to them (professional projects, new ideas of products or services, their neighborhood, their community, etc.).

Creative CSs can play an important role in creating a breeding ground for creativity and innovation. For example, they could be used "for work meetings, where spontaneity and accidental encounters may spark new ideas or provide an occasion for the extension of networks" (Wittel, 2001: 68). Furthermore, they could facilitate the emergence of trust, knowledge exchanges, cooperation, and cross-fertilization of ideas so as to favour the development of a collaborative atmosphere, which creates opportunities for co-creating new products or services.

Despite a general acknowledgement of the importance of the relational dynamics that take place in creative CSs, local administrators (and also actors in charge of managing these spaces) too often do not pay enough attention to the understanding of this aspect. As a result, the relational dimension of creative CSs is often underconsidered, and it is not exert enough effort in sustaining it. This lack of understanding and effort is not a trivial issue since the way in which different actors involved in a creative collaborative space are linked to each other plays a critical role in determining the outcomes of their collaboration and the success of a collaborative space. For example, dense and frequent face-to-face contacts have a

positive impact on the propensity of individuals with different backgrounds to collaborate, and thus on their creativity and innovation (e.g. Myerson and Ross, 2006; Oksanen and Stahle, 2013).

The adoption of structured network methodologies to investigate the features of the relational patterns developed in a collaborative space could be an important 'first step' for adopting proper actions aimed at creating a collaborative environment. The design of the physical spaces represents another important tool for developing beneficial relational dynamics. Indeed, spatial arrangements of offices, the use of ergonomic furniture, window view and plants, or features such as colors may have a positive influence on creating an environment that support experimentation, cross-fertilization, and lateral thinking, which in turn sustain creativity and innovation (Dul et al., 2011). Strengthening the links between a collaborative space and the universities and the research centres operating in the geographical area could be important as well. In particular, launching projects that involve students enrolled in various training programmes could be a means by which exploiting potential synergies and supporting the dissemination of the creativity and innovation culture among younger generations.

Other actions aimed at strengthening the relational foundation of creative CSs could regard the implementation of appropriate communication activities and events aimed at increasing the awareness of a collaborative space both internally (among the involved actors) and externally, i.e. among those targets (citizens, potential partners, other spaces, etc.) that have not yet been reached out to. In that sense, it may be useful to organize specific meetings and information exchange events, such as prizes or festivals, which may provide interesting opportunities for promoting ongoing projects (both consolidated and emerging ones) as well as international best practices. Such moments also make it possible to increase the number of relationships with other creative CSs, boosting the exposure to experiences outside the local ecosystem. The presence of such connections allows for increased circulation of ideas and experiences, also avoiding the risks typical of over-embeddedness[23] (Uzzi, 1997).

Finally, it is important to note that online relationships could also play a pivotal role in the creation of a climate of trust and cooperation. In that sense, it might be important to develop collaborative web platforms that serve as an effective tool both for the representation of actors that operate in a collaborative space (thus promot-

23. 'Over-embeddedness' means the situation in which the actors that operate in the same geographical context feature many close links with each other and very few with the outside world, thus reducing the flow of new information and knowledge.

ing what already exists), and for their coordination (possibly on specific issues and calls for actions). For instance, web platforms may serve to foster contacts between people and/or organisations that share the same problem and may want to cooperate to find any possible solutions, thus fostering cooperation and co-planning of responses to common needs. Alternatively, they may be a tool for local governments (or other actors) to engage different stakeholders (citizens, firms, associations, etc.) in discussions and co-planning of some public policies. In all these cases, web tools can complement formal and informal face-to-face interaction.

Conclusion

This paper discussed the relational determinants of creativity and innovation underlining the social foundation of creative CSs. In so doing, we highlighted actions that could contribute to designing effective creative CSs, which are increasingly important tools for implementing effective creative-led policies. In particular, this paper can inform policy makers, local administrators and creative CSs' managers to leverage the 'social side' of creativity and innovation by designing soft (festivals, workshops, events, etc.) and hard (physical spaces, incentives, etc.) infrastructures aimed at underpinning the development of proper relational dynamics. The ultimate goal of these actions is to create local ecosystems for creativity and innovation, thus ensuring an atmosphere of trust and cooperation that fosters the exchange of complex information and knowledge, the development of joint initiatives, and the co-creation of new products and services.

In summary, local administrators and creative CSs' managers should focus their effort on three main areas of action:

- Support: this area covers all actions aimed at supporting the development of the collaborative relational dynamics not only through economic and financial means, but also through sponsorship and educational support intended at developing a culture and a climate of trust and cooperation;
- Facilitation: this area covers those actions that range form playing a steering role wherever required to dealing with conflict mediation/solution, to planning occasions for creating (and maintaining) relationships with other collaborative spaces;
- Dissemination: this area covers all actions aimed at promoting knowledge of a creative CS, reaching out both more and more local stakeholders (who have not yet got in touch with it) and external actors (i.e. other national and international experiences).

Finally, it is important to note that sustaining effective relational dynamics characterizing creative CSs allows to increase not only its capability to create creative and innovative outcomes, but also its ability to function like a 'magnet' (Scott, 2000) – i.e. attracting other professionals working not only in creative settings, but also in more traditional sectors (e.g., banking, ICT), who might be attracted by the idea to experience a vibrant context and interested in working in related activities. As a result, local administrators will benefits from an increase in the human capital already accumulated in the area and a 'refresh' of people and ideas.

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Foundations for the Municipal Commons of the Global Information Economy

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As the global economy shifts from being principally about the manipulation and transportation of atoms to knowledge exchange, bandwidth becomes our commons of collaboration. Cities face the challenge of assuring that their enterprises and residents have the next generation broadband networks necessary to assure that bandwidth does not constraint economic or social progress. This essay explores the challenges and opportunities cities have in putting in place the foundation stones to thrive in the 21st Century Global Information Economy.

Cities and the Commons of Collaboration: Broadband

Cities are the cradle of civilization. For several millennia, their mission has been to create the commons for society, goods and services that individuals cannot produce on their own and that are largely shared by all in a community. From an economist's perspective, these goods and services produce significant public externalities but are unlikely to be created by private sector actors.

Society's understanding of the need for such assets has led cities to organize the building of physical and social foundations for economic growth and social progress for thousands of years. In their earliest manifestations, this meant building walls for defense and marketplaces for trade. The commons constantly evolves. In transportation, cities engaged in building other facilities, from roads to ports to train stations to airports. For markets, most cities stepped away from building markets but many provide space for a new wave of farmers markets and rules that enable the burgeoning market of food trucks. Cities take responsibility for the development of common areas, such as tourist areas, sports and convention facilities and parks. In the last several centuries, cities have taken steps to assure that all within their bounds had access to certain kinds of network facilities, such as electricity, water, sewer, and in the last century, communications. All such facilities and rules have in

common two key elements: they are locally bounded and they create a number of positive externalities for the surrounding community, such that their financing has to come from a common source, often taxes but increasingly through partnerships that involve usage fees.

In the 21st century, a new commons has emerged: the commons of collaboration known as broadband. It began as a way for academics to share research but has emerged as the commons of collaboration for every economic sector and social network, from families to local communities to national and international groups. It is already true, and will be even more so in the future, that the table stakes for a city to thrive will be ubiquitous access to affordable, abundant bandwidth.

Foundational Challenges for Cities for the Global Information Economy

What is the role of a city in building and maintaining this essential commons for economic growth and social progress? To thrive, cities will have to address three basic challenges:

- Assuring that their enterprises and residents enjoy affordable, abundant bandwidth everywhere;
- Assuring that all within their communities are online; and
- Using the broadband platform to improve the delivery of public goods and services.

Affordable, abundant bandwidth everywhere

To a significant extent, broadband networks are built with private investment dollars and paid for with subscription fees, not tax dollars. Still, the networks create a number of public and private positive externalities such that all cities have an interest in making sure such investments are forthcoming. Indeed, most mayors, in my experience, would like to assure that all their businesses and residents have access to affordable, abundant bandwidth. Unfortunately, most mayors do not believe their cities have that today. While some will consider the city offering its own broadband service to meet that need, most look to market forces and private capital to do so.

To obtain such bandwidth, we need to start by understanding why we do not have such bandwidth today. After all, we have known for some time that the deployment of fiber networks, in contrast with the historic cooper phone networks or hy-

brid fiber coax cable networks, can provide such abundant bandwidth. Yet fiber deployment is moving forward at a slow pace. The simple, but politically difficult, truth is that for both current and potential broadband providers, the current cost of deployment and operations of fiber networks is greater than their risk adjusted returns. Under such conditions, no enterprise is likely to make the necessary investment.

Cities, however, can change that math. Over the last five years, cities have taken a number of steps to lower the costs and risks of deployment in a way that enables capital to flow to new fiber. In the United States, Google Fiber has driven a lot of changes but AT&T, CenturyLink and my own organization, Gig.U – a consortium of three-dozen university communities working to accelerate the deployment of next generation broadband networks – have worked with dozens of communities to find ways big and small to lower the costs.

For example, construction costs are a huge barrier to greater fiber deployment. Here, cities are the lead government actor. Rights of way management, permitting, pole access, building access, build-out requirements and other local government activities all directly impact planning and investment. Smart local policies, such as requiring conduit or fiber installation during road construction, can reduce deployment costs by 90 percent while adding less than 1 percent to total project cost and minimizing neighborhood disruption.

Cities also play a role in the availability of wireless networks. Of course, the economics of wireless networks are driven by international standards, so national institutions are best positioned to address spectrum allocation issues. Nonetheless, cities affect mobile services in many ways, from the availability of cell towers to improving the quality of Wi-Fi through broader fiber deployment. Most mobile communications travel over wired networks at some point so the better the wired network, the better the mobile service. Further, as discussed below in the section on 5G mobile, the next generation of wireless will ride over a wireline network even more than it does in the current generation.

As we saw with the data from the National Broadband Plan[24], the deployment of wireline and wireless networks are staggeringly expensive. Breaking free from the status quo requires both creative and viable economic models. Broadband operators are businesses, not charities. If communities do not work to lower barriers to entry and enable efficient builds, the necessary new investment simply will not happen.

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24. https://transition.fcc.gov/national-broadband-plan/national-broadband-plan.pdf. See Chapters 3 and 7.

In that light, all cities should be exploring any methods that can lower the cost of deploying and operating future-proof broadband networks.

Getting everyone on

It has become increasingly clear that a person's full participation in the economic, civic and social life of his or her community requires a broadband connection. It is also clear market forces alone are unlikely to achieve universal adoption. Studies have shown that the principal barriers to adoption are affordability, digital readiness and relevance.[25] These are related. If one cannot afford a service or does not know how to use it, it is unlikely to be relevant. If one does not think it relevant or ca not afford it, one is unlikely to take the time to figure out how to use it.

The affordability issue is often addressed on a federal level. The biggest policy levers that affect affordability are competitive market structure and subsidies for low-income persons. Cities, as discussed above, can adopt various policies that lower the cost of deployment, making intensified competition possible. Indeed, while we think by broadband as individuals, to a significant extent, we create our broadband options as a community. At an early Gig.U meeting, for example, a cable company representative said it could sell consumers in some of our communities a gigabit service for $7,000 a month. None accepted the offer. Subsequently, due to a variety of policy initiatives, several Gig.U communities were able to entice a potential competitor to make the necessary investments to sell the same product at $70 a month. The impact on that cable company? It announced it would sell a similar product at that $70 price point as well. That competition will also result in an increased speed and lower price for entry-level services.[26] The price reduction was not a function of new technology or a change in consumer preference. Rather, the difference lay in how a group of communities approached how they bought bandwidth by improving the math for the deployment of competitive networks.

As to the other barriers, cities again play key roles. Cities are the best positioned to offer training. Such training generally takes place in local institutions such as libraries, schools and community centers and are organized by local organizations targeted at the specific needs of local residents. While federal organizations can fund

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25. http://www.pewinternet.org/2015/12/21/3-barriers-to-broadband-adoption-cost-is-now-a-substantial-challenge-for-many-non-users/. See chart in full report on page 8.

26. Cable prices, for example, are twice as high in cities where it does not face competition from Google Fiber. http://arstechnica.com/information-technology/2016/08/comcasts-70-gigabit-offer-is-only-good-in-cities-with-google-fiber/.

such efforts, local efforts will remain essential. Cities are also best positioned to increase the relevance for the under-adopting community. As discussed below, local governments provide a number of services under-adopting communities need. Moving those services to the digital platform can both improve the delivery of the services and increase the relevance of broadband.

Using the platform to better deliver public goods and services

Surveys indicate that the three biggest factors for non-adoption are age, income and education level.[27] Federal agencies often provide a variety of support for seniors, low-income persons and those who did not graduate high school but again, the actual service delivery for such services as education, health care, job training, social services and public safety occurs at the local level. Local policies will determine the speed by which these services become more personalized, accountable and effective.

Mayors have noted the virtuous cycle between raising adoption levels and improving municipal services. Forty-four Mayors, writing in support of the United States Federal Communications Commission upgrading its subsidy for low-income persons to obtain communications services noted: "Getting more low-income households online will help modernize delivery of public services – facilitating more responsive and effective governance while lowering overheads for local governments. E-government delivery also saves the public the expense of visiting government offices in person – a particular concern for low-income households. Taking advantage of egovernment frees public beneficiaries from losing wages if they are paid hourly, and it allows easier and more ubiquitous access to opportunities and resources…. Putting broadband in reach for more low-income households will help us deliver better services community-wide, and foster opportunity for more of our residents."[28] What is true for those mayors will be true for mayors around the world.

Challenges for the Next Wave of Technology

While many cities can point to significant progress in the last decade, the goals of abundant bandwidth, adoption and public use are likely to remain a challenge for

27. http://www.pewinternet.org/2015/12/21/3-barriers-to-broadband-adoption-cost-is-now-a-substantial-challenge-for-many-non-users/. See complete report, chart at page 8.

28. http://nextcenturycities.org/wp/wp-content/uploads/2015/11/NCC-Lifeline-Letter1.pdf.

sometime to come. As markets and technology evolve, however, the strategies and tactics for how cities achieve those goals need to evolve as well. In the next decade, cities will need to consider how to achieve their aspirations through policies and practices that take advantage of three emerging developments: the Civic Internet of Things, Fifth Generation (5G) Wireless, and Big Data.

The Civic Internet of Things

The Internet of Things itself refers to the ability of devices, equipped with far greater computing power and connected to the Cloud and each other through far greater bandwidth, to provide a greater awareness of a situation and to act to improve outcomes. These developments are already having a dramatic impact[29] on how we manufacture goods, in what is generally referred to as the Industrial Internet of Things.

The Civic Internet of Things is, at one level, simply adding intelligent devices to a number of infrastructure systems generally run by cities, including, but not limited to water, sewer, power, and transportation. It also creates new opportunities to improve the data on which decisions are made in areas such as public safety, public health, and social services. For example, while numerous cities already have security cameras and gunshot recognition sensors. Developing technologies are enabling such cameras and sensors to automatically detect unusual activities and to enable a rapid response, resulting in a 10% to 30% decrease in crime.[30] The Civic Internet of Things can reduce electrical outages and water loses, improving all manner of resource management. Another big use is adaptive traffic management, which can improve traffic flow and dramatically reduce time spent in cars looking for parking spaces.

All in all, McKinsey estimated that the global economic of municipal use of the Internet of Things would be between $930 billion and $1.7 trillion by 2025.[31] Beyond the financial savings, cities are using such technology to better inform residents of the state of the city and thereby improve the public dialogue as to what a city

29. http://www.supplychain247.com/article/how_the_internet_of_things_is_transforming_manufacturing_today.

30. http://www.mckinsey.com/business-functions/business-technology/our-insights/the-internet-of-things-the-value-of-digitizing-the-physical-world.

31. http://www.mckinsey.com/business-functions/business-technology/our-insights/the-internet-of-things-the-value-of-digitizing-the-physical-world.

should prioritize in terms of civic improvements. In short, the Civic Internet of Things represents an opportunity to do for the basic civic infrastructure of the early 20th Century what smart phones have done for communications compared to the standard black dial tone phones of fifty years ago.

5G mobile

Currently, most cities enjoy fourth generation (4G) services. The wireless industry has suggested, however, that the next generation (fifth generation or 5G) will provide a massive increase in performance and throughput. 5G holds great promise for basic communication needs, advanced new communication services like two-way 4K video, advanced security and privacy controls and many other promises. Currently, engineers are designing the 5G core network architecture to allow virtualization and maximum flexibility to accommodate multiple different, secured, wireless network services and service providers over a single network design.

While the promise of 5G is great, so are the challenges to deployment. 5G will also depend on a different network architecture than 4G. 4G customers received their data from a macro-cell, a large tower that serves a broad area and many customers. 5G customers will receive their data from many small cells that serve a smaller area and many fewer customers. 5G radio deployments will be exponentially larger in number and more densely distributed in order to support the 30 to 50 times faster bandwidth enabled by 5G in comparison with 4G. 5G service providers will need to be able to build or lease wireline networks that extend much closer to the customers than the wireline networks wireless customers currently depend on. This leads to challenging economics. While 5G plans are still nascent, it appears likely that:

- The network costs will be significantly higher than any previous wireless network deployment;
- It may be cost prohibitive for the major carriers or any new carriers to overbuild end to end wireine networks; and
- It may be cost prohibitive to create multiple 5G networks.

Both cities and providers should share a common goal of enabling the successful deployment of 5G networks, as well as efficiency in managing and maintaining the 5G network. Both should also understand that optimizing the considerable investment required to deploy the network will take a partnership, with cities pro-

viding access to assets, efficient construction oversight and supportive policies, and providers designing the network architecture to embrace the public interest and public sector uses. Just as cities had to act to change the math of fiber deployment to make that possible, they will have to act to lower deployment costs for 5G or risk being bypassed by the offerings.

Big data

Every level of government, from multi-national bodies to local municipalities are increasingly involved with policy issues related to big data. Protecting the security and privacy of information will largely be left to national government entities. But cities, particularly as they become "smart", are all going to need cyber-security plans to protect essential infrastructure that depends on big data.

Cities are also on the front lines for big data and social equity. In 2014, a White House report[32] found that societal discrimination may "be the inadvertent outcome of the way big data technologies are structured and used." A follow-up 2016 report[33] outlined how big data could lead to both societal improvements and data discrimination in terms of access to credit, jobs, and higher education, and criminal justice. Cities will experience a similar phenomenon as they employ algorithms to improve services.

Cities will also be implicated when an entity has such a significant data advantage that competition – or, in the recent case of Facebook, political discourse[34] – might be unfairly skewed. Whenever a media platform has become the equivalent to a town square, government has tried to maintain some form of fair access for appearances and advertising by candidates.

But fairness is not just important for political debate. Governments also act to protect fair markets. Here again, big data raises new issues. Cities, like all major enterprises in this era, look to big data to improve how they fulfill their mission. Sometimes they partner with private sector actors to share data and improve services on all sides. For example, various cities partner with Waze, and others with, to improve transportation. Similarly, Chicago used big data in a partnership with Allstate to improve food inspection. Partnerships occur at the

32. https://www.whitehouse.gov/sites/default/files/docs/big_data_privacy_report_may_1_2014.pdf

33. https://www.whitehouse.gov/sites/default/files/microsites/ostp/2016_0504_data_discrimination.pdf.

34. http://www.nytimes.com/2016/05/11/technology/facebook-thune-conservative.html?_r=0

national level as well, such as the Google AI company's controversial use of millions of British National Health Service patient records to develop a kidney-monitoring app.

As cities develop ways to exploit the emerging Civic Internet of Things, such partnerships will become common. These partnerships hold great promise and should be encouraged. Nonetheless, governments have to be conscious that data is an asset for enterprises and, in addition to protecting the security of the data, cities have to ensure that access to certain data does not cause competitive problems.

Institutional Challenges

As cities seek to address these challenges, they will face a number of institutional challenges and political trade-offs.

Internal Organization: Who owns the problem? City organizational structures have evolved over the years to have clear lines of authority and responsibility for specific functions. Assuring that a city meets the challenges outlined above does not fit neatly into those traditional boxes. While many cities have recently added a Chief Technology Officer and Chief Information Officer, or even a Chief Innovation Officer, those positions do not fully reflect the full spectrum of activities the city must undertake to succeed. Success depends on managerial leadership that can hold a number of different internal agencies responsible for a common mission.

Time Frame: Deployment cycles v. campaign cycles. Cities are led by political leadership that often looks at projects through the filter of campaign cycles, often of four years or less. These projects will inevitably take a longer time. Thus, projects like this require significant political support from stakeholders to survive the ebbs and flows of political cycles. While many municipal officials understand that just as everything a community does ten years from now will be affected by the quality of the broadband networks it uses, it is critical for city governments and key stakeholders to understand many things communities do today will affect the broadband it has ten years hence.

Relationship with Private Providers. The existing broadband service providers generally react to public efforts to accelerate next generation deployments by both offering some modest, focused improvements and discouraging any governmental activity. It is important for cities to respond to such efforts with a clear and united voice about what the community needs and to outline a process that is transparent and does not foreclose the incumbents' participation.

Scale v. Speed of Decision Making. Many cities would prefer to proceed with such a project on their own. For the city, this has the advantage of being able to decide a number of questions solely on the grounds of what best serves its residents. For the provider this has the advantage of speed of decision making. Many cities, however, will not have the scale necessary to attract multiple providers to potentially deploy and operate a network. Thus, a number of communities have acted as part of regional effort to provide incentives for deployment. Community who choose this path, however, will have to establish procedures for fast decision making as that is essential for improving the network economics.

Control v. Risk. There are a number of tasks that are necessary in deploying and operating a network, including designing, engineering, constructing, marketing, servicing, and financing, among others. Cities have different preferences for how much control they want over decisions made in each of these phases. What is constant in all such efforts is the more control the city wants to exercise, the more risk it will have to take.

Conclusion

Throughout history, cities have prospered by taking advantage of trends that have the ability to stimulate economic growth and social progress. Today we see communities making various investments in physical infrastructure, such as in deep-water ports or airports, or intellectual capital, by investing in institutions of higher education and research facilities.

The biggest such trend in our time is how information, as an input to every product and service, is increasing in importance, transformed by massive improvements in data storage, computing power, and communications. Some cities are attempting to give them themselves an early mover advantage by obtaining a superior level of bandwidth to develop a leadership position in technology related sectors.[35]

But these trends are not just for those who themselves trying to position themselves as a Silicon Valley, Alley or Wadi. These are trends that change the expectation of all businesses and residents for what constitutes a desirable place to locate, to con-

35. See, for example, Chattanooga (http://www.tennessean.com/story/money/2016/06/14/chattanooga-mayor-gigabit-speed-internet-helped-revive-city/85843196/) and Kansas City (http://www.govtech.com/e-government/Kansas-Citys-Gigabit-Internet-Experiment-Starts-To-Take-Shape.html) as two examples of early gigabit cities taking advantage of more abundant broadband.

duct business, or to raise a family. What today is sometimes viewed as a luxury will shortly be seen as a necessity. Today, some cities believe they ca not afford to invest in these foundation stones. Tomorrow, it will be clear that they can not afford not to.

These trends are not just about broadband networks; they are about the next generation of broadband-led urban development. Just as technology is transforming agriculture, retail, manufacturing, and every other sector of the economy, technology is also transforming the way our society, and particularly cities, address the mission of providing vibrant communities in which individuals and families can thrive. Abundant bandwidth, universal adoption, and improved public services offered over broadband networks are quickly becoming the foundation stones for the economic growth and social progress that all cities will need to thrive in the 21st Century Information Economy.

Incubating Trust through Civic Technology and Living Labs: A Trans-Atlantic Perspective

Jeffrey Brown, Bertelsmann Foundation

Cities in the United States (US) and the European Union (EU) continue to punch above their weight when it comes to advancing innovation at the global level. Through bottom-up solutions and entrepreneurial policymaking, cities have become *de facto* hubs for job creation, human capital, advances in infrastructure and a host of other factors stimulating innovation in the 21st century. By the year 2025, the McKinsey Global Institute estimates that the top 600 cities in the world will be responsible for 60 percent of global GDP, a percentage that can only be expected to rise as the pace of urbanization quickens. Furthermore, the importance of cities will only be enhanced by the continued march of digital transformation and the development of cities containing so-called 'domain expertise'[36] in infant industries such as genomics, big data and cybersecurity. With more than 75 percent of EU citizens and 82 percent of US citizens residing in urban areas, it is clear that cities will continue to serve as incubators for innovation and growth long into the future.[37]

At the same time, cities have become the locus for many of the governance challenges that nation states face. From housing to inclusive growth and job creation, cities have been compelled to take over responsibility for entire swathes of policymaking that were once under the purview of national governments. In the EU, power is being devolved to localities stretching from the United Kingdom[38] to

36. According to Alec Ross (2016), 'domain expertise' is defined as "deep knowledge about a single industry, which tends to concentrate in specific cities or regions.".

37. European Environment Agency, "Urban environment", http://www.eea.europa.eu/themes/urban.

38. "Devolution Deals", Local Government House, London, http://www.local.gov.uk/devolution-deals.

Greece[39]; in the U.S., gridlock at the federal level is spurring municipal governments to step into the breach of traditionally federal domains such as healthcare and education (Katz & Jones, 2016). This devolution of competencies from national to local authorities means that the burden for solving intractable problems is increasingly falling to cities (Katz, 2016).

Despite the trends detailed above, the emergence of cities as engines of innovation with increased responsibility for policymaking is juxtaposed with a striking decline in citizens' trust in government. A 2015 Pew Research Center study found that just 40 percent of Americans trust local government to do the right thing "always or most of the time", with a paltry 23 percent expressing the same level of confidence in the federal government (Horrigan & Rainie, 2015). When measured in the aggregate, trust in regional or local public authorities at first appears greater in the EU than in the US, whereas 47 percent of Europeans say they "tend to trust" regional or local public authorities, according to a May 2015 Eurobarometer poll.[40] However, these results mask stark regional disparities that are especially pronounced in Mediterranean countries, where the same poll found that just 26 percent of Greeks, 23 percent of Spaniards, and 22 percent of Italians profess trust in their regional or local government.

As the trend toward urbanization continues apace on both sides of the Atlantic, policymakers and their constituents are confronted with a fresh conundrum: while their cities have become the lynchpins for innovation and growth, their inhabitants increasingly express distrust in their local government. Although cities have rightfully taken advantage of the opportunities afforded by the migration of physical and human capital to become engines of innovation, the trust gap between citizens and their government threatens to undermine this progress. Given the responsibilities and challenges that cities face, strong bonds of trust and civic participation are the hard currency that will be key to propelling sustainable innovation and growth into the future. In other words, by working to cultivate civic trust, policymakers and citizens can safeguard the status of their cities as innovation hubs while positioning themselves as the arbiters of future growth.

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39. Nikolaos-Komninos Hlepas, "The Impact of Local government Reforms in Greece: a Critical Perspective", in Lucica Matei and Spyridon Flogaitis, eds., Public Administration in the Balkans – from Weberian bureaucracy to New Public Management, http://aei.pitt.edu/15831/1/ASsee_No.1_2011_cu_coperta[1].pdf.

40. European Commission, "Eurobarometer Interactive", http://ec.europa.eu/COMMFrontOffice/PublicOpinion/ index.cfm/Chart/getChart/themeKy/18/groupKy/92.

Although the public sector rarely reaches the critical mass necessary to innovate and reinvent itself, advances in technology – combined with the increased economic and political clout of cities – are providing the impetus for cities to take action. Digital innovation has ushered in a suite of tools that can be used to foster communication not only between government and the citizenry, but among citizens themselves, thereby providing a rare opening for governments to reimagine how they interact with their citizens and vice versa.

Yet, while these new digital tools are promising, their capacity for transformation is likely to fall short unless its design and implementation is combined with intensive neighborhood-level engagement. Drawing in part on the preliminary findings of the Bertelsmann Foundation's *Transatlantic Policy Lab* (TAPL)[41] project in Boston and Athens, this paper outlines how civic technology and community engagement can be deployed to stimulate civic trust.

The Importance of Civic Trust

Over the past 30 years, academics have honed in on trust in government as the essential pillar upon which the legitimacy and sustainability of political systems are built.[42] However, the importance of trust has often been overlooked or discounted in the policymaking process, which has resulted in the development of policies that most often maintain the bureaucratic status quo or, worse, deepen mistrust that already exists. Indeed, trust is *the* crucial ingredient in the policymaking process and is needed not only to implement meaningful service reform, but it is also as an output of improved service delivery.[43] Therefore, it is crucial that policymakers consider both inputs and outputs when designing public policies that seek to bolster civic trust. Before examining how technology and engagement can feed this virtuous circle, it is first necessary to identify the ways in which citizens' interactions with local government are evolving.

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41. In 2016, the Transatlantic Policy Lab convened two dozen European and American policy experts in Athens, Greece and Boston, Massachusetts to apply their expertise to a series of equity and economic development challenges at the neighborhood level. For more information: http://www.bfna.org/page/transatlantic-policy-lab/overview.

42. OECD, "Government at a Glance 2013", http://www.oecd-ilibrary.org/governance/government-at-a-glance-2013_gov_glance-2013-en.

43. OECD, "Government at a Glance 2015", http://www.oecd-ilibrary.org/governance/government-at-a-glance_22214399.

As local governments adopt responsibilities and craft new roles for themselves in an era of ever-increasing innovation, cultivation of the public's trust will become crucial to crafting and sustaining strong public policy. For most, local government provides the sole opportunity to engage with public officials, government institutions and local politics. From school board meetings to permitting processes, citizens are most likely to interact with local rather than state or federal officials. Since local issues, such as housing and schools tend to directly touch citizens' lives, the proximity of local officials allows them to empathize with – and be more responsive to – their constituents' concerns. Proximity also gives local governments the flexibility to respond – and deliver public services – in ways that may not be feasible at the national level. Therefore, the practical and local nature of services delivered by city government makes it possible for citizens to render rapid judgment on the quality of services delivered, which in turn impacts civic trust.

Trust in local institutions is essential for the success of government programs and policies that are often dependent on the cooperation of citizens. High levels of civic trust support social cohesion, well-being and civic participation. When the bonds of civic trust are strong, policymakers are given tacit approval to be innovative and develop creative policy responses. For example, high levels of civic trust in Estonia during the 1990s permitted the government to push through "Tiigrihüpe" (an Estonian phrase meaning "tiger's leap"), a program that expanded network infrastructure and technology in schools, and set the stage for further implementation of civic technology and e-governance.[44]

In contrast, when civic trust is weak, policymakers often deliver the minimum level of services necessary through traditional channels of government bureaucracy (Fitzgerald & Wolak, 2014). A dip in trust can lead to declining compliance with government rules and regulations, leading to graft and corruption. At the far end of the spectrum, a lack of civic trust leads to the gradual de-legitimization of actions taken by public officials, leading to political turmoil, the rise of extremist or anti-establishment political candidates, and demand for government reform.

Digital innovation allows communities to access tools that can facilitate personalized and efficient responses to citizens' queries while enabling government to deliver higher-quality services at a lower cost, thus creating a virtuous circle in which improved service delivery leads to improved trust in government. Improved service de-

44. Centre for Baltic Studies, University of Tartu, "The Tiger Leap", http://sange.fi/~ozone/Tigerleap.pdf.

livery is already underway at the local level via programs such as Massachusetts' *Commonwealth Connect*, enabling citizens to report problems to local governments across the state. In the same vein, New York City's *311 mobile application* allows citizens to check the status of garbage and recycling pickups, in addition to requesting service on nuisances such as rats or potholes. These innovative tools have already led citizens to demand more from their government while simultaneously providing a glimpse into the future delivery and consumption of services.

Yet, while this current wave of innovation has proven that digital practices can indeed be deployed by leaders working from city hall, the next challenge is to apply this technology to improve community relations and civic trust at the neighborhood level. Bringing all citizens into the policy making process will require a second wave of civic innovation that centers on a community approach to its design and use. Bridging the gap in trust at the local level will require a nuanced approach that combines civic technology and intensive community engagement.

Using community engagement as a jumping-off point, technology has the capacity to upgrade civic trust in two significant ways. First, digital innovation will allow citizens to collaborate and coproduce with government – and each other – in ways that previously had not been feasible. Second, the spread of open data and accompanying visualization tools will permit greater transparency and citizen input into the development of government policy, thus lowering barriers to civic participation in localities on both sides of the Atlantic.

While still in its infancy, civic technology as applied to cities big and small will have a profound impact on innovation. In an era of declining civic trust and growing competition among cities for scarce resources, local governments must refocus their attention on their most crucial resource: their residents. Increased civic trust will not only engender greater civic participation and transparency, but will also provide localities with a competitive edge when it comes to attracting investment, business and human capital.

The Promise of a Mixed Approach: Civic Technology and Community Engagement

The following sections analyze trends in civic technology and examine how they can be applied to narrow the gap in trust between citizens and their local government. By charting the evolution and current state of digital solutions, this analysis identifies opportunities for future innovation and notes the importance of including elements of community-centric design and use.

Accelerate and incentivize the diffusion of open data to local governments

While local government is uniquely positioned to innovate and attempt to bridge the gap in trust, it is also constrained by limited financial and human resources with which to address the trust deficit. The mobilization of open data offers a possible solution to this quandary by completely transforming how government functions and the manner in which it delivers services. Open data refers to data that can be used freely and redistributed by anyone (including government), and includes interoperability and universal participation.[45] Still largely an untapped and underutilized resource, open data provides a unique opportunity for government to bring to bear its voluminous, centralized and public repository of data for the public good.

Most action on open data is initiated by the U.S. federal government and European institutions. In Europe, the European Commission launched its Open Data Strategy in 2011 and a *pan-European data portal* in 2015. The Commission's strategy has allowed member states to determine the specific types of data that are released as 'open.' In its outreach to cities, the Commission targeted its efforts to increase the penetration and interoperability of open data in large cities such as Berlin, Paris and Amsterdam.[46] For example, the City of Paris has launched *ParisData*, a platform for municipal data that is meant to foster the creation of application-based solutions by citizens.

In the U.S., President Barack Obama's administration oversaw the passage of the Digital Accountability and Transparency Act of 2014, which obliged federal agencies to release spending data in an open format. The administration also launched the *data.gov* website, which serves as a clearinghouse for federal data on topics ranging from housing to crop yields.[47] These initiatives were followed by the March 2016 launch of *The Opportunity Project*, an initiative that pairs open data with more than 30 companies and nonprofits to develop tools to promote the usability and transparency of data.

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45. The Open Data Handbook, "What is open data?" http://opendatahandbook.org/guide/en/what-is-open-data/.

46. European Data portal, "Analytical Report 4: Open Data in Cities", May 2016, http://www.europeandataportal.eu /sites/default/files/edp_analytical_report_n4_-_open_data_in_cities_v1.0_final.pdf.

47. Maury Blackman, "The Quiet Revolution: Open Data is Transforming Citizen-Government Interaction", *Wired*, https://www.wired.com/insights/2014/07/quiet-revolution-open-data-transforming-citizen-government-interaction/.

As in the European Union, the introduction of open data platforms in the United States has mostly benefited large cities such as New York, Los Angeles and Chicago. For example, Los Angeles has launched its own *Open Data* platform and Chicago continues to build its *Data Portal*. However, the open data revolution has yet to be exported to small and mid-size cities. For example, while open data policies have been adopted by 71 percent of US cities with populations over 500,000 (including the five largest U.S. cities)[48], only 15 percent of communities with populations between 100,000 and 500,000 have adopted similar strategies.[49] Given the intimate nature of the connection between citizens and their local government, it is evident that small and mid-size cities stand to reap huge rewards from the hyper-targeted insights that open data could deliver.

Encouraging and incentivizing small and mid-size cities to take advantage of open data is likely to spur policy experimentation, and could lead to the eventual bottom-up transfer of policy solutions from local to national government.[50] Much as with online advertising and the delivery of content via algorithms, open data could lead to the targeting and creation of customized policy solutions, that could in turn lead to greater citizen satisfaction with service delivery.

In the United States, some communities with fewer than 150,000 residents are already reaping benefits from open data. For example, Montgomery County, Virginia has been recognized by the *Center for Digital Government* (CDG) and the *National Association of Counties* (NACo) for its dissemination of planning data visualizations via social media.[51] In Europe, the Transatlantic Policy Lab's engagement in Athens, Greece resulted in a number of open data recommendations aimed at bolstering the public's trust, including the launch of a 'visualization gallery' that would allow local NGOs, academic institutions, and residents to access city data in easily accessible formats, and the creation of a platform to monitor the performance of local officials.

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48. Alisha Green, "All five of the largest U.S. cities now have open data policies", *The Sunlight Foundation*, October 15, 2014, http://sunlightfoundation.com/blog/2014/10/15/all-five-of-the-largest-u-s-cities-now-have-open-data-policies/.

49. "Open Data Beyond the Big City", Civic Innovations (blog), September 29, 2014, https://civic.io/2014/09/29/open-data-beyond-the-big-city/.

50. Ibid.

51. Janet Grenslitt, "Digital Counties survey 2016 – Winners Announced", *Digital Communities*, July 20, 2016, http://www.govtech.com/dc/digital-counties/Digital-Counties-Survey-2016-Winners-Announced.html.

Although large cities have thus far used their comparative wealth of resources and economies of scale to drive implementation and adoption of open data, it is also important to explore how open data platforms can be scaled in a cost effective manner so that they can be utilized by local governments to augment civic trust. For example, open data and accompanying visualization tools would allow public affairs officers' access to the analytical and communication tools necessary to transmit their engagements to the community via social media. However, the knock-on benefits from the use of open data could extend far beyond the local government-citizen nexus. For example, in the long-term, open data would allow journalists more seamless access to publicly available information, thereby creating an additional set of checks and balances that could ultimately be used to improve the quality of public services and civic trust.

Yet, while innovation through open data provides the technical means to better connect citizens with their government, it is crucial that its design and implementation draw in the voice of citizens and communities.

Cultivate civic engagement between citizens

In a digitized world with increasingly complex flows of information, citizens' input is a critical resource for policymaking and trust building. Sound decision-making requires a meticulous process of collecting the knowledge, experiences, views and values of the community. Implementing difficult or controversial decisions depends on citizens' consent and support, and unless citizens themselves comprehend and are engaged in the decision-making process, trust will be easily degraded.[52] In the past, civic engagement hinged on elected officials hearing out the complaints, demands and compliments of citizens in city council chambers or at the local state fair. Although this system permitted some citizens to have their voices heard, it was impossible for local government to gauge the collective voice of the community. Levels of civic trust were largely dependent on how policymakers responded to these demands for action.

However, digital innovation has changed the paradigm for how government services are delivered and how citizens interact with their elected officials and communities. In the future, citizens will be less likely to request one-way transactional services from their local leaders and more likely to demand the coproduction of customized policy solutions in a collaborative process with local leaders and their

52. OECD, "Government at a Glance 2009", October 22, 2009, http://www.oecd-ilibrary.org/governance/government-at-a-glance-2009_97892640750 61-en.

constituents. Although the concept of coproduction dates back to 1980s-era Detroit, it has enjoyed a renaissance with the rise of innovative governance solutions such as participatory budgeting. Coproduction (or "community-driven civic tech")[53] is gaining additional popularity with the emergence of platforms that allow citizens to participate in the creation of community-based solutions. The shift away from a consumption-based model is crucial, as it increases civic trust and engagement by allowing citizens to demand greater participation rather than more services (Goldsmith & Crawford, 2014).

Coproduction between government and citizens is most likely to occur at the neighborhood level, where residents are already aware of the issues facing their area and are more likely to engage in the participatory process (Frieling, Lindenberg & Stokman, 2014). There are a variety of coproduction methods that exist, and a few that put the community at the center of civic technology design. Government sponsored agencies and programs such as *18F* in the US and the *Government Digital Service* in the United Kingdom, which aid in the digital transformation of government services, are already engaging citizens at the neighborhood level. However, they remain under the purview of government bureaucracies. Mobile application based solutions channeling the documentation, reporting and communication of neighborhood concerns through apps such as *SeeClickFix* and *Public Stuff* also exist, although they have yet to capture and channel the collective voice of a community into the policymaking process.

Although the contours of coproduction (or "community-driven civic tech") as it relates to technology are still under development, the *Smart Chicago Collaborative* has drafted a set of guiding principles for the coproduction of civic technology that could be used as a guide for future pilot projects.[54] Championing a "build with, not for" approach that prioritizes the people who are set to benefit from civic technology over the production of a specific product, this system of coproduction relies on the community to drive the process.[55] Instances of successful coproduction include

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53. Laurenellen McCann, "5 Modes of Civic Engagement in Civic Tech", Smart Chicago Collaborative, March 6, 2015, http://www.smartchicagocollaborative.org/5-modes-of-civic-engagement-in-civic-tech/.

54. Laurenellen McCann, "5 Modes of Civic Engagement in Civic Tech", Smart Chicago Collaborative, March 6, 2015, http://www.smartchicagocollaborative.org/5-modes-of-civic-engagement-in-civic-tech/.

55. Laurenellen McCann, Crieria: People First, Tech Second", Smart Chicago Collaborative, February 5, 2015, http://www.smartchicagocollaborative.org/people-first-tech-second-5-criteria-for-community-driven-civic-tech/.

Motor City Mapping, which uses a platform and citizen-to-citizen cooperation to map and digitize information on abandoned properties and land use in Detroit.

In Europe, elements of coproduction have been introduced in Groningen and Winschoten in the Netherlands, where coproduction is used to create a link between city planners and citizens in order to design better policy at the neighborhood level. In Mediterranean Europe, the Transatlantic Policy Lab in Athens has recommended that several elements of coproduction be introduced to increase trust in the city. First, the group has proposed the creation of a digital communication platform that would allow direct coordination among residents, nongovernmental organizations, small businesses and neighborhood stakeholders. In addition, the Transatlantic Policy Lab experts noted the need for greater citizen-to- government coproduction (as in the Netherlands) and recommended the establishment of an 'innovation platform' and 'innovation unit' to unearth and scale citizen-led projects.

The methods detailed above are likely to evolve greatly as civic technology spreads. A potential challenge for coproduction in the age of digitization will be developing collaborative tools for citizen input at the neighborhood level. This would allow collaboration to be scaled and replicated without the use of costly and labor-intensive moderation by intermediaries.

However, another challenge involves the complex task of coproducing in the context of the great diversity of neighborhoods that exist within cities. Based on a study of Boston and Athens, the findings of the Transatlantic Policy Lab show that the capacity (and demand) for citizen to citizen interaction differs greatly among cities and individual neighborhoods. For example, in Boston, experts discovered that rapidly changing demographics led to far different levels of citizen-to-citizen communication between the neighborhoods of East Boston and Roxbury.

Although government aids in the construction and coordination of technical infrastructure such as broadband and platforms to spur coproduction, it is important to ensure that stressed neighborhoods are included in the coproduction process. If these communities are left out of the process, inequality is likely to rise and the bonds of civic trust will likely unravel further. Wealthy and middle-income neighborhoods are used to interacting to coproduce services that create positive externalities for their communities. Examples include the creation of city-backed neighborhood watch patrols to ensure public safety, or the involvement of local groups in aiding in the construction or refurbishment of public facilities such as swimming pools and libraries.

Since residents of stressed neighborhoods sometimes lack the infrastructure for this type of spontaneous coproduction to take place, local governments must

consider adding additional resources to these communities to create the basic conditions necessary for coproduction to occur. Outreach via social media and the implementation of pilot projects to spawn trust could be a jumping-off point to cultivate the minimum level of trust necessary to engage in coproduction. However, such assistance requires both effective (and neutral) intermediaries and a government committed to designing effective social media engagement strategies.

The future of civic technology depends on civic engagement

To date, governments in the US and EU have been fixated on creating the scale for e-governance, civic technology and smart cities technology to succeed. However, a mapping of civic technology and smart cities programs by the European Parliament has shown that the chief factor in determining the success of such programs is not technology, but citizen involvement in the creation and implementation of technology-led interventions.[56] Although technology is often seen as the chief enabler of civic innovation, without engaging citizens about the role that technology will play in their cities, these technologies could very well fail or open fresh digital divides.[57] Instead, the deployment of civic technology must be accompanied by so called bottom-up processes that survey and actively include agile, iterative design and community stakeholders (Pallot et al., 2011).

As the development of civic technology continues, the power of non-digital strategies that inform new tools must also be considered. Indeed, the creation of bottom-up civic technology depends on surveying the complex patchwork of stakeholders and issues within a city's diverse ecosystem. Tailoring digital solutions to the intricacies of neighborhoods requires interaction with the local population, buy-in from political leaders, and significant time spent empathizing with the concerns of citizens. Therefore, the success of e-governance and civic technology is likely to depend on underlying circumstances that are tied to particular cities, neighborhoods, and even streets or corners within neighborhoods. Adoption and penetration of civic technology could be accelerated by implementing creative ways of engaging local communities.

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56. European Parliament, "Mapping Smart Cities in the EU. European Parliament: Policy Department, Economic and Scientific Policy", http://www.europarl.europa.eu/studies.

57. FutureEverything, "Smart Citizens. Manchester: FutureEverything", http://futureeverything.org/publications/smart-citizens/.

One way to ensure that local communities are involved in the design process of civic technology is to host living labs. According to Pallot et al. (2011), "living labs are an excellent approach to bridge the gap between technology push (i.e., solution developers) and application pull (i.e., user communities), because they bring the necessary combination of digital skills, creativity and innovation methods together." Living labs can thus be regarded as an effective means to facilitate bottom-up processes within civic technology initiatives, as they promote multistakeholder collaboration and consider end-users as innovators of the solution itself (von Hippel, 2005).

In Europe, living labs are increasingly being integrated into the policy design surrounding smart cities and civic technology. For example, Ghent, Manchester, Athens and Issy-les-Moulineaux have all incorporated intensive stakeholder engagement into the design of technology meant for larger processes of smart city development. Although not connected to the implementation of a specific smart cities program, the findings of the Transatlantic Policy Lab in Athens and Boston show that community engagement is an integral part of designing implementable solutions targeting specific neighborhoods. Through intensive stakeholder engagement during the Boston and Athens labs, experts uncovered the primary drivers for citizens' frustration and lack of trust in their local government. If scalable solutions utilizing civic technology are to be realized in communities large and small, their success will largely be dependent on whether they have been designed using the experiences of citizens' at the neighborhood level.

Conclusion

The great power of civic technology lies in its ability to increase civic participation and trust in local government. However, data-driven approaches, civic technology and engagement strategies must work in tandem and reinforce one another to retain the public's confidence. While government can construct civic technology in a way that reinforces civic participation and trust, it must also be aware of emerging debates, such as those around the role of government in ensuring data protection. If governments are not sensitive to the development and deployment of technology, they risk entrenching and amplifying the deficit in trust that already exists. At the same time, civic technology will allow citizens a greater degree of autonomy from local government – either to coproduce with their fellow citizens or have a greater say in the policymaking process. Since services will be increasingly available online through virtual city halls, it will be incumbent upon citizens to develop a civic relationship among themselves in order to form a coherent community that is capable of articulating its voice, goals and needs.

The need to innovate will push localities in the US and EU to adopt comprehensive civic technology and digital governance strategies in the near-term. While it is important to remember that these technologies are still in their infancy, the diffusion of community-designed civic technology to municipalities in the EU and US holds innumerable lessons for rapidly urbanizing localities around the world. Given that more than half of the world's population now lives in urban centers, a number that is expected to grow to 67 percent by 2050, there is no better time to take a step back to ensure the formation of sound policy that meshes innovative technologies and community engagement.

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Urban Changemakers: Successful Bottom Up Innovation in Cities

Alessandro Valera, Ashoka Italy

How does innovation come about in urban environments? Many are inclined to assume that a favourable environment to innovation is created by forward-thinking local administrations who invests in the development of smart cities, or that urban development begins with innovative start-ups clustering in one city where taxation is low, access to credit and investment is abundant, and smart young people are flowing in. While these elements are certainly enabling, Ashoka's approach is different. Ashoka's assumption is that it is not just enabling conditions that lead to social or environmental change. Rather, leading social entrepreneurs who show innovation of thinking, a creative attitude to problem-solving and leadership skills are the ones helping to create system-changing solutions, with a ripple effect on society at large. Some people change systems, so that systems can change many more people. While this may sound as a chicken-and-egg paradox, it is an important change of focus: the fastest and most efficient strategy to solve society's most pressing social and environmental challenges is to scout for innovators across the globe that have *already* found solutions to these issues, even if only experimentally and at local scale. Ashoka's strategy is to select these social entrepreneurs, which we call *Ashoka fellows*, and to support them in two ways. On one hand, we provide them with financial support that allows them to focus completely on the development of their new idea. On the other, we forge an alliance of changemakers, made up of universities, companies, professionals, local authorities, students and volunteers, who can work alongside our fellows. This *team of teams* contributes to turn a fellow's idea into a model that can be scaled to maximise its potential impact. It also works to make sure that a niche innovation can tip and become mainstream, profoundly affecting our policy, our practices and our societies' paradigms.

This paper will explain Ashoka's approach to social innovation, its vision to make *Everyone a Changemaker* to achieve wider social change. It will also present a few case

studies of Ashoka fellows with a particular focus on urban innovation. We will attempt to show how citizens, under the leadership of what we call social entrepreneurs, can organise communities around them to lead social change. They can unite citizens into a movement, they can convince the public sector to act and nudge the private sector to get involved. This century provides an unprecedented opportunity to solve many of humanity's social problems if the right solutions are identified and the right people to lead the change transnationally are empowered and equipped to do so.

Ashoka: Everyone a Changemaker

Ashoka's work began in 1980 in India as an idea of Bill Drayton, who is still nowadays its founder and CEO. Bill Drayton's observation was that several international programs aimed at solving pressing issues such as poverty or social exclusion had largely failed. His intuition was that this was not only a matter of traditional top-down aid flowing from the so-called First World to the Third. Even when development programmes understood that the involvement of local people and local resources were crucial, they almost always limited themselves to putting a patch on the consequences of certain problems, rather than trying to change the macro dynamics that had caused them. The focus was seldom on system-changing solutions, but at best on direct service to help struggling communities or particular sub-groups. Even when the approach to international cooperation was moving from "giving them fish" to "teaching them how to fish" – to use a common proverb exemplifying these different approaches – Ashoka aimed to go further: its aim was to find, support and connect the most innovative social entrepreneurs who were on their way to "revolutionize the fishing industry as a whole". While many development programmes, whether led by the state, the private sector or foreign aid, tried to reinvent the wheel by looking for new solutions to complex project, Ashoka began to look for those people who had already found solutions and had implemented them successfully, creating tangible impact, even if geographically limited. The key criteria to find these people were the presence of a new idea with the potential of affecting whole systems; proven impact and a potential for even bigger impact, both in terms of spread and scale; an entrepreneurial spirit, both in terms of attitude to problem-solving and leadership skills; creativity, fundamental to continuously adapt one's method to changing circumstances; and ethical fibre. Ashoka was not (and is still not) necessarily looking for social businesses, but for men and women who make solving one social issue the core mission of their lives and approach this enormous challenge by overturning classical approaches and developing instead new

paradigms. The example of Kailash Satyarthi is a case in point. Ashoka elected Kailash as one of its fellows in 1993 because of his vocal action in freeing children from forced factory work and to bring them back into the education system. Few would have identified him as an entrepreneur. But Ashoka saw a potential, not only in his project, but in him as a person. The recruitment process assessed that he possessed personal characteristics that made it more likely for him to become the leader of a large movement. Ashoka helped him to gain visibility, to develop new practices, such as the creation of the Child Labour Free Certification. Through this system, companies that wanted to be certified as child-labor free would hire Kailash and his organisation to carry out an inspection in practices and policies. This allowed his organisation to grow stronger and become more sustainable. In 2014, together with Malala Yousafzai, Kailash won the Nobel Peace Price for his work which had affected almost 100,000 children in over 100 countries.

The methodology through which Ashoka recruits social entrepreneurs with system-changing solutions, often at very early stage of their development, has been developed and refined in the last four decades. Its main characteristics are the focus on one person, rather than one project, and the *reliance on nominators*. Indeed, one cannot apply to become an Ashoka fellow. Fellows are nominated by a large network of collaborators, stakeholders and partners of Ashoka. The methodology was experimented since the very beginning of Ashoka's work in India with the assumption that collective intelligence would highlight the most significant and impactful innovation. Rather than coming up with a definition of innovation and scanning the Indian subcontinent in search of it, Ashoka began by approaching different leaders in different communities (from elders, to doctors, religious figures, local entrepreneurs, teachers, etc.) asking them one simple question: who do you think are the people who are contributing most significantly to the development of your community or your region? By asking this questions to dozens or hundreds of people the same names began to emerge. The nominated social entrepreneurs would then be approached and, if they passed a selection process, would become Ashoka fellows and receive a stipend to be able to fully focus on their social mission.

From India, Ashoka spread to Brazil, Indonesia and other large developing countries first. In the following decades, it became a global organisation, beginning, in the early 2000s to also work in developed world, where many social and environmental problems were in need of solutions. It now operates in over 80 countries globally and, since 2015 is also active in Italy.

Meanwhile, social entrepreneurship moved from being a new area of focus to become increasingly mainstream, with government adopting national strategies and

parliaments passing legislations on it, with Foundations shifting their focus from traditional forms of aid to social entrepreneurship. Ashoka's role has since expanded. In the same way as we had contributed to the development of social entrepreneurship from a niche field to an established reality, we wanted to be equally ambitious to detect new areas of development and work for them to become the new norm. In order to do this, we relied on our most precious resource: our fellows. By comparing all those social entrepreneurs active in a similar field, despite using different methodologies or being active in different contexts or locations, we managed to refine certain elements that were common to one sector. In the very early years of education, for example, we realise that making sure that children experience and master empathy is equally important to their development as learning how to read and write. We discovered that anyone working with teenagers in any corner of the world can be successful if they manage to make the young person develop self-efficacy and empowerment so that they can see themselves as changemakers: active agents of change whether in their school, their neighbourhood, their country or in the world. Ashoka's mission has therefore expanded: we now see ourselves as facilitators of processes of framework change. On one hand we continue to discover and foster innovation in every field. On another, we involve people in other sectors, from businesses to trade unions, from governments to universities, to become part of the change and to accelerate the process of transforming new paradigms into new policy and new practices. Our vision of the world is one in which everyone sees himself or herself as a changemaker and acts as one.

Ashoka in Italy

At the beginning of 2014, Ashoka was operating in over 80 countries across the globe but not in Italy. Thanks to the support of the *Robert Bosch Stiftung,* Ashoka began its operations in Italy focusing on a pressing issue, that of unemployment, which in the first half of this decade had reached unprecedented high rates. Through a programme called *This Works*, several Ashoka fellows from other countries, who had developed innovation, which had resulted in job creation, came to Italy and were paired up with local partners who could adapt and implement the original model in Italy. Beyond the creation of new jobs, this project contributed to set the basis for a sustainable and independent office of *Ashoka in Italy*. The process of replicating one model in another country requires the activation of many players who need to work together and begin to form a community: from advisors to local partners, from new funders to journalists, *This Works* allowed Ashoka to be presented to the Italian public and to attract inter-

est from all players in the ecosystem. The launch process was concluded in a record timescale, and by 2015 Ashoka Italy was given the green light by the global office in Washington D.C. to be registered in the country and begin its operation. Within a few months, five impressive social entrepreneurs that had emerged as particularly innovative from a research project aiming to map the sector were brought to an international panel. Ashoka Italy had selected them among the many nominated as they seemed to particularly fit its ambitious criteria to produce social impact with the potential of completely reforming entire sectors. Not only these five men and women had achieved remarkable results through their innovative work, but they were also on a path to reform the school system, the way in which employment was approached in prison, corporate culture regarding parental leave as well as legislation on this matter, not to mention the approach to fight organised crime. As it seldom happens, all five passed the global selection program that lasted over nine months and became Ashoka fellows. It was particularly important that innovation would not necessarily imply technological development. In three[58] of our fellow's innovation, technology played a crucial element in the model, but in the other three the innovation was about creative and entrepreneurial think-outside-the-box solutions that did not require the use of technology. It is important to stress that to modernise and innovate our societies does not necessarily mean to develop new technological products.

A case in point is the field of the antimafia movement. While this is rarely conceived as the flagship star of our ecosystem, there are not that many places in the world in which the fight against organised crime and its grip on the social and economical control of a territory is fought not only by the police, but by organised civic society groups. It is even more impressive that in many cases, these groups manage to create sustainable enterprises, which give citizens and businesses more incentives to fight the local mafias, by making it not only the most ethical choice, but also the most economically sensible.

In the next months, Ashoka Italia will focus – as well as on selecting a new round of fellows- on taking this first set of innovation to other countries, beginning with the UK, Germany, the US and the Netherlands.

58. If we consider an Italian fellow selected the year before through Ashoka France.

Results achieved

Ashoka is active in a variety of fields and rarely engages in direct delivery of services, as it focuses on strengthening the impact of other innovators as well as to create alliances to turn innovation into widespread practices. For this reason, Ashoka has decided to *measure its impact* in terms of how its works actually affect systemic changes. We regularly survey our fellows and our partners. A side effect of working with our fellows for life is that it is easier for us to keep track of their work and to measure mid-term and long-term outcomes of our contribution. In terms of effect on public policy and corporate deontology, 57% of Fellows have contributed to change national policy within 5 years of election. This number has remained consistent since tracking began in 1998. They do this by directly contributing to drafting legislation (35% of Fellows); providing testimony or research (48% of Fellows) or by organizing citizen action around a certain legislation debate (46% of Fellows). For what concerns the impact on the businesses and companies that through Ashoka engage directly with social entrepreneurs, 52% of Fellows have achieved changes in the code of conduct, mission statement, or official policy of a large organization or industry at a national level within 5 years of election. In terms of market dynamics and value change, our surveys show that 54% of Fellows have changed market dynamics at a national level within 5 years of election. This means that they have increased access to goods and services, created new markets, generated income for the poor or changed the flow of market information. Ashoka also measures its impact connected to business and social congruence. 61% Fellows receive revenue through market-based elements providing an average of 41% of their budget. 28% of Fellows have developed a joint venture with a business. Crucially, Ashoka has also gathered that 66% of Ashoka Fellows have created cultures of changemaking at a national level within 5 years of their election. This means that not only Ashoka, but also its fellows are slowly moving away from only offering direct delivery of service, to develop in the "beneficiaries" a culture of problem-solving and empowerment, used to make everyone part of the solution of social problems. For example, 95% of Ashoka fellows active in the youth field put young people in charge of developing solutions or running projects.

For these reasons, NGOAdvisors and the Global Journal of Philanthropy, that every two years rank hundreds of global non-profit organisations for their impact and innovation, had placed Ashoka within the first 20 in their 2014 report. Since our mission began to expand and new programs emerged, *the 2016 report* has placed us 6th in the global ranking.

Changemakers and cities

As the global population continues to grow and the proportion of those living in urban areas reached 54% in 2015[59], cities have become essential parts of the solutions to world issues. In the last part of this paper, we will present four case studies illustrating the kind of system-changing innovation that Ashoka promotes within the field of urban development[60].

Sascha Haselmayer, Citymart

Five percent of the world's economy is tied up in procurements by local city governments. While in some cities innovation is growing, systems-based solutions are not scalable when the market is limited to single cities. It is typical for a company to pitch a solution to up to 1,000 cities over a ten-year period after inventing a successful solution to secure 130 leads and 11 contracts. This translates into a cost of € 7,500,000 (US$10 million) for a small business just to find the best potential customers. Meanwhile, cites are under financial pressure and need to source low-cost systems solutions regardless of where they come from. To respond to this challenge, Sascha aims to spread innovation into cities by strengthening their own innovation capacity, improve governance by sharing methods and solutions to engage communities, and radically alter the way cities deliver much-needed services. In addition to the various services offered, Citymart leads #citiesshare alliance, a global movement promoting a more agile approach to problem-solving in cities and the sharing of solutions and methods among cities, including more than 80 cities.

Increasingly, cities ask businesses and the citizen sector to transform and innovate, but do not include any changes within their governance and operations to improve transparency and inclusion. The marketplace between innovations and the cities that need them is murky. There are few clear channels for learning about new innovations, or clear paths to procure and implement them, either because of lack of political will, or proven examples to encourage adoption. Corruption, risk aversion of the local politicians or the lack of a problem solving approach are just few of the factors that hinder cities from developing innovative and sustainable solutions to urban issues. At the same time, they have immense resources, as five percent of the world's economy is tied up in procurements by local city governments.

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59. Data from the World Bank, 2015.

60. Parts of the descriptions of the fellow's activities have been copied from their online profiles, drafted by Ashoka's Venture teams.

Citymart offers a unique set of services to enable cities to identify, evaluate, and adopt game-changing solutions, which contribute to the creation of more sustainable, resilient, entrepreneurial and responsive communities. Citymart helps city governments to become more open, agile and empathic by opening their procurement processes to be problem and impact focused and invest less public resources to greater societal effect. For example, the "Procurement by challenge" methodology and the Procurement 2.0 Platform, Citymart inspires city services and spending by providing complete market insight about available solutions, giving access to start-ups and small businesses to contracting opportunities, and avoiding the reinvention of services at high cost in time and money by sourcing solutions available elsewhere. Sascha partners with the city to build internal evidence on the impact of his methodology in the city, and to inspire and support (through institutional capacity building) broader subsequent policy and organizational changes at larger scale and the potential for a shared-risk partnership to achieve larger impact. The Partnership includes the implementation of a number of challenges to begin opening up procurement and introduce the methods of challenges to pilot or procure solutions for the community. A series of preparation activities are usually included, such as roadshows and meetups with local start-ups, innovators and business to identify problems, needs and opportunities suitable for challenges.

Through 99 Challenges published by cities through Citymart, they have discovered more than 10,000 new solutions, eliminated re-inventions and scaled proven urban and social innovations across cities around the world. Today, 7.5 Million citizens benefit from solutions delivered 3x faster through Citymart– with 33 Million benefiting indirectly.

It has been calculated that every dollar procured through Citymart on average is expected to deliver an ROI of 200% – in cost savings, transformative solutions, avoided re-inventions and local job creation and entrepreneurship.

Stuart B. Cohen, Walkable

Over the last 50 years, poorly planned growth that assumed people would drive for every single trip has dominated in the United States; with devastating environmental, social and economic consequences. Supported with billions in highway subsidies we have been paving over farms, forests, and open space at an astonishing rate. Cars now cause 80 percent of the air pollution in many urban areas, and transportation is by far the country's largest source of greenhouse gas emissions. The long distances between home and destinations have left many people with grinding commutes, few transit options, and less time with friends or to engage in

civic activities. But the impacts are most intense for low-income families. With so many jobs moved out to corporate parks, commuters that rely on transit can now access just 1/9th as many jobs as those that are able to drive. Fortunately, there is tremendous demand for a new way of growing. Walkable towns and villages with a mix of housing, shops, parks and community facilities have huge market demand. For this reason, in 2005 Stuart co-founded the Great Communities Collaborative, a unique partnership of three Bay Area community foundations working in tandem with transportation, environmental, housing, and social equity groups. By coordinating the work of experts and organizers at a regional scale they were able to work in 25 communities over three years, providing tools that help residents identify crucial needs early on, and then providing technical assistance and trainings so residents have a strong voice in shaping the future of their communities. But engagement itself is not enough. The Collaborative created a host of tools that demystified issues, for example using complex transportation models to show how growing in the right places, and doing it in a way that houses more people than cars (with reduced parking requirements) can actually reduce overall traffic, save families thousands of dollars in transportation costs, and reduce spending for cities, all while developers would be able to meet growing market demand for walkable communities. Stuart and his colleagues have built the Collaborative to be a powerful anchor to shift policies into practice, and a participatory spirit through cross-sector resolve, aggregated resources, and an expansive shared vision.

Stuart is helping spearhead an independent certification approach that specifically looks at new development through the a holistic lens of transportation and community impacts, addressing such questions as: Does this development maximally equip new residents with the tools, information, and opportunities they need to use public transit as an alternative to owning and using cars? Does this development make homes affordable? This certification, called GreenTRIP, solves several problems at once, and aligns public and private interests that have been assumed to be oppositional. Essentially, the appeal of GreenTRIP to builders: Let us, a trusted third party be engaged from the design phase forward, and help you get quickly through the entitlement process by making sure the building works optimally for the community, for the environment, and for your bottom line. (To builders, every month of delay is costly, so the incentive is high to participate.) TransForm staff advise developers early in the process on what it takes to meet these standards, and help quantify the costs and benefits of various solutions.

Through the Great Communities Collaborative, TransForm garnered broad citizen engagement and the zoning for their downtown was changed to allow 3,500 instead of 500 homes. The final plan included community requests for an affordable child-

care center, and safer streets – identified early in the process. Bolstered by tremendous citizen support for this plan, though much more "density" was now allowed a local landowner, designed ground on a 300-home development that is certified transit-friendly. By cutting its parking in half, the development offers 100 affordable units instead of the required 60, more profit for the developer, and free space on the ground floor (i.e. initially sketched as a parking lot) for the childcare center the community wanted.

Andy Lipkis, Functioning Community Forests

While Andy's work remains rooted in TreePeople, he is launching Functioning Community Forests with a broader mission: to retrofit cities for sustainability. This initiative inspires and equips urban dwellers to help nature heal their cities. Andy is working to enable cities to establish green, life-enhancing infrastructure based on trees and tree-mimicking technologies. Andy describes his strategy as a hybrid involving information technology, participatory processes, and integrated financial and human resources. By designing computer programs to model, synthesize and calculate "what the human brain can only intuit", he enables ordinary people to manage complex systems. For example, Andy is developing mapping software to create the feedback mechanisms that citizens need to engage with their infrastructure agencies and hold their elected leaders and government accountable. To begin addressing a major challenge, Andy brings together the best minds from a variety of disciplines in a design collaboration. He uses a cost-benefit analysis to show corporate, elected officials and agency leaders that it is in their interest to participate. Solutions reached through this process reflect the views of all relevant parties. His strategy is to solve multiple problems at once, including conserving, cleaning and storing water, mitigating water and air pollution, and mitigating and adapting to climate change. To do this, he galvanizes citizens, policymakers, public agencies, and community organizations in united efforts to transform cities into generators of health, resiliency and abundance.

Paula Z. Segal, 596 acres

Against all odds, Paula is proving that neighborhoods can change when neighbors see vacant lots as sites of opportunities and create communal, green spaces in areas that lack them. As a migrant and a lawyer, a community-garnered and community organizer, Paula is able to navigate the social and legal landscape and blaze a path for a new model of community empowerment. Over the last four years Paula has harnessed the yearning of urban residents for vibrant, green space as a mechanism

for putting the keys to previously inaccessible sites into the community's hands, facilitating the creation of parks, gardens and farms, and ultimately increasing the agency that residents have in shaping their neighborhoods and cities. Using highly engaging, street-level posters backed up by dynamic, interactive online maps and tools, Paula began by tagging and flagging vacant, municipally-owned land as potential sites for vibrant community spaces. Passersby might first notice posters reading "this land is your land" or "find your lot in life". The small print on the sign direct the citizens to the *596 Acres* website, where they can connect to other residents, access probono legal support. Streamline their outreach to public officials, the media and potential collaborators. In New York City alone, 162 lots have become hubs for such organizing and 34 have already been transformed into vibrant, community-managed green spaces and made permanent through transfers to the Parks Department or via leases with public authorities. Thousands of neighborhood across the US have followed, from New York to New Orleans, Los Angeles or Detroit. Through this approach, communities do not rely as much on the state to provide; after all the state is not particularly good at equitable access. Nor di they depend on the market to distribute; this hasn't led to more equality or fairness either. Community land access advocacy empowers communities to steward the things that they need to sustain themselves.

596 Acres has also developed an award-winning open source case management system called Liming LotsTM to demystify and decode public data, maintain continuity of local campaigns and easily transfer knowledge from one campaign another where the decision-makers are the same, or the decision-making procedure similar. As Paula puts it, the effects of individual campaigns – some successful and some not- ripple nevertheless through communities. Neighbors tell neighbors about their experiences and the possibilities that exist behind rusty fences. As a convener of multiple, different efforts across New York and, through replication efforts in other cities across the world, 596 Acres is able to help identify patterns and champion the new field of "community land access advocacy" in the face of global trends towards privatization of urban spaces.

Conclusions

Cities can be a hotbed for innovation in every field. The abovementioned case studies show that innovation with huge impact on cities and with unlimited replication potential can begin with lean ideas experimented by social entrepreneurs. In all the cases presented, the city administrations did not begin the innovation process themselves but were encouraged by the social entrepreneur and the movement created

around them. Ashoka's mission is to help more and more social entrepreneurs to turn their ideas into models and to gather changemakers in every corner of society, active in different fields and at different levels of decision-making, to create a coalition that can speed up the positive impactful change discovered by these social entrepreneurs. This can happen in every city in every country in the world.

Uneven Development and Expertise in the 'Smart City'

Taylor Shelton and Jennifer Clark, Georgia Institute of Technology

The idea of 'smart cities' is constantly in the process of becoming more important to the way future cities are planned, developed and governed. Focused broadly on the application of new digital technologies to urban problems *in order to increase efficiency*, the smart cities concept has been at the center of both rapid, greenfield urbanization in peripheral areas of the global south, as well as more piecemeal efforts in the existing cities of the global north. While the dominant vision of smart cities has not gone uncontested (Greenfield 2013; Sennett 2012), a significant portion of the critiques of this idea have focused more on the corporate-dominated visioning exercises for greenfield cities in the global south, and less on the myriad ways that the smart city ideal is being instantiated in the form of 'actually existing smart cities' (Shelton et al 2015).

A variety of different actors and institutions, both private and public, for-profit and not-for-profit, has been actively shaping the smart cities agenda for the last several years. While the United States government has been relatively slow compared to the European Union in promoting the smart cities idea, on February 23rd, *the President's Council of Advisors on Science and Technology (PCAST) released their report "Technology and the Future of Cities"*. The report outlines a federal strategy to guide investment and engagement in smart cities initiatives, and is sure to play a significant role in the way ideas of 'smartness' are applied to any number of initiatives currently in the planning and deployment stages in U.S. cities. The *US Department of Transportation's Smart Cities Challenge*, for example, joins the the PCAST report in signaling that federal involvement in urban issues in the near future will likely be couched in the language and approaches of 'smartness.' Those seeking to capture federal funds for urban projects, it is implied, would do well to get on board.

Although the approach taken in "Technology and the Future of Cities" positions smart cities as critical to US economic competitiveness, the report itself has been met with mixed reviews, even from those ostensibly friendly to such concerns. *One*

prominent player in the smart cities space has called the report "a rambling, sloppy embarrassment that fails to capture even the basics of a smart city". On the other hand, *Richard Florida's assessment at* CityLab *is much more positive about the potential for this exercise* to place cities at the center of federal technology and innovation policy. This latter view is consistent with the recent efforts of advocates of federal investment in technology to more explicitly *link cities to innovation policy*.

But rather than focus on the definitional or public management issues raised in the report, we highlight here two key elements worthy of closer attention. The first issue of interest in "Technology and the Future of Cities" is also the most explicitly *geographic*: a focus on the creation of 'urban development districts' as test-beds for the implementation of smart city ideas and technologies. It is important to highlight the fact that the report recommends the development of smart cities to happen not at the scale of the city, but rather in 'discrete regions within cities,' where "[a] district does not necessarily have a predefined scale, nor must it fall within the political boundaries of a single city" (p. 2).

The report justifies its focus on these 'urban development districts' by arguing that, "[d]istricts offer larger cities the chance to take on these challenges in bite-sized stages" (p. 8). It is true that smaller scale, test-bed or 'living lab'-style implementations are useful for assessing the utility and interoperability of certain technologies or approaches such as bike sharing, digital parking meters, or real-time data collection about energy use or road conditions. Dense urban districts containing many early adopters are certainly better than *cities without any people in them*. However, it is important to recognize what an urban development strategy built entirely around these spaces means for cities as a whole: the perpetuation of longstanding patterns of geographically uneven development (Smith 1984).

In short, these test-beds are not problematic only because of issues related to combining and interlinking incommensurable systems that are often developed in isolation from one another. Instead, the focus on specific intra-urban territories risks reinforcing and deepening the myriad social and spatial inequalities that exist not only between, but also within cities. Even though American cities have long since given up on what Stephen Graham and Simon Marvin (2001) called the 'modern infrastructural ideal' of pervasive and integrating infrastructural connections, the targeting of smaller districts within cities is likely only to create new forms of 'secessionary network spaces'. These kinds of 'smart enclaves' will be highly connected both within their boundaries and to quite distant places through networks of fiber optic cables, but will likely be functionally distinct from the surrounding neighborhoods and urban area that lack such advanced infrastructure and technology.

Although the report recommends that some of these targeted districts should be located within low-income communities, a vision of the smart city promoted by a district-centric implementation remains one of significant socio-spatial fragmentation and differentiation. Some places are inevitably privileged over others in the provision of new technology services, and it is unclear whether places neglected in the first rounds of these programs will ever see similar levels of investment.

It is also worth putting these district-level implementation strategies in broader context of the history of urban economic development. Recall the evolution of various 'zones' – 'free trade zones', '*enterprise zones*', 'empowerment zones', '*promise zones*' – designated for special services or tax advantages intended to drive development into such territories (and, necessarily, away from or out of others). Literature on this matter records mixed results and significant debate (cf. Hall 1982; Goldsmith 1982; Harrison 1982). In any case, the provision of special technology services in some neighborhoods, but not others, raises serious concerns about fairness and justice, leaving open the question of who has the right to the smart city. Unfortunately, the PCAST report places minimal emphasis on such matters, meaning that planned investments into new infrastructures and technologies are more likely to deepen longstanding inequalities than to ameliorate them.

The second issue of interest relates to the type of expertise that is (or is not) present in the report's construction and in the formation of its conclusions. Only a few of the 100+ listed contributors to the PCAST report represent the perspective or expertise of social science focused on cities and the urban scale. The technoscientific orientation of the report instead privileges experts in the sciences and engineering from both academia and industry. Indeed, the burgeoning field of 'urban science' – *founded on the principle that the conventional urban social sciences have been insufficiently scientific* – occupies a prominent place in the content, as well as construction, of the report. This prominence of 'urban science' contrasts with a conspicuous absence of established disciplines such as urban geography, urban sociology, urban history, urban economics, urban anthropology, and urban planning, which, rather than seeking to produce a single, unified law of urbanization, have provided over a century's worth of in-depth, place-based *and* generalizable research that aids our understanding of precisely those urban inequalities bypassed in the PCAST report's discussions.

This report is yet another sign that the production of urban knowledge, especially that which is deemed useful for governance and administration, is troublingly disconnected from the last century of urban scholarship. Today, urban knowledge is increasingly focused on the ability to gather, process and analyze massive datasets about any number of urban (or not-so-urban) phenomena, privileging the techni-

cal over the social. The role of the urban social sciences in the development of the federal government's smart cities initiatives is given scant mention in the report, aside from the mention that "[g]iven earlier discussions regarding the interplay between technology and norms of behavior, it will also be essential to integrate social, behavioral, and economic sciences with these more traditional infrastructure sciences" (p. 41).

Given that beyond its contributions to our more general understandings of urban inequality, critical social science research has recently provided a significant rebuke of the smart cities concept, it would be worthwhile for PCAST or other government agencies to consider such work as plans move forward. For instance, Rob Kitchin's (2014) overview of smart cities outlines five key concerns deserving of more attention: the inherent politics of ostensibly neutral data, the emergence of technocratic governance, corporatization and lock-in to proprietary technologies, the potential for such systems to be hacked or otherwise disrupted, and intrusions on citizens' privacy. Elsewhere, both Wiig (forthcoming) and March and Ribera-Fumaz (forthcoming) have documented precisely the problem we raise with regard to smart city development districts, looking at Philadelphia's failed engagements with the IBM Smarter Cities Challenge and at the unintended consequences of the 22@Barcelona district. A particular concern is how a combination of proprietary technologies and security barriers may limit and circumscribe community participation and economic development opportunities for small and emerging firms in the design, development, and deployment of smart cities technologies (Clark 2013, Clark forthcoming).

Ultimately, the financial investments in smart cities that will be made by the federal government (i*nitially estimated in Fall 2015 at $160 million*) represent an exciting opportunity for anyone interested in US cities. It remains to be seen, however, whether the preoccupation with new technologies obfuscates critical issues, such as whether provisioning fundamental services is dictated by efficiency or equality. Given the general absence of perspectives from the urban social sciences in the current conversation, it is difficult to see how investments will be equitably targeted. Instead, failures to attend to the ways urban spatial inequalities are produced means contemporary smart cities initiatives, like those advocated for in "Technology and the Future of Cities", will simply fall into the trap of exacerbating uneven development. Or, as has often been the case, the report and its recommendations – like US cities themselves – will be ignored.

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A Holistic Model of Areas of Innovation in Cities

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Cities have become nodes of competitiveness at an international level. It is in cities where innovation takes place and contributes to the better economic performance of their regions and improved quality of life for their inhabitants. Cities need to maintain their identity despite opting for similar approaches to improve their competitiveness. The use of elements from the past, and the need to find a balance between reinventing themselves and maintaining their own identity is a challenge for most cities.

The creation of innovation districts, scientific parks, urban clusters and smart cites has become a common tool for urban revitalisation. Usually, it has been applied in former industrial neighbourhoods in need of regeneration (brown field), as is the case with 22@Barcelona. In other cases the projects are starting from scratch (green field). This is the case of Skolkovo Technopark. The top-down approach to this type of urban development requires not only a clear methodology but also an in-depth knowledge of the context, and the stakeholders that participate in the transformation. Identifying factors for success and failure related to the specific exercise of building up a particular area have been widely studied from many academic disciplines (Moulaert & Sekia, 2003; Padmore & Gibson, 1998).

The aim of this paper is to propose a Metamodel of Areas of innovation of Cities (Innovations Districts or Knowledge Cities). Several variables will be taken into account not only on technical and social conditions strictly related to the area, but also on the effect this type of development might have in the city as a driver for change.

Talent as a Basis for the New Economy

After the third wave of globalisation that took place in the XX century, comparative (and competitive) advantages of cities and countries currently rely on new forms of production based on knowledge and talent. Rather than typical factor endow-

ments associated with lower costs, countries – and particularly cities – aim to attract highly qualified people from all over the world at the same time as enhancing their own fertile soil through education and the development of skills.

The dichotomy between companies and people emerges as a key one in the new economy. Unlike in the past, not just companies but also people and talent are key elements for increasing economic growth. Therefore, ideas, creativity and, in summary, new inputs for the value chain becomes essential for the new arena of urban competition.

As a result, not only hard factors (infrastructures, transport, and connectivity, among others) typically involved in attracting companies, but also soft factors (atmosphere, leisure activities and tolerance, among others) are essential for attracting individuals, and turn traditional cities into nodes of the knowledge economy.

But to what extent are those creative and talented workers involved in the production of new innovative processes and products? How can cities and urban environments promote the engagement and attachment of talented people in the nurture of the knowledge economy? It becomes essential to provide mechanisms and tools to develop a dense network of relations that not only stimulates talent but also transforms it into added value creation.

Economic activity is necessarily associated with a particular geographic area: it is instrumental to locate innovation. However, a geographical area is more than just a business location: it is interaction space and residence, generating synergies between people, institutions and policies. In recent years, a growing interest has been identified in knowing which mechanisms are available on the ground to create innovation (Belissent, 2010; Zygiaris, 2013). The approaches are varied, ranging from academia to local agents who want to improve their capacity to generate high added value.

Among others, clustering of companies and technologies has been identified as one of the most effective strategies to group synergies and increase dynamism in the creation of economic value. However these strategies do not work properly where talent is concerned.

> "The clustering of talent – especially entrepreneurial talent and knowledge workers – is different. Talent moves because it can move and cluster because it makes sense especially if the connectivity advantages come into play" (Cannon, 2011).

The enhancement of a specific area with the aim of creating innovation requires identifying a local context with the potential to embrace challenges and able to gen-

erate a new way to connect with the rest of the city. Awareness about the power of new tools for connectivity is vital to understand how talent can be also attracted and retained. What does clustering knowledge activities in a city provide for talent from all over the world?

The capacity for transformation of the existing environment to attract companies and talent is a policy challenge: cities design development strategies and roadmaps towards innovation in certain districts in the light of other experiences, however, the major strategic lines of action require a process of adaptation and validation for each context and specific situation. Transferring models does not guarantee the transfer of results. Nevertheless, cities currently aim to assemble talent from all over the world, benefiting from the interaction of different people, from different backgrounds and with different abilities in a single project or endeavour. The role of the city is crucial in developing a particular image to appeal and hook those knowledge workers.

> "In fact, there is a direct correlation between the ability of a city to gather highly skilled people and the region's potential for innovation and economic growth. Generating ideas and their processing as innovative tools applied to business does not depend on classical items of business location anymore: the very personality of the city becomes crucial in creating an attraction for certain groups that provide new capacities and growth potentials for the region" (Pareja-Eastaway and Piqué, 2010).

Science and Technology Parks have an important role to play in the Knowledge Economy. We are already witnessing the evolution of the traditional models into new ones, the Areas of Innovation. This model was analysed by Luiz Sanz in 2001 as 'Learning Village'. Three main elements were described: (i) businesses, (ii) educational centres and (iii) residential areas. The three element are still at the centre of the study, as they include the key concept behind the areas of innovation: a place for working and living in the knowledge based economy and society.

Citizens as the Fourth Pillar (Quadruple Helix)

The definition and function of the Triple Helix concept combines industry, government and universities in the same environment arguing their capacity to provide a framework for action of the knowledge-based economy (Etzkowitz and Leydesdorff, 1995). The model goes beyond linear systems based innovation policy of demand (market pull) or supply policies (technology push); it suggests strengthening synergies arising between agents in a bottom-up perspective to innovation initiatives

strengthened at national or regional level, top to bottom. (Etzkowitz and Leydesdorff, 2000). This model may include the 'markets' as a fourth element. In this sense, demand becomes a key factor of innovation development. Stakeholders can act separately or coordinate actions through the development of new knowledge, new economic sectors or regions: promoting innovation ecologies, players assume the roles of others, and hybrid structures appear that allow permanent joint initiatives.

On the other hand, the importance of adequate educational facilities is crucial to ensure the production of talent in the country. The presence of both public and private schools of high quality, such as universities, ensures the availability of a highly-skilled workforce and attracts businesses to these places.

As mentioned above, the increase of global competition and cheaper sources of high-quality technological solutions means that companies can no longer rely on maintaining a competitive advantage based on 'traditional' drivers of price and quality. They must seek alternative sources of competitive advantage. Nowadays companies are undertaking major transformations in their innovation processes and business models in order to deliver more valuable products and services to the market. Open business models, a greater focus on understanding latent consumer needs, and more direct involvement of users in various stages of the innovation process are, among others, key drivers of these new strategies.

> "The user-driven innovation approach is believed to promote the development of new more inexpensive public services and ways of operating them" (Wise, 2008).

Several authors have acknowledged the need to develop a new model (or models) that include the user perspective in innovation development. They all agree on user-driven innovation as an essential success factor for both private firms and public sector organizations.

Currently, the concept of 'user-driver innovation' has shifted from a perspective where the consumer simply added value to already existing products developed by companies to the involvement of consumers to produce innovation along the process of product conception, development and market introduction among others (Wise & Høgenhaven 2008).

Besides direct consumer involvement in the creation of positive innovation externalities in the company or along the value chain, there are other side effects related to the user as an inextricable element of the demand side of the market. As Piqué and Majó (2012) summarise, the creation of 'sophisticated demand' has clear ben-

efits in at least four distinct areas: the city itself, as well as its citizens, its business network and its scientific and technological environment. Better products and services compel companies to include the core of innovation in new services and products in increasingly competitive environments.

The Smart City as the Platform for the Knowledge Economy

Urban changes are conditioned by global transformations that have changed patterns of production and renewal of the industrial economies.

The urban space has been adapted to the dominant mode of production: the trading town, the industrial city or Fordist city are good examples. The most recent change in the relationship between capitalist development and urbanization is associated with increased post-Fordism primarily associated with the knowledge economy or the creative economy. Cognitive cultural capitalism (Scott, 2008) presents a city based on neoliberal policies characterized by central business districts, elegant shopping and entertainment areas and revitalized port areas that meet the requirements for industrial renewal and attract talent and tourists to the city. This is the scene in which global competition and global flows of values pose new challenges for policy and governance in urban communities, increasing the intensity of innovation and postmodern cultural trends.

Economic globalisation has made municipal governments much more concerned than in the past about the global aspects of local economic development.

In a sense, cities are becoming global networks of city-orientation with the strategic task of adjusting urban communities under the conditions of the global economy. Municipal governments can do so by increasing their competitiveness influencing the general context in which this competition between cities takes place. Municipal governments need to increase their capacity to govern and to design structures favourable government. Therefore, the creation of successful responses to the global interurban competition is essentially a problem of strategic positioning and governance (Anttiroiko 2009).

> "Place is the factor that organically brings together the economic opportunity and talent, the jobs and the people required for creativity, innovation, and growth" (Florida, 2005).

The ability of cities to effectively attract external resources – particularly where high value-added activities are concerned – largely determines their position in the global urban hierarchy, which reflects and determines its overall appeal and capacity in

the globalized environment. This reinforces the need for basic urban policies involving local people and capable of balancing development policies with the adoption of an integrated vision.

Ecosystems of innovation arise in this context as a keystone in the global-local synthesis: they attract external resources, enhance existing ones and create favourable conditions for global competitiveness. Thus, in the processes of renewal and urban revitalization that claim to stimulate innovation, we see the convergence of the improvement and upgrading of physical infrastructure on the one hand and, on the other, the development of investment in human capital and social improvement.

> "The creation of innovation districts, the numerous scientific parks and urban clusters together with the so-called "smart city" label, have become usual tools and discourses associated to urban revitalization. Usually, it has been applied in former industrial neighborhoods in need of regeneration. The top-down approach to this type of urban development requires not only of a clear methodology but also a deep knowledge of the context and actors that participate along the process" (Piqué and Pareja-Eastaway, 2013).

A Holistic Model of Areas of Innovation in Cities

Urban regeneration involves the participation of the community, companies, institutions and policies in order to generally improve the quality of life of citizens. However, policies have focused on different aspects to renovate or renew, pointing out at one type of regeneration (physical) or another (social). Integral approaches to regeneration are meant to combine both physical intervention but also social policies in order to improve the quality of life of citizens (Roberts and Sykes, 2000). Later on, this focus has been predominant in the regeneration of cities and districts. An all-embedding intervention improving not only infrastructures or public spaces but also providing for intangible elements to the community to increase its quality of life has been generalized all around.

Certain cities definitely offer a better set of attributes for businesses and economic activity than others; these include simultaneously tangible assets in the form of easily measurable physical elements (i.e. highways, airports) and more indefinite elements such as image, the quality of governance and social and cultural features (Begg, 2002).

Infrastructures and urban transformation

The historical development of cities has a huge influence on their current situation. The association of a city to a determined economic profile does not emerge immediately: to a large extent, the past determines the present of cities. Consecutive economic transformations inexorably leave their legacy in the territory.

The availability of good infrastructure and transport connections as well as centres of higher education, the availability of capital and labour with the necessary qualifications, together with an institutional context that favours the location of business through programs and specific actions such as fiscal exemptions or land at a below market price have been the factors traditionally considered as a determinants of the economic location of business.

The opportunity to develop a Smart City strategy for both green or brown field districts is a strategic decision to include in the holistic approach.

Companies and economic development

Traditionally, huge importance has been given to the advantages of agglomeration economies, the economies of scale and clustering as promoters of economic growth. Industrial clusters have been analysed and identified as playing a highly relevant role in the analysis of innovation and the definition of political support to industrial activity (Porter, 1990). Industrial clusters are defined as geographic concentrations of companies of the same sector or sectors related along the value chain that collaborate or compete and have also links with of other actors (such as the universities). According to Porter (1990), clusters reflect a top-down approach to promote a certain region, which basically consists of grouping different stakeholders (universities, technology and research centers, business, management and financial resources both private and public) interested in working together in an economic sector.

Talent and social development

These factors underline the importance of particular equipment or urban attributes that contribute to the creation of an attractive environment for people. Since talent has become the engine of the new economy based on creativity and knowledge, these aspects associated with the region have become more important than location factors for economic activity. Quality of life, 'atmosphere' or tolerance are just some of these elements.

Personal or professional networks, implicit or explicit, become the connectors between stakeholders who participate in different parts of the economic activity. In fact, network factors are an alternative formulation to the classical location factors, closely related to the aspect of connectivity that offers a good provision of infrastructures. Besides, they also involve those aspects which point out at the individual path of people and its attachment with the territory.

Governance

Areas of excellence create a model of dynamic innovation based on the concept of the "triple helix" (Etzkowitz, 2000), which enhances the confluence of public administration, universities and companies in order to develop synergies between these strategic partners to increase the competitiveness of the production system and assist in the creation, growth and consolidation of employment. Collaborative relationships form the basis of the development of the triple helix: this interaction results from the synergies created in the territory among stakeholders rather than from a 'prescription' from the authorities. Besides, the different stakeholders involved assume different roles than the traditional ones, providing the opportunity for innovation. Vertical and horizontal governance will be necessary to articulate clusters (strategic sectors) and the Areas of Innovation (holistic approach). The incorporation of citizens' needs and city challenges in the quadruple helix is another strategic decision to make when developing a governance model.

Conclusion

Cities are the platforms of the knowledge based economy because they are the platforms of talent, the real raw material of the new economy. Cities must provide a good place for working and living if they want to attract, retain and create talent. Cities are also a goal of innovation. For this reason, they can be a place for learning new applications. Policy makers, universities and industry can use the city like a lab to learn locally in order to compete globally.

The Quadruple Helix involves the demand side of innovation. Citizens are the beneficiaries of the innovation, but also they could play a key role in the process of innovation. Cities that want to develop areas of innovation will need to develop hard factors and soft factors for urban, economic and social transformation.

Both greenfield and brownfield developments need to create an ecology of innovation that will include all the agents of the ecosystem (universities, Industries and government). The starting point may be different, but the vision must be clear in

the direction of the knowledge based economy and society. Cities should understand the challenges to achieve this vision, and develop actions that are solving the urban, economic and social challenges, taking advantage of the capabilities of the agents of the ecosystem.

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More Sustainability, Higher Growth Potential and Lower Risk: Why the Global Financial System Should Support the Circular Economy

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A product is just a temporary use
of a material or component
(M. Braungart)

Introduction

Economic and social issues related to sustainability have been gaining enormous momentum in the debate among scientists, economists and media in the last 30 years. There is now an ample and well established consensus that economic decisions, in broad sense, cannot overlook the impact that those decisions have on the environment, on the quality of life and on future generations.

However, despite this broad consensus, when it comes to financial investment decisions and financial and risk modelling, environmental sustainability, at least in the minds of investors, seems to be still going hand-in-hand with higher constraints, higher costs and lower profitability. This view contrasts with that of the Porter hypothesis (Kramer & Porter, 2011), according to which there exists a positive relationship between environmental supportive regulation and firms' competitiveness, thus favoring growth, enhancing profitability and reducing risks.

In this paper we will argue in favor of the Porter hypothesis, extending our line of reasoning to the circular economy[62], a new production and consumption paradigm

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61. The views expressed here are the author's only and should by no means be referred to Intesa Sanpaolo, its Board or its management. I wish to thank various colleagues and friends with whom I discussed most of these issues and in particular Federico Butera and Brian Barnier for their invaluable suggestions. All errors remain my own.

62. For an introduction to the circular economy and a discussion of how it can positively impact the business sector, see Lacy, P. and Rutqvist, J. (2015).

that has been recently attracting a growing interest from policy makers, corporate names and some banks alike.

The paper is organized as follows. We briefly introduce the concepts of the circular economy, setting the stage with a simplified macro model to illustrate the potential for growth given by the circular economy. Then we turn to some examples of corporates and business lines that have been inspired by the circular economy, trying then to understand how banks can also fit in this new paradigm by adapting their financial and risk models. Our conclusions close the paper.

The circular economy as growth-enhancer: a brief description and a simple macro model[63]

As opposed to the linear economy that we have in front of us every day, characterized by the classic sequence "take, make, dispose", the circular economy is an economy that is restorative and regenerative by design and aims to keep products, components and materials at their highest utility and value at all times. A circular economy tends to preserve and enhance natural capital, to optimize resource utilization by circulating products, components and materials and by minimizing systematic leakage and negative externalities stemming from wastes.

Lacy and Rutqvist (2015) describe five main business models that can enable the circular economy:

1) Circular supply chain, that provides renewable energy, bio-based or fully recyclable inputs to replace single-lifecycle materials;
2) Recovery and recycling, that finds resources and energy from discarded products or by-products;
3) Product life extension, that extends the lifecycle of products and components by repairing, upgrading and/or reselling;
4) Sharing platforms, that enable the utilization rate of products by favoring the shared use/access/ownership;
5) Product as a service, that offers products access and retain ownership to internalize benefits of circular resource productivity.

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63. This paragraph is based on various documents issued by the Ellen MacArthur Foundation and on Ruggerone, L. (2016). For a micro analysis and measurement of the circular economy, one can refer to Circularity Indicators – An approach to measuring circularity, available at: http://www.ellenmacarthurfoundation.org/circularity-indicators/.

Elaborating a bit more on those concepts and models that can enable the circular economy, we modified and simplified a macro model, originally proposed by Foster (1980), that helps to show, in a formal way, how the circular economy can allow the economic system to choose a more virtuous equilibrium characterized by lower pollution and a reduced level of non-renewable resources consumption, without affecting growth.

The model is described by two equations of motion that capture the dynamics of pollution through time, while allowing for pollution accumulation and the law of motion for nonrenewable resources S:

$$\dot{P} = \alpha E - \beta A - \delta P \quad (1.1)$$

$$\dot{S} = - A - E \quad (1.2)$$

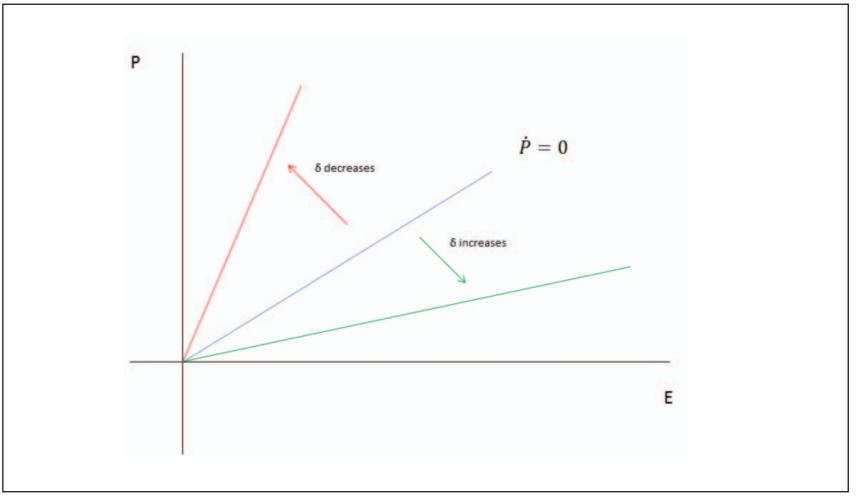
A dot on the variable denotes variation with respect to time, while the symbol P denotes the stock of pollution. It is worth stressing that, in this model, the use of energy (E), necessary for economic growth[64], generates a flow of pollution at a rate equal to α, while A stands for the level of antipollution activities. We assume that A, by using energy itself, can reduce the pollution stock at a rate equal to β, while the pollution stock is subject to an exponential decay at a rate δ, larger than zero, but lower than 1. All parameters in equation (1.1) are positive, by construction. In sum, pollution tends to increase with energy (i.e. with economic growth in our simplified model), while it tends to decrease when antipollution activities kick in and as a consequence of "natural" decay (dissipation effect). Equation (1.2), simply states that the stock of energy resources (S) is reduced by the use of energy for economic productive activities and by the implementation of antipollution activities that, themselves, require technology and energy resources.

By substituting the solution for $\dot{S} = 0$ into (1.1), we can then easily derive the locus of points along which pollution is stable (i.e. does not increase nor decrease), by setting the equation equal to 0 and expressing pollution (P) as a linear function of fuel extraction (i.e. energy) E:

$$P = \frac{\alpha+\beta}{\delta} E \quad (1.3)$$

64. Admittedly we make here the simplified assumption that more energy means more growth. While the correlation between energy and growth is probably positive, it may be correctly argued that higher growth does not always necessarily entail higher consumption of fossil fuels. Furthermore, it could also be argued that the way we currently measure growth (GDP) is not fully appropriate, as we should weigh more the quality of life of people, rather than the amount of goods and services they can access.

Equation (1.3) describes an infinite combination (a line) of levels of pollution and fuel extraction, where pollution is stable. The slope of this line depends, among other things, upon δ, which describes the rate at which pollution dissipates. In our analysis, this parameter could also be called the "circular economy" parameter, as the circular economy represents a very powerful means for increasing the speed at which pollution dissipates. As a matter of fact, the circular economy helps dissipate pollution because it gives "wastes a new life"[65]. What is waste and pollution under the linear economy turns into a new product with a new life, thus resulting in a faster dissipation of pollution (higher δ). It is easy to see that, *coeteris paribus*, a higher δ implies a flatter line (e.g. the green line in the graph below), therefore, in a circular economy world, society can choose, in equilibrium, a combination of higher energy, that ultimately brings in higher economic activity, and lower pollution. The opposite is true if, for some reason, δ becomes lower. In that case, the economy is stuck in a vicious equilibrium where, the same level of energy extraction (i.e. economic activity), is coupled with a higher level of pollution. It is worth stressing that this interesting result has been obtained without changing α, nor β. Furthermore, our result holds true even if no antipollution activities, that themselves require energy extraction, are in place (β=0). One may argue that circular economy can also reduce the stock of pollution, decreasing the value of parameter β at the numerator, thus contributing further to the "flattening" of the equilibrium line.



65. Not only that. In a model of circular economy, the parameter δ captures also the re-utilization of goods, the reduction of the number of products through sharing platforms, etc.

Our simple model bears some interesting implications. The continuous push for economic growth under the linear economy paradigm (higher E) brings along with it, not only a higher utilization of (finite) energy resources, but also a higher level of pollution. However, if the linear economy paradigm is abandoned and the production and consumption patterns of the economy start being inspired by the circular economy which enhances the re-utilization of seemingly exhausted products by giving them a new life, the society can choose an equilibrium characterized by higher growth (through higher E) and/or a lower level of pollution (lower P). Therefore, not only is the circular economy supportive of a better, more clean environment, but, *coeteris paribus*, it also allows the economy to reach higher growth.

The circular economy as risk mitigation: some examples from the real world

By carefully considering how the circular economy works, one can observe also how this new paradigm can open the way for a lower level of riskiness for some industrial and service sectors and some companies. Here we do not have a simple theoretical model, like in the previous discussion on growth; therefore we base our discussion on some real world examples[66].

Think of a company whose production crucially depends upon a non-renewable input that, by definition, is finite and whose price is subject, not only to supply-demand forces, but also to the speed at which the non-renewable resource is consumed and depleted. The profitability, and therefore the value of such a company are likely to be very volatile and to become even more volatile as the finite resource-input continues to be used. Volatility is perceived by markets and investors as risk, it is something that investors and financial markets dislike, so it reasonable to expect that shareholders and creditors of this hypothetic company would be happier if its cost structure, and therefore its value, were more stable and less subject to exogenous forces. One way of obtaining this result would be to turn the linear supply chain of the company into a circular supply chain, by which the input of the production is no longer subject to a scarce resource price volatility and its depletion rate, but falls instead within the control of the company itself. Such a change in the production function obviously requires time and resources and cannot be achieved

66. For specific examples and names of companies that fall within this category, please refer to Lacy and Rutqvist (2015).

in a short time span, but the result is so remarkable that forward looking investors should welcome such a plan.

Let us offer another example, where technological progress has triggered a major rethinking about an important line of business, like that of selling light bulbs.

Years of research and development have made possible new kinds of light bulbs that have gradually become more energy efficient and much longer lasting. This development culminated, in the last few years in the full commercialization of LED lights that guarantee low energy consumption and even longer lasting bulbs. If light bulbs producers were to keep on basing their business on the volume of sales, they would be heading to a massive scaling down of their production and their profits. However, clever and forward looking managers in this sector understood that they needed to switch their business from selling bulbs to selling "light", while keeping the possession or property rights in the bulbs that can be partially utilized and reconditioned by the company itself at the end of their, now longer, lifecycle[67]. In this example, the company, through a deep change in its business model, manages to survive, while becoming more sustainable.

A third, slightly different example can be drawn from the tires industry. Think of a company that produces high-end tires for high performance sport-cars. It is reasonable to expect that such a company keeps its quality standards very high and, for this reason, it may well have a non-insignificant portion of tires that do not fully comply with the high quality standards imposed and that cannot be put on sale in the market because of reputational reasons. These "unmarketable" tires are a cost for the company as they have also to be stored and, ultimately disposed. If the company were to partner with other companies that are able to provide the technology necessary to crumble down the tires and utilize the material for, say, producing asphalt to be used in highways and motorways, we would have a perfect example of circular economy by which a waste becomes the crucial input in a different production function, benefitting the supplier, who would save money by delivering "non-compliant" tires, and also the end users who would be driving their vehicles on safer, more economical and less noisy roads.

Finally, I would like to provide an example of circular economy processes that can be particularly interesting and useful if applied to large cities that produce enormous amounts of wastes, treated through incinerators.

Well established technologies already allow the ashes of the incinerators to be used

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67. This is what Philips has been doing, recently.

for the construction of concrete and clay bricks, but an innovative Italian company has successfully tested the production of high-end porcelain tiles that use ashes as one of the production inputs. Lab tests have certified that there are no qualitative differences between tiles produced with a 30% content of ashes and those produced with the standard components.

This result bears important consequences for the environment and also for the financial profile of such an innovative company[68]. On one side, setting up a production unit of tiles that utilizes ashes in the proximity of a large city's incinerator realizes that restorative process that is at the base of the circular economy, on the other improves considerably the risk profile of the company. In this case, in fact, the company, rather than paying in full for its production inputs, receives an inflow of cash to use the incinerator's ashes in its production function and can continue selling its tiles at the same price as no qualitative difference in comparison with traditionally produced tiles. This income stream helps remarkably reduce the cost of production for the company, while utilizing the ashes that would otherwise be dispersed elsewhere.

This brief summary of examples, certainly a non-exhaustive and, even, superficial list, gives an idea about the thrust that a circular economy approach can provide to the reduction of riskiness of corporate names in various industrial sectors. Reducing risks bear important positive consequences for shareholders and creditors alike and should be reflected in share and loan prices and in the yield of bonds issued by green or circular economy companies[69]. Unfortunately this is very seldom the case. Investors, banks and financial markets in general tend not to price in this reduced risk, despite convincing empirical evidence shows that sustainable companies tend to be more competitive than non-sustainable ones[70]. As a matter of fact, in the "financial" decisions process the level of sustainability or circularity of companies and firms is almost always overlooked and finds no role in the financial models used by banks and investors in gauging the riskiness of their debtors. A deep rethinking of this kind of model is needed.

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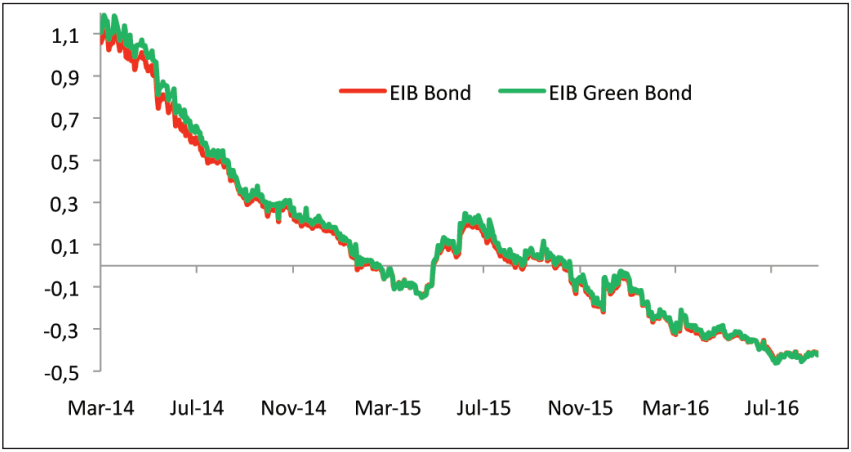
68. Here we do not elaborate on the positive spillovers stemming from the introduction of a new technology on labor productivity.

69. The chart below shows that the difference in yields between a bond and a green bond issued by the same name is immaterial. The green bond is not priced at a significant premium.

70. See, for example, Sangalli, I. and Trenti, S. (2014).

Yeld of EIB bonds



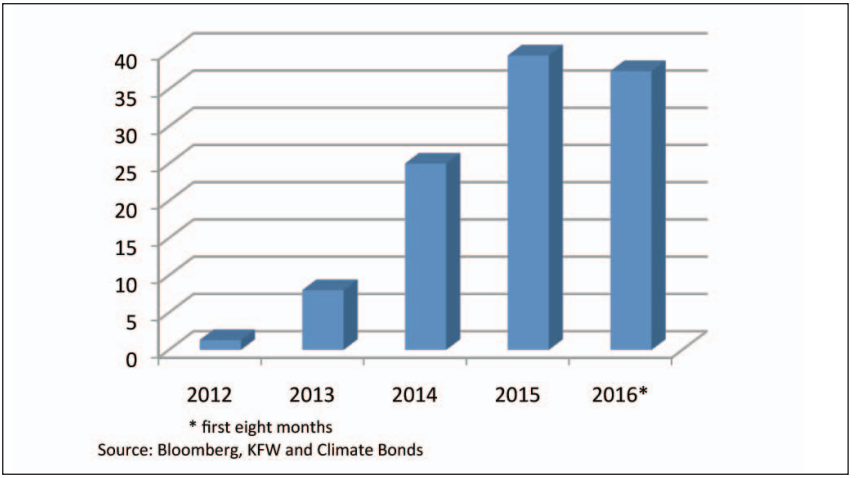
Can the financial sector contribute to the circular economy? How?

The structural changes briefly described here that can turn linear companies into circular ones and can help sustain a cleaner and higher rate of growth of the economy cannot be done overnight. They require abundance of human and financial resources and also a long time. When time and mobilization of resources are required to foster deep changes in the economic and productive systems, the global financial system comes into play with its support for companies and policy makers that wish to foster the evolution from a linear to a circular economic system.

We have already briefly discussed the need for a change in financial and risk models that investors use to assess equity and loans and bonds prices, but, on top of that there are other very relevant issues that must be tackled to make the financial industry more capable to properly assess the circular economy. The regulatory framework comes first. The global financial crises of the last 10 years have left behind them, not only a legacy of doubtful and non-performing loans that weigh on the balance sheets of banks, but also a new body of rules and regulations that have been driving commercial banks away from long run commitments and from those innovative sectors whose credit history is shorter and, presumably, less reliable. Such a regulatory environment does not seem to bode entirely well to encourage banks and the regulated financial sector to support a long and deep change of the economic and production systems.

Another factor that negatively impacts the supply side of credit for the circular economy is the lack of commonly recognized principles for circular economy bonds. The diffusion and growth of green bonds, for instance, is largely due to the issuance, by some financial industry associations, of processes and guidelines for the issuance of green bonds. The issuance of green bonds has initially been driven by the Multilateral Development Banks, but more recently, thanks to a body of recognized guidelines that establish the principles and the use of proceeds of green bonds, a growing number of private corporate names and other public institutions have tapped the markets with this kind of paper[71].

Green bonds issuance in EUR bn



Turning to the demand side, one can think of a set of potential significant investors that could be involved in the support to the transition to the circular economy. Apart from the usual suspects, such as, angels, incubators and private equity funds, which by nature privilege innovative sectors and projects, also all those investors with a sustainability bias and with a balance sheet characterized by long term liabilities should in principle be interested in this kind of long term assets. Among them, one can think of insurance companies, public and private pension funds and

71. According to Bloomberg and Kfw, the 5 largest green bonds issuers in 2015 have been: EIB, Kfw, TerraForm Power, EDF, ING Bank.

also sovereign wealth funds that typically derive their resources from the sale of non-renewable energy sources and might be interested in somehow offsetting their global footprint on the environment by investing in circular economy projects[72].

Conclusion

Through the use of a simplified macro model and some examples drawn from the real business world, we have shown how the circular economy can be seen as a means of sustaining growth, while reducing the negative impact of wastes that are starting to suffocate our world. Furthermore, we have also presented some qualitative evidence about the potential role of risk-mitigation that the circular economy can play, helping to stabilize production costs and to make companies less vulnerable to scarce resources, by giving wastes a new life as inputs in the circular economy production function.

We believe that these arguments should be sufficiently strong and convincing to encourage, not just the industrial sector, but also the financial sector to rethink and reshape its regulations and its financial models in order to factor in the enormous potential that the circular economy can have in terms of economic and social welfare.

A lot still needs to be done to make the global financial sector ready for the circular economy. The regulatory body has to be adjusted accordingly, leaving more leeway for players to invest in infant industries and technologies and financial players need to become more aware of the long term opportunities that the circular economy can offer in terms of economic growth and sustainability.

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72. Recently also Blackrock, the largest investor in the world with around USD 4.3 trn. under management, has drawn the attention of large companies and investors to the need for a long term sustainable development.

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PART 3
CITIES ADDRESSING INNOVATION

Introduction to the Dialogue between Cities: Interview with Sandra Baer, President of Personal Cities

Interviewer: What are the critical skills that can help cities solve many of the challenges cities across the globe face today?

Sandra Baer: The personal landscape of cities is changing and the uncertainty around cities – in the world economy, security, climate and demographics – affects our capacity to keep up with the pace of change. However, I think the opportunity to create alignment will give us the power to solve difficult problems. The real challenge is to understand how we can join together, how we can form effective teams and how we can build coalitions of trust to get things done. To do this, we will need to be honest about the current state of our cities and what is needed to shape their future. We are collectively responsible to join up, to get aligned, to create the power as a collaborative group to solve each city's problems. For many cities today, the top challenge is to understand the "big picture" – to see the interdependencies among all of the departments and identify what issues need to be addressed first. Setting priorities and a focus for action requires city leaders to convene a "smart city committee" to determine priorities. This committee or team can set the focus for what problems to tackle and who will take the lead in solving them.

I: ***What changes in city management will be necessary in the future? In particular, what will change in the relationship between cities and companies?***

SB: The traditional approach for cities and companies to work together often fails to convene all of the stakeholders. Here is the approach I see most often: A company interested in winning business from a city will reach out to a city leader, but the city leader may be reluctant to meet with the company….and often legitimately so. City leaders are often bombarded with companies wanting to sell them a single "point" solution. Should they take the meeting with this company? What about the company's competitors or smaller, more agile peers? And most of all, how will

this company help the leader to solve a number of problems – all interrelated and all needing attention.

I think we need stronger collaborations. Meetings between one company rep and one city leader often miss the mark of truly thinking holistically on behalf of the municipality. Representing private sector interests, a company's first mandate is to understand a city's problems and priorities, holistically. What is their stage of "readiness"? What are the barriers the city faces to begin (or to continue) the process of innovation? And who are the champions in the city and in the community that have the influence and the enthusiasm to help the city grow? Second, a company should explore how the company's products and services fit into bigger solutions, across silos. What other organizations are a part of those solutions? What other companies can the company partner with to truly help a number of city leaders and their teams set priorities and recommend some early successes? In the meantime, every thoughtful city leader needs to understand the interdependencies between every city sector to connect the dots – the people, the data, the knowledge, the problems and the opportunities. The idea is to create an internal exchange of ideas and issues that is shared and acted upon. The extra element of collaboration is outside of city government. True stakeholder engagement will look to civic leaders, university researchers, citizens and community organizations. All of these groups need to have a voice in shaping the future of their city.

I: ***Will technologies play a role in facilitating the relationship between cities and companies?***

SB: Two results create a win-win for the city and for the private sector working to win business. First the city is "ready to buy." The smart city team has joined up to assess their problems and their status of innovation. With a number of companies presenting ideas and solutions, the team is smarter about the technology, the costs, the timing, the choices, etc. All told, the city team is mobilized to share the benefits of an investment in the city's future and will work collaboratively to win support from their community. Second, the companies that join forces have had the opportunity to present their technology, while building trust with the city leaders. They have had the platform to build relationships – more than just selling a product, the companies are considered trusted advisors – advisors that help each city leader to "think big" on behalf of the all of the people who live, work, play and visit the city.

I: ***Can you tell us some actual examples?***

SB: Here is an idea that is now working in US cities: A team of city leaders puts together a set of ten questions that map out the city's top problems. These are tough questions that cut across city departments…and answers that require big ideas from a number of players. Once the questions are set and agreed to by a number of city departments, they can be communicated to a number of companies, civic leaders, community organizations, university researchers, entrepreneurs, etc. Basically a team of experts will address the questions, all thinking collaboratively about the city's issues. From this collaboration, the city will host a roundtable discussion – as a start, no more than 12 at the table – others can be invited to "listen only." The format is a half-day session with a separate facilitator to keep the discussion on track and on time. No sales pitches are allowed – only a focus on advice, ideas and recommendations about the ten questions on the table.

Here are two examples of this new collaborative approach.

In the first case, the head of strategic planning for a big city transit organization tasked his "brain trust" to lay out the top issues/problems they need to address over the next year – focused on "the ridership experience" and how the organization could better hear citizen voices, enhance metrics and analytics, strengthen communications, identify optimal technologies and gain internal and public support for new initiatives. Six companies invited to the table, with specific instructions to provide "big picture" advice, filled the day with actionable ideas and recommendations. The audience, consisting of representatives from 12 internal departments, actively contributed to the conversation; asking questions and pushing back on some of the advice. Follow up is ongoing. And one session is just the beginning to a different kind of dialog. But adjustments to the strategy are in progress. Several of the private sector experts are receiving requests for more help. Most revealing, new collaborations – between public and private sector players – are in the works.

In the second case, having lost businesses and citizens to the suburbs in 2007, a mid-sized city in Connecticut set out to re-invent itself – to be a "smarter city" that attracts people and enterprises back into the city. The Chief Innovation Officer formed a smart city team – with the mayor's endorsement, all departments were required to attend monthly meetings (in person). Their task was to understand each other's issues and develop an action plan to transform the city. (According to the CIO, the real benefit is a much improved appreciation of each city leaders' problems and how they are all interrelated). The team identified top problems that cut across departments – public safety, public works, energy, communications, finance and procurement. Through a set of mentoring sessions, with internal department

leaders and selected company invitees, the team became smarter – about technology choices, financing options and a focused approach to gain support for improving the city's livability, workability and sustainability.

Today, the city is rejuvenating its image. It continues to work better as a team and has launched many new initiatives with a variety of private sector partners. Their process exemplifies a time-saving approach that reflects a clear understanding of:

- The city's cross-cutting problems
- Key stakeholders within city government and within the community
- An integrated mindset that considers department interdependencies
- And most important, the opportunity to build trusted, respectful partnerships

As cities work to get "smarter", they are also finding new ways to include the entire ecosystem of the community. Increasingly, cities are seeing the interdependence of their operation and working holistically to engage all stakeholders.

Dialogue between Cities: Austin, Boston, Milan, Pittsburgh, and Turin[73]

Interviewer: ***How can cities balance the need to attract new talent and the one of upgrading the skills of existing residents and workers, in particular of low-income and disadvantaged groups?***

Austin: Austin is a regional hotbed of innovation where the creative class is embraced, encouraged and supported. It is also a venture capital investment hotspot for angel investment, venture capital and private equity. We are focused on attracting and retaining talents, increasing capital, growing and diversifying the innovation ecosystem, and leveraging local universities. In particular, we are interested in making a place that on the one hand retains the individuals who are here, and on the other hand, attracts talents from outside. Balancing these two forces is fundamental in order to bring innovation into the city. In so doing, we make a lot of investments to assure high standards of life quality. For instance, after completing their studies it often happens that students from our universities decide to stay in Austin. Moreover, we have several initiatives that also provide good opportunities to disadvantaged people such as economic disadvantaged individuals and those with high disabilities. Our goal is to avoid inequalities that lead to unbalanced development.

Boston: In Boston, we are fortunate in that we do not really have a problem with attracting new talent. The City of Boston is home to 35 institutions of higher lear-

73. The following participated to the dialogue: for the City of Austin, David Colligan (Global Business Expansion Division Manager Economic Development Department) and Casey Smith (International Program Manager Economic Development Department); for the City of Boston, The Mayor's Office; for the City of Milan, Renato Galliano (Director Urban Economy and Labor); for the City of Pittsburgh, Laura S. Fisher (Senior Vice President Workforce & Special Projects), Debra Lam (Chief Innovation Officer), and Stefani Pashman (Chief Executive Officer 3 Rivers Workforce Investment Board); for the City of Turin, Fabrizio Barberio (Director Development, Innovation, UE Funds and Smart City).

ning and enrolls approximately 150,000 students. In addition, we employ thousands of clinical staff and medical researchers in our Longwood Medical Area, one of the densest medical communities in the world and a major economic engine for Boston and its surrounding towns. Our focus then turns to retaining talent. This is a challenge in Boston due to factors such as housing and the cost of living in the city, and the availability of good paying middle class jobs to support building a life and family in Boston. Upgrading the skills of existing workers and residents remains one of our biggest challenges. Currently, the majority of low paying jobs in the city are held by City residents; however, the majority of higher paying jobs are held by non City residents. That picture presents a great outlook for the Greater Boston region at large, but not necessarily for the City of Boston itself.

Our Office of Workforce Development (OWD) is currently examining the apprenticeship model as a potential pathway to help Boston residents acquire the skills to vie for good middle class jobs. For example, OWD's Professional Pathways program places high risk youth in paid six month internships across different departments in Boston's City Hall. Through these internships, young people are exposed to a professional work environment and gain valuable work skills, which they may not have otherwise obtained based on their backgrounds. Of the 14 participants who participated in the program this year, 11 have either obtained private sector placement or received internship extensions that will lead to fulltime employment. In addition to exploring the apprenticeship model, we are examining how we can expand access to jobs in other industries. We have succeeded in traditional industries like hospitality and construction, and we need to broaden that scope. Boston is undergoing a new creative renaissance, and as a result we are trying to build pathways to jobs in the creative and technical industries to ensure our residents are set up for success in the 21st century and beyond.

Milan: Combining initiatives aimed at improving skills and qualification of local workforce with the effort to foster innovation and attract the best talent to the city is a strategic concern in the City agenda. A vision of the city's future based on this balance has been reintroduced into the public discourse in 2011, also in response to growing inequalities sharpened by the financial crisis brought in 2008. This means our approach is focused on strengthening the economic potential and attractiveness of our metropolitan area and, at the same time, strengthening the ability of existing workers to adapt to changing market demands and to benefit from innovation and investments in new technologies. On the first front, cooperation between universities and enterprises by supporting new training services, setting up startup programs and providing help for highly-qualified young Italians and foreigners in finding accommodation is proving crucial. As far as disadvantaged

groups are concerned, we targeted the creation of "Individual plans for employment/re-employment" which are defined on the basis of specific requests for workers coming directly from companies. Training, upskilling solutions and employment services are designed/selected accordingly and not vice versa.

Pittsburgh: to attract new talent and upgrade the skills of existing residents and workers are both relevant and important objectives, and they are not mutually exclusive. If you actually are able to work on both simultaneously, you get a mutually reinforcing dynamic. In Pittsburgh we actually look at all target groups as equal members of our valued community. For instance, we engage the seniors of our ageing population as ambassadors towards young people, providing them with an opportunity to help younger members of the community with their experience and knowledge. We also provide them with free wifi access in senior centres and. through community groups, we are able to provide ICT training to them, so that they can become trainers for their peers afterwards. We also pay great attention to the education of our kids and young people in general. The YWCA Greater Pittsburgh Youth Services Department excites students' interest in STEM through hands-on, collaborative, and project-based learning, expanding their appreciation, knowledge, and interests while developing in them the confidence to think about and apply STEM (science, technology, engineering, and math) in their future career choices. Finally, being Pittsburgh among the least diverse cities in the US, we have developed a long term strategy to make the City population more diverse, as we believe that a more diverse community is more creative and generates more innovation and therefore economic development. Pittsburgh has a history of producing talent and ideas, and we have laid out a roadmap for inclusive innovation that builds upon this tradition. We work together with local stakeholders to diversify the economy and workforce. It is our goal to provide the same opportunities to each of our residents through inclusive innovation.

Turin: The development of cities depends on interdependent factors acting in a precariously balanced ecosystem, whereby the effect of each action reflects on the entire local ecosystem. Moreover, considering the delicate transition of economy toward new development and welfare models, it is essential to develop policies that are able to generate inclusive growth. (i.e. to balance economic growth with social cohesion). A policy supporting talents is crucial to generate value, but it is not enough to feed and grow such a complex and interconnected environment like an urban system. In order to trigger inclusive and sustainable growth, cities must increasingly turn into enabling environment pivoting on local communities, as well as on their ability to act for society and to enable active inclusion and generative welfare.

Facing new challenges, starting from the potentialities of the local urban context, is crucial in enabling everyone to have an active role in the territorial development process. In this regard, it is important, for instance, for a city to support sharing economy, already creating new jobs and narrowing the income inequality gap of citizens in those places where it has been first introduced.

I: ***How can cities support the creation of decent jobs and the development of new entrepreneurship?***

Austin: Austin is a top thriving innovation and entrepreneur ecosystem. We create entrepreneurship, jobs, and start-ups by collaborating with the Chamber of Commerce. The Chamber works to ensure effective training programs and senior talent attraction strategies to train or re-train residents for the continually evolving employment sectors of the greater Austin region. "Innovate Austin", for instance, is an economic development initiative, powered by the Austin Chamber of Commerce, focused on making Austin the first region to start and grow a technology and innovation based business. The goal is to increase visibility and recognition of Austin's hottest innovators and startups to help recruit additional venture capital and top talent to Austin. We also support a strong education system in order to let students face the college and the future careers challenges. In this regards, we work closely with the universities, like the University of Texas, University of Texas IC2 Institute and other 21 accelerator programs as an economic development program to foster and cultivate the creation of decent jobs and the development of continued innovation.

Technology is our main focus, but also initiatives tied to cultural industries within the region and the city of Austin. This attention to Creative and Music industry is also reflected by the structure of the Economic Development Department, which has two divisions out of five dedicated to cultural arts and music & entertainment. The latter, for instance, is an economic development accelerator for Austin's music industry, and an active community partner for Austin's citizens, community groups, and neighbourhoods. Our focus on high standards of life quality is also embodied in the Redevelopment Division coordinating innovative partnerships and consults on projects to redevelop and invigorate Austin's urban areas. The goal is to create a positive environment that satisfies the needs of Austin residents, entrepreneurs, and visitors. Seaholm District, 2nd Street District, MUELLER Redevelopment, and Soul-Y Austin are some examples of the projects that Redevelopment Division manages. Finally, we have the division Small Business Program aiming at fostering job creation and supporting the growth of new and existing businesses by providing capacity building information, tools, and resources.

Boston: City government is an endlessly deep well for improvement. We are a tremendous source of things that need solving due to our acute awareness of what is happening in the city and the tradeoffs that have to get made for us to deliver services to residents. Innovation typically happens in the context of a challenge. Government can frame its challenges so that innovators who may not be the traditional people that government buys services from can work on them. If we continue to frame our challenges as large scale procurement challenges, we miss out on a lot of opportunities for other people to help us solve things. We can sponsor hackathons and challenges, and create opportunities for startup companies that may not have the infrastructure to go through traditional procurement to find a way to work with us. One hackathon we hosted focused on reinventing the City's online permitting experience, which resulted in a larger scale effort to streamline permitting, making it easier to launch and operate small businesses in Boston. This included reinventing our online permitting platform and creating tools to help permit applicants better track the progress of their permit applications. In addition, we operate the Boston Main Streets program, which established thriving commercial districts throughout the city. Today, we operate 20 Main Streets districts across the city, which support nearly 4,000 businesses in these districts. More support for those kinds of programs will help develop new businesses. In recent years, Boston has also elevated its presence as a leader in the global innovation ecosystem. This is a direct result of the political and capital investments made in the Seaport neighborhood through public-private partnerships to provide infrastructure and resources for innovators and entrepreneurs to scale their ideas. Those partnerships and investments made it possible for us to not only attract startups, but also attract more established companies that are interested in growing their innovation capacities to locate their businesses in Boston. The announcement that General Electric (GE) would be moving their headquarters to Boston was a big win and milestone for us, and would not have been possible without the commitment of multiple governmental agencies at both the city and state level and the leadership of the Mayor and the Governor. In addition, collaborations and partnerships between the private biotechnology industry, government agencies and Boston's clinical institutions resulted in the creation of the state's Digital Health Initiative, which will provide financial support and other resources to support digital health entrepreneurs in Massachusetts. Public-private partnerships, more often than not, have enabled us to continue fueling the growth of new entrepreneurship in our city.

Milan: According to our experience, policy responses to the challenge of creating good jobs need to focusing on soft regulation of spontaneous economic dynamics with innovation potential and supporting forms of enterprise that are capable of

combining added value and innovation, on the assumption that they can produce not only high-skilled employment but also occupational inclusion for broad sections of the population. With regard to jobs and development, the local administration approved in 2012 a policy document entitled "Policy Guidelines for Employment, Economic Development, Universities and Research in Milan" which set out a range of measures on several fronts, based on support for microenterprises and self-employment, attracting and training human capital and support for innovation. By reversing the logic that had essentially entrusted the task of job creation to the capacity of private enterprise to make efficient investments, we have made skills support and self-employment – especially among young people – a central focus of action. The initiatives that have trialled include a series of experimental "active labour policy" measures, such as microcredit, the establishment of a number of specialized business incubators in different zones of the city, with the aim of recreating links between residential and productive functions and digital manufacturing workshops (so-called "fab labs" or "makerspaces"), which are home to experiments with new forms of connections between digital innovation and manufacturing and artisan traditions in Milan and Italy.

Pittsburgh: we think it is key to get closer to the end user needs. We have set up Small Business Managers in our neighbourhoods, whose role is to focus on helping small businesses thrive, which is key for the development of local neighbourhoods. We have also set up the Small Business Resource Program", through which we bring together all relevant agencies and organise meetings in the local neighbourhoods of the City to provide information to small business owners on fiscal and legal regulations to make it easier for people to run their businesses. Those meetings are promoted through community flyers, social media and the City's website. We also film the meetings and put them on You Tube, and over time we have collected some FAQs that are available on the website, so to make those resources available to people who were not able to attend the meetings. We also have specific programs targeted at Start ups. PGH Lab for instance is a program that brings the City and local Start up companies together. Through PGH Lab, local Start up companies can pilot their products and services and help the City meet complex challenges. Topics of the program are citizen engagement, city operations and climate change and environment. The Lab does not offer any financial compensation for companies testing their product and services in the City.

Turin: Although Italian cities, as public administrations, have not direct responsibility for the active labour market policies, actually managed at regional and national level, can play an important role in supporting employment and business. Cities have the opportunity to particularly develop complex programs holding together

different aspects: the urban regeneration of the more degraded or changing areas, the support to the entrepreneurship dimension connected to the use of regenerated spaces, and the creation of new opportunities for providing services to the cities. The paradigm of social innovation is fully consistent with this role played by cities and this kind of programs. Using the territory as an asset for its development is therefore an opportunity to simultaneously achieve different results: on the one hand reigniting and supporting new functions to those areas that need to be rethought and transformed, and on the other hand increasing the supply of services and economic activities, promoted by new entrepreneurs and their innovative business and service models, to meet an often unexpressed and only potential demand. Driving these processes means ensuring those changes already spontaneously generating in our cities.

I: ***What role is there for smart technologies in ensuring that public services are more equitable and accessible to low-income groups?***

Austin: Technologies are crucial in ensuring a good quality of life, which, as we said before, is our main objective. Thus, we are very interested in smart city principles and tools, which could play a critical role in in managing some experience of the city. For instance, in line with our interest in energy conservation and green energy development, we are following smart city principles for energy use and consumption, and for reducing our traffic problems. In so doing, we provide an online platform to share best practices, equipped with tools giving people the possibility to help us when we have any issue. We also have an open data platform, a public database available for specific users needs, where it is possible to develop APP solutions for the city. Our ultimate purpose is to increase public management transparency, by involving citizens in decision making. That is the reason why before to foster the major agreements we solicit public input, for our projects, or specific needs, by providing them for instance with public forms or platform community to have a feedback on our decisions, and to let them understand how it is a specific solution performing within the city.

Boston: Government has a tendency to respond to the people who are the most vocal, who are not always the people who may be most in need. The use of data and data analysis can provide quantitative evidence to where services really need to be provided, and help direct our resources more effectively. For example, in Boston we experience an unusually large turnover in apartment rentals on September 1 every year due to the large student population we have in our city. Many of these students are inexperienced in apartment renting and upon move-in day often find that they have been misled by a deceptive ad or broker. This year, we debuted a new tool that

leverages big data techniques to help our Inspectional Services Department more quickly identify possible cases of deceptive rental ads targeting college students. Already, the tool has turned over several cases of possible intentional deception and are being investigated for fraud.

We have also seen that the use of smartphones as a primary means to access the Internet is prevalent among lower income households. Making sure that digital city services work as well on a mobile platform as they do on a desktop computer is critical to ensuring we deliver services to all city residents in an equitable manner. In addition, providing public services through convenient digital channels ensures those who are most pressed for time and have the least capacity and flexibility in their lives to figure complex government services are still able to access them. Again, these individuals tend to be from lower income areas in cities. Our BOS:311 service is staffed 24 hours a day, seven days a week with public servants who answer resident phone calls and respond to non-emergency inquiries sent via Twitter, a mobile app and the Web. By providing a number of ways for residents to reach us, BOS:311 provides convenient, comprehensive service delivery that values our residents' time and shows respect for the complexities of our residents' lives. Finally, we may be on the cusp of an era in which intelligent street furniture can provide widespread connectivity and help keep low income residents connected. New York City, through its LinkNYC initiative, plans to replace over 7,500 payphones with structures called Links to provide free WiFi connectivity, device charging capabilities and Internet- based access to city services in the public realm. Although there is early promise with LinkNYC, we need to remember that there is currently no widespread, citywide implementation of these structures, and no published research that shows the true social and economic benefits from these types of programs.

Milan: Being a smart city means also being an equitable city – "distributing the future more evenly" across all the Municipals. Given this rapid expansion of new technology, we must be mindful that we do not perpetuate the digital divide. Rather, we must use this opportunity to close the gap. For the Deputy Mayor Cristina Tajani, this means our approach to technology in Milan is focused on developing tech talent, providing broad access to free or affordable internet, promoting innovation in the delivery of government services, and growing an inclusive tech and innovation economy. Smart is a city where each citizen is unique and where all kinds of 'intelligences' and all diversities create value. This requires that everyone contribute as an aware citizen. Therefore, it is important to encourage smart policies focused on old people, children, young people, people with disabilities, migrants and the most vulnerable in order to ensure steadfast equal opportunities, eliminating barriers and discrimination based on race, ethnicity, religion, nationality, gender,

sexual orientation, age, disability or health condition. An inclusive and smart city can also be achieved through the use of new technologies able to foster the social realignment between public and private resources; to enhance existing informal networks and cooperation between the different stakeholders; to devise new ways of supporting and promoting multiculturalism; to ensure the availability of new forms of homecare and to give a voice to people otherwise considered 'weak'.

Pittsburgh: our administration believes that the only way to move Pittsburgh forward is in with consistent, inclusive conversations with the community. So we have launched MindMixer, an online platform to provide opportunities for City Government and citizens to work together by connecting civic challenges to community problem-solvers.

Another example of our commitment to this is Beacon, an online platform to make public procurement in our City more accessible. This tool was created as part of a year-long partnership between the City of Pittsburgh and a non-profit called Code for America. The projects coming out of this partnership leverage modern technology and user-centred design to make improvements to the ways products and services are purchased within City government. Within this partnership, a set of three web apps was developed that helped open up purchasing data, increase internal communication between staff, and engage businesses interested in working with the city. Connected by an open database, these tools enable city staff to transparently and efficiently manage, track, and advertise contract opportunities. Another app we have deployed is "MyBurgh", which helps Pittsburgh residents and employees better track non-emergency requests through the 311 system. The app, which is free to iPhone and Android users, allows users to capture location by GPS, track the progress or completion of a 311 job and upload pictures and .pdf files. MyBurgh also provides information from the city, such as press releases, contact information, garbage and recycling pick-up and seasonal information such as snowplow tracking and snow resources.

Turin: Digital or "smart" technologies represent now an asset available even beyond the real predictable needs. Some people say there is more technology available than demand to meet. That is exactly the point: properly defining what is the public demand for technology, for instance, with regard to all the social groups and particularly to the weakest ones, to improve the accessibility to services by making it equitable. In this regard administrations should be accompanied not so much in researching the market offer, but in properly defining its needs. Moreover, another issue is represented by those responsible for providing services, whose profiles are not always appropriate and updated the way they should be.

I: ***What are the best mechanisms for strengthening innovation within and between cities?***

Austin: We have an open approach in innovating, not a specific policy; we are focused on investments assuring high quality of life. For example, we have made accessible public spaces for single families and other community members. We believe that by ensuring high standard of life quality we sustain our innovation ecosystem. Through our successful investments, we are able to secure companies to have work force available, since people want to stay and live in Austin.

Boston: Government can be a connector to different parts of the innovation ecosystem within a city. We interact with companies, universities, non profit organizations, and constituents, all of whom bring a different perspective to the table. We can scope problems and identify relationships where we can match an interesting idea to an existing pain point, and minimize potential friction that could prevent solutions from being realized and scaled. We can also create a pipeline for university programs to really deep dive with us on interesting urban challenges, and create a home for those programs to provide the support that they need to succeed. We believe in communication and sharing best practices when it comes to strengthening innovation between cities. As a city, we actively send our Mayor and senior City officials to represent Boston and share our success stories at events like the National League of Cities and the US Conference of Mayors.

Milan: Challenges, such as social cohesion, equitable economic growth, policies against social fragmentation, respect for diversity, the empowerment of women and demands for more democracy are increasingly critical components for sustainable urbanization. Policy responses to these challenges need to be supported by strong territorial (horizontal) and institutional (vertical) partnerships promoting the relevance of multilevel policies as well as citizenship practices. In this sense, there is a general consensus that points towards social inclusion as a multidimensional objective to be pursued by cities, as the closest level to citizenship. Cities are, in turn, considered the principal engine of economic and social development. The social interaction in cities drives innovation and creativity, giving rise to cutting-edge technological and cultural production systems. However, cities are often the scenario of the greatest inequalities in the world, but the paradox is that they are also the key to deliver basic services, bridge inequalities, ensure sustainable resource management frameworks and achieve poverty zero objectives. Overcoming these inequalities is a key challenge in the Urban Millennium. Cities therefore rely on inclusive partnerships and mechanisms fostering commitment, bold action, humanism and reconciliation with our civilization and territories. Inclusive partnerships can make cities more respectful of the environment and the future generations, more beautiful and convivial.

Milan Smart City is a European and international City, a hub of economic, social and cultural networks which are truly global. In order to be a pilot for smart, green and inclusive urban policies, Milan must be both inward and outward-looking. Milan was and is a strategic bridge between north and south, a city of the Mediterranean area and a crossing place. Trough EU Project, exchange with other cities and international cooperation Milan will transfer and acquire know-how the best practices. It is a challenge set for Milan in 2017 and Europe 2020. Milan actively participates in Major international, European and national smart cities networks which promote on-going comparison of smart practices.

Pittsburgh: it is important to establish solid partnerships with all the relevant stakeholders in the local ecosystem: foundations, Universities, NGOs, companies. We usually formalise these partnerships with MoUs. For instance, in 2014 we formalised a partnership with the Carnegie Mellon's Metro21 initiative, which seeks to research, develop and deploy 21st century solutions to the challenges facing metro areas. Pittsburgh is also a founding partner of the MetroLab Network. Established in September 2015, MetroLab brings together 34 city-university partnerships focused on sharing and furthering innovative solutions to challenges facing metros.

Turin: In order to strengthen the ability to innovate, cities have to increasingly become collaborative platforms, where public and private can create innovative models to face common challenges, risks (but also successes), and the role of the public sphere as a supporter is more evident as well as its task of ensuring the redeployment of the effects of innovation to the community it represents. In this regard, it could be very useful to consolidate the relationship with other cities facing the same challenges through, for instance, projects aiming at platforms simplifying the programs and speeding the replicability of virtuous development models.

I: ***What are some of the success factors and the challenges in developing effective partnerships for inclusive growth in cities?***

Austin: We do have a specific identity within the state of Texas: Austin is the creative city, the 'city of music'. Therefore, we want to collaborate with other cities by also keeping our unique identity. We have several collaborative projects but we do not have formal partnerships: we are interested in learning from other best practices, also at international level. For instance, in line with our strong focus on creativity and music, we are connected with other similar cities like Nashville or Toronto (and other major music cities in the world). These partnerships focus on developing music industry here, and that's why we collaborate with other global music cities

in order to better understand what's better for the ecosystem, and implement best practices. Furthermore, we work very closely to regional and federal government to secure the resources that could contribute to sustain business opportunities, new investments, and jobs creation.

Boston: One of the large scale challenges in developing effective partnerships for inclusive growth in cities is that the forces that drive growth are often forces whose natural inclination is towards less inclusivity rather than more inclusivity. This is not unique to Boston. Non governmental investment in cities is often made by people and organizations with wealth, and there can be a tendency for those investments to benefit those who make the investment. For example, investing in housing development in the highest priced neighborhoods typically yields the highest margins for the developers. As a result, there is inherently less incentive for developers to build in lower income areas.

This is by no means via a malicious act, but it has the perhaps unintended effect of perpetuating or strengthening inequality. In addition, when investments are made in up and coming areas or neighborhoods which have historically have had a lack of investment, even most well intended development efforts can produce displacement effects. Positive effects accrue to the residents that move in, as opposed to the residents that have historically occupied those areas. The tension we struggle with in a positive economic environment is how do you promote inclusivity without squashing growth? Encouraging equity without impeding growth is a big challenge. Most cities in the United States are overly reliant on property taxes due to the existing funding and policy mechanisms in place. That causes a situation where growth is crucial in order to raise revenue for supporting the effective delivery of City services. In Boston, we have tried to combat these market forces by enacting our Inclusionary Development Policy (IDP). Established in 2000, the IDP promotes the building of affordable housing units by encouraging developers to include affordable units with their developments, create affordable housing in an offsite location, or make a cash contribution towards the development of affordable housing units. In 2015, over half of all new, income-restricted units in Boston were created through the IDP.

Milan: As a global mega-trend, urbanization presents big opportunities for innovation, job creation, economic growth, sustainable development, and urban design. Indeed, there is a lot of interest in what the cities of tomorrow might look like, from smart cities to green cities to resilient cities. Less prominent but no less important is the ongoing conversation about how we can make sure tomorrow's cities are just and inclusive ones – meaning cities that put people first, and put equity and social justice at the center of policy and design. Inclusive cities communicate

to their residents: You belong here. In an inclusive city, residents have the power and the resources to collectively shape, change, and plan their cities. These are not just nice ideas. If cities are not inclusive and built for and by everyone, they will simply fail to thrive. On many occasions, city councils are the facilitators of broader collaborations. Indeed, leadership is distributed across multiple organizations. These leaders need to co-operate closely to make sustainable competitiveness visions happen:

- Private sector involvement, ranging from small entrepreneurs to large transnational corporations. Many organizations in the private sector are increasingly ready and willing to invest in their urban environments to the benefit of their core strategies and profit, in a 'shared value' fashion.
- University involvement, including educational and research institutes. The performance of cities increasingly relies on their educational and research backbone, and the other way around as well. Knowledge institutes increasingly see cities as a research subject in its own right, and cities can benefit from their problem-solving capacity.
- Citizen involvement. Involving citizens to the full often results in 'unusual suspects' getting involved, bringing novelty and identifying previously hidden problems and opportunities.
- Not-for-profit involvement. Involving not-for-profits and NGOs can act as brokers, with a degree of independence to carry projects through and to encourage the right partnerships.

Pittsburgh: having the private sector partner with public agencies (e.g. workforce boards) leverages the best resources of each, but structural fragmentation causes great difficulty in identifying and connecting the most effective partners. In this regard, regions, like Pittsburgh, can innovate and create new public/private partnerships, programs and models that work, but sometime state-level policy barriers impede full implementation since government funding streams are not designed to blend and mix. Thus, it is important to find out how to align performance goals and funding streams to collaborate rather than compete.

Turin: The introduction of a regulation strongly endorsing the creation of markets looking at social innovation as both the mean and the end able to generate inclusion and growth, in order to balance and endure the development of a territory, is certainly the most important factor to foster inclusive growth. One of the main challenge is to find a balance between the recognition of privates' provision of service ownership and the full economic sustainability in activities which can arise with the public support, and only designed for a full level of self-sustainability.

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EDITOR BIOS

Fabrizio Montanari (Ph.D. in Business Administration from Bocconi University) is Associate Professor at the University of Modena and Reggio Emilia, where he is also Scientific Coordinator of OPERA, a Research Unit at GIUnO Research Center, specialized in the study of creativity and innovation. He is also Adjunct Professor at Bocconi University and Research Affiliate at ASK Research Center of Bocconi University. He has been Visiting Scholar at Boston College, lecturer at NYU within the project Campus Abroad of Bocconi University, and Visiting Professor at Copenhagen Business School and Johannes Kepler University of Linz. His main research interest regards the analysis of networks, clusters and teams in creative industries. He was Thematic Expert for Emilia Romagna at the 7th European Week of Regions and Cities, and Thematic Expert (URBACT Programme) for the themes "Promoting Entrepreneurship" and "Improving Innovation and Knowledge Economy" (2012-2014). He is scientific advisor of Fondazione Giacomo Brodolini.

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Diego Teloni is the Director of Fondazione Giacomo Brodolini. He has over 15 years of international experience working for public, private and civil society organizations in the design, delivery and intelligence for innovation and social change. He has a wide expertise in the coordination of EU wide projects and proven ability to manage international teams and networks of experts. He is expert in planning and management of research and intervention projects on labour market, social innovation, local economic development. He has extensive and practical knowledge of EU and Italian labour market policies, instruments and procedures, and in particular on active labour market policies (ALMPs) and on public employment services (PES) functioning.

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Adams Nager is an economic policy analyst at the Information Technology and Innovation Foundation. He researches and writes on innovation economics, manufacturing policy, and the importance of STEM education and high-skilled immigration. Nager holds an M.A. in political economy and public policy and a B.A. in economics, both from Washington University in St. Louis.

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Luigi Ruggerone. After completing his postgraduate studies in Economics in the UK, Luigi joined Banca Commerciale Italiana in 1996, working in Milan for the Research Department and then the Risk Management. In 2013, with his wife

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Margherita Russo is Full professor of Economic Policy at the University of Modena and Reggio Emilia (Italy). In the last decade she directed research projects on the regeneration of competence networks, on the assessment of policy innovation networks, in the EU projects, Iscom, INSITE, V-MUST and in the LLP Comenius STENCIL. Russo is the Italy representative in the Oecd/Ocse Working Party on Technology and Innovation Policy.

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Charles Wessner currently teaches Global Innovation Policy at Georgetown University and is a powerful advocate of effective innovation policies. Previously, he served for two decades as a National Academies scholar where he founded and directed of the National Academy of Sciences Technology, Innovation, and Entrepreneurship Program. As an outgrowth of his work with the U.S. government, he advises technology agencies, universities, and government ministries, including the Prime Ministers of countries in Europe and Asia. In addition, he cooperates closely with international organizations and lectures at major universities in the U.S. and abroad.

Quaderni Fondazione G. Brodolini

Fin dalla sua costituzione, la **Fondazione Giacomo Brodolini** si è preoccupata di diffondere la conoscenza dell'attività scientifica e culturale svolta. L'attività editoriale è divenuta nel corso degli anni sempre più intensa, al punto da avviare, nel 1984, una linea nuova per pubblicare i principali risultati dell'attività di ricerca. Nascono i **Quaderni della Fondazione Brodolini**. Negli anni, viene collezionata una serie di volumi che mettono a disposizione del mondo scientifico, universitario e delle organizzazioni sociali, i risultati dell'attività di ricerca svolta dalla **Fondazione** in tutti gli ambiti di studio.

I **Quaderni della Fondazione Brodolini** si dividono in due collane.

Le culture del socialismo italiano

La collana **Le Culture del Socialismo** pubblica i risultati delle iniziative culturali (atti di convegni, saggi, ricerche, ristampe, inediti) promosse dal seminario permanente a carattere interdisciplinare "Le Culture del Socialismo italiano". Il seminario, attivo presso la **Fondazione**, ha intrapreso un'attività di studio, ricerca e dibattito politico-culturale sui diversi periodi che caratterizzano la storia del Socialismo italiano. Nella collana è prevista, inoltre, la pubblicazione di testi che, pur non essendo un prodotto delle iniziative culturali del seminario, hanno una diretta attinenza con i temi trattati.

1. *Francesco De Martino e il suo tempo. Una stagione del socialismo*, a cura di Enzo Bartocci, pp. 300, Edizioni FGB 2009
2. *Una stagione del riformismo socialista. Giacomo Brodolini a 40 anni dalla sua scomparsa*, a cura di Enzo Bartocci, pp. 326, Edizioni FGB 2010
3. *Lombardi 2013. Riforme di struttura e alternativa socialista*, a cura di Enzo Bartocci, pp. 370, Edizioni FGB 2014
4. *Le culture politiche ed economiche del socialismo italiano dagli anni '30 agli anni '60*, a cura di David Bidussa e Andrea Panaccione, pp. 250, Edizioni FGB 2015
5. *Programmazione, cultura economica e metodo di governo*, a cura di Enzo Russo, pp. 274, Edizione FGB, 2015
6. *Contesti, valori, idee di Adriano Olivetti*, a cura di Giorgio Cavalca e Andrea Panaccione, pp. 104, Edizioni FGB 2016

Studi e ricerche

La collana **Studi e Ricerche** presenta i risultati dell'attività di ricerca svolta dalla **Fondazione** nelle aree che, nel tempo, sono diventate il centro delle sue iniziative culturali: occupazione, sviluppo locale, valutazione delle politiche pubbliche, politiche sociali, pari opportunità, storia.

1. *Diritti sindacali e democrazia dell'impresa in Europa, i recenti sviluppi in Italia, Francia, Spagna, Grecia*, a cura di Elena Pisani, pp. 162, Marsilio Editori 1984
2. *Osservatorio regionale sul mercato del lavoro e politiche del lavoro. Un confronto su alcune situazioni regionali*, a cura di Ugo Ascoli, pp. 100, Marsilio Editori 1984
3. *Una legge per la democrazia industriale, a cura di Franco Carinci e Marcello Pedrazzoli*, pp. 163, Marsilio Editori 1984
4. *La democrazia sindacale in Italia. Dibattito italiano ed esperienze europee: Francia, Spagna, Gran Bretagna, Germania*, pp. 214, Marsilio Editori 1984
5. *Sindacato e riforma istituzionale,* Antonio Baldassarre, Piero Craveri, Luigi Mengoni, Tiziano Treu, pp. 126, Marsilio Editori 1984
6. *Il ruolo del volontariato nell'assistenza agli anziani*, a cura di Renzo Scortegagna, pp. 162, Marsilio Editori 1985
7. *Professionalità e formazione nel settore delle costruzioni. I quadri intermedi*, di Franco B. Franciosi e Carlo Rossi, pp. 178, Marsilio Editori 1985
8. *Nuove tecnologie e informatizzazione nei processi d'ufficio: studi di casi nella Pubblica Amministrazione*, a cura di Paolo Calza Bini, pp. 147, Marsilio Editori 1985
9. *I potenziali di sviluppo industriale endogeno nel mezzogiorno d'Italia*, a cura di Anna Salghetti-Drioli, pp. 230, Marsilio Editori 1985
10. *Dall'esportazione al marketing internazionale*, di Franco Bosello e Michele Orcalli, pp. 170, Marsilio Editori 1985
11. *La partecipazione nel pubblico impiego*, di Sabino Cassese, Umberto Romagnoli, Massimo Severo Giannini, pp. 124, Marsilio Editori 1985
12. *Sappi che oggi è la tua festa... per la storia del 1° maggio*, a cura di Andrea Panaccione, pp. 150, Marsilio Editori 1986
13. *Mercato del lavoro giovanile. Analisi e previsioni 1973-94*, a cura di Marina Schenkel, pp. 98, Marsilio Editori 1986
14. *Imprese e risorse umane nella transizione. Uno studio di casi sulle trasformazioni in atto nei mercati interni del lavoro*, a cura di Paolo Calza Bini, pp. 180, Marsilio Editori 1986
15. *Le politiche del lavoro in Europa agli inizi degli anni ottanta*, A.A.V.V., pp. 277, Marsilio Editori 1986
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17. *Uno statuto per la democrazia sindacale. Atti della giornata di studio organizzata dalla Fondazione G. Brodolini*, A.A.V.V., pp. 86, Marsilio Editori 1987
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35. *Lavoro pubblico e spesa pubblica, a cura di Antonio Bellacicco e Leonello Tronti*, pp. 232, Marsilio Editori 1992
36. *Il contributo del mondo del lavoro e del sindacato alla repubblica e alla costituzione*, A.A.V.V., pp. 163, 1998, Edizioni Lavoro 1998

37. *L'identità italiana: emigrazione, immigrazione, conflitti etnici*, a cura di Enzo Bartocci e Vittorio Cotesta, pp. 336, Edizioni Lavoro 1999

38. *L'evoluzione del sistema di protezione sociale in Italia*, A.A.V.V., 128, Edizioni Lavoro 2000

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41. *Inclusive labour markets? An italian overview by regional data*, edited by Marcella Corsi, pp. 292, Edizioni FGB 2006

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