NETWORKED SOCIETY CITY INDEX 2014

ERICSSON

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The Networked Society City Index compares cities' ICT maturity and their social, economic and environmental development (triple bottom line).

The world is changing at an ever-increasing pace, and is simultaneously facing greater socioeconomic and environmental challenges. Twenty-first century Information and Communications Technology (ICT) offers cities newfound possibilities for addressing these challenges, by optimizing resource use, improving connectivity and increasing socioeconomic prosperity.

CITIES HOLD THE KEY

As the rate of change accelerates around the world, the economic and political importance of cities is growing quickly. Today, the majority of the world's people live in cities, and it is becoming increasingly obvious that cities hold a major key to solving the social, environmental and economic challenges that they face.

Consequently, cities have become dominant players in the global economy and therefore must strive to keep up with rapid changes. New technologies can provide dynamic cities a competitive and sustainable edge over those that are slower to adapt. The Networked Society City Index indeed shows a strong relationship between ICT maturity and triple bottom line development, a result supported by international research.

Cities need to take the lead towards a more networked urbanism and think multi-dimensionally when considering their social and environmental benefits and resource efficiency. Cities must be governed in a dynamic way to be resilient and face future challenges. As such, strong and visionary leadership at multiple layers is necessary for cities to develop and reform institutions and systems that enable new ICT solutions to be implemented.

Many cities also have the opportunity to leapfrog others by avoiding expensive and increasingly obsolete physical infrastructure and instead moving straight to innovative applications using advanced mobile technology.

The 2014 edition of the Networked Society City Index continues to explore the connection between ICT maturity and triple bottom line development in cities around the world. New cities have been added and the index now includes 40 cities from around the world. The 2014 edition of the Networked Society City Index has been developed by Ericsson in collaboration with Sweco, a leading consultancy firm specializing in sustainable development.[1]

Stockholm ranks highest, followed by London, Paris, Singapore and Copenhagen. The top five cities are the same as in 2013, but Paris has now climbed to third position. Irrespective of the cities' current status, in all cases the index shows strong links between ICT maturity and sustainable urban development.

This index – including the supplementary City Profiles, literature study, and discussions with city stakeholders and experts – shows that ICT can be an effective tool for supporting the sustainable development of cities.

Around the world, we observe a clear trend toward more investments in ICT infrastructure, greater affordability and increased ICT use in cities. Interestingly, cities with a low ICT maturity rating seem to be maturing more quickly than high-performing cities, indicating a catch-up effect. Many cities also have the opportunity to leapfrog others by avoiding expensive and increasingly obsolete physical infrastructure and instead moving straight to innovative applications using advanced mobile technology.

ICT offers possibilities for improving efficiencies and cutting costs in current systems, freeing up resources that can be reallocated into more productive areas. These possibilities can take the form of more adaptive and individualized solutions as well as greater transparency about service quality and results. ICT further provides a foundation for more radical innovation, fundamentally changing the approach to how challenges are tackled and needs are met. This process will reshape existing industries and define new markets.

By analyzing the connection between ICT maturity and sustainable urban development, we see an image of a new city emerge. From this image, we make three predictions about the opportunities for cities worldwide, derived from new technology and ICT solutions and applications.

We explore these three predictions and their implications in detail on Pages 8–9.

3 PREDICTIONS ABOUT THE URBAN FUTURE

These are our predictions for a more sustainable urban future.

PEOPLE POWER WILL DRIVE URBAN DEVELOPMENT

GDP WILL BE REDEFINED TO CAPTURE NEW SCOPE OF GROWTH

COLLABORATION WILL CHANGE THE CORE OF ORGANIZATIONS

CHALLENGES OF TODAY AND TOMORROW

The world is changing at an ever-increasing pace and cities are facing increasing socioeconomic and environmental challenges.

CLIMATE AND ENVIRONMENT

SOCIAL INCLUSION

NEW CONDITIONS FOR ECONOMIC COMPETITIVNESS

ICT PROVIDES NEW OPPORTUNITIES TO MEET FUTURE CHALLENGES

ICT presents new ways to organize society and change the way individuals and businesses behave.

INNOVATION IN TECHNOLOGY AND MARKETS

NEW WAYS TO SHARE INFORMATION AND COMMUNICATE

BEHAVIORAL CHANGES

LEADERSHIP SUPPORTING, ADOPTING AND APPLYING ICT IN NEW WAYS

PREDICTIONS – TOWARD A NEW WORLD

In the same way as the railway formed London and highways formed Los Angeles, ICT will form future cities around the world. By analyzing the relationship between ICT maturity and sustainable urban development, we see the emergence of new Networked Society cities that consider social and environmental benefits and resource efficiency together. ICT creates possibilities that drive change and challenge existing systems and beliefs about how cities work. We predict fundamental change in many aspects and present three key predictions for the cities of the future.

Our predictions are based on several years of analysis and research about the Networked Society and the relationship between ICT and urban development. Furthermore, our analysis is based on the index results, literature, and discussions with city stakeholders.

PEOPLE POWER WILL DRIVE URBAN DEVELOPMENT

People rather than institutions will drive urban progress to a larger extent than ever before seen. We are now partly easing the rule of top-down institutions for more bottom-up urban development. New bottom-up innovations empowered by more open public services and governance approaches will characterize this power shift.

With ICT, people have effective tools to turn ideas and new thinking into powerful actions. Starting often from a practical need – to improve everyday life – innovative solutions can scale up rapidly and have significant impact on city life world-wide. For example, Airbnb quickly became a credible online community for people to advertise, discover and book unique lodging all around the world. The solution emerged from two roommates who were struggling to pay the rent for their San Francisco loft. The site was founded in 2008, has grown to over 800,000 listings in 33,000 cities and 190 countries, and is today a shaping force in the hotel industry.

At the same time, public services are being transformed all over the world. ICT is removing the borders between institutions and individuals, creating a foundation for a more collaborative approach between city governance and people engaging in new initiatives. Common characteristics of the transformation include opening up decision making, budget processes and everyday operations to public participation.

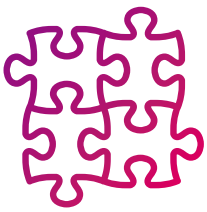
The aim is typically to create a dynamic co-production process, resulting in more inclusive, higher quality and more efficient public services.

Around the world, examples are springing up of people self-organizing to establish cooperative initiatives that tackle social problems, improve living conditions, increase collaboration, or – in countless other ways – make their cities better places to live.

GDP WILL BE REDEFINED TO CAPTURE NEW SCOPE OF GROWTH

New, innovative solutions in the Networked Society will alter the traditional view of value creation and wealth. World cities are drivers of economic growth today and their importance will increase further as urbanization continues. GDP will be redefined to capture a new understanding of sustainable value creation and wealth in cities and in nations.

ICT is changing the rationale for value creation and, with it, the wealth of cities. Collaborative consumption, or sharing economies, signals the shift in consumption from ownership to access. High-density cities can use network technologies to do more with less by renting, lending, swapping, gifting and sharing products, instead of increasing consumption and production. GDP does not capture this kind of value creation, and it has other weaknesses that will become more acute in the future. How we measure growth and progress will be vital to achieving a higher level of sustainable development. Because existing GDP measures do not capture the new and increasingly important aspects of the economy, human well-being, nor sustainable resource management, city leaders risk making poor assumptions of growth. The Networked Society, therefore, requires a new perspective on value creation and a new definition of GDP.



COLLABORATION WILL CHANGE THE CORE OF ORGANIZATIONS

The future presents radically altered conditions for organizations and businesses alike. Organizations will have to step out of traditional models and mindsets in a more connected and individualized society. This development puts pressure on legal systems and city governance structures to adjust accordingly.

ICT partly alters the justification for existing company structures. For example, ICT can drive down fixed costs linked to companies' financial and economic departments. This and other structural changes will come with the introduction of new cloud-based-services, automation, and other developments. Furthermore, innovative ways to communicate and share information will usher in new collaborations and more dynamic formations – only partly resembling today's organizations – that redefine the core purpose and function of companies and institutions. For example, we will see networked groups of self-employed people or companies work toward a common goal, then transform or dissolve. We already see this development to some extent and ICT will further enable aggregations of people outside the traditional company.

Tomorrow's networking organizations will be more flexible and efficient; they will have more access to human capital and less need for financial capital; and they will be better able to maximize resources. Therefore, the prevailing conditions of city management will also evolve, requiring changes in legislation and governance.

CITIES IN THE NETWORKED SOCIETY

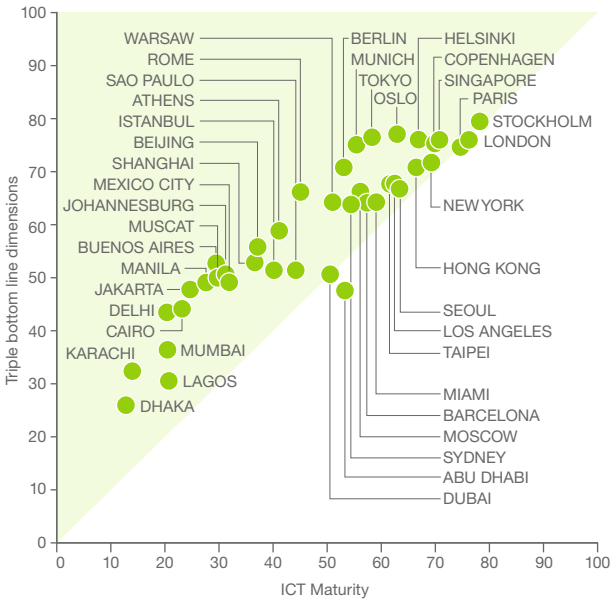
Stockholm ranks first in the 2014 Networked Society City Index, followed by London, Paris, Singapore and Copenhagen. The top five cities are the same as in 2013, but Paris has edged past Singapore. Paris' improvement can largely be attributed to better results in ICT maturity compared with 2013. Stockholm and London perform well in all dimensions of the index and distinguish themselves particularly with their high ICT usage. The cities added in 2014 are Berlin, Munich, Barcelona, Athens, Rome, Warsaw, Muscat, Abu Dhabi and Dubai.[2] Among these, Munich enjoys the highest ranking, followed by Berlin and Barcelona.

Irrespective of a city's stage of economic development, we observe strong links between ICT maturity and triple bottom line (social, economic, and environmental) performance. Both the index and the supplementary City Profiles show how ICT can support sustainable urban development.

Interestingly, the index cities vary more in ICT maturity than in triple bottom line performance (as shown in figure 1). This variation is primarily explained by the cities' environmental impact, as cities that are more economically developed often have a larger environmental footprint, and vice versa. But while this effect acts as a balancing mechanism in the index, we can see that many of the more economically developed cities also show signs of reducing their environmental impact. There are indeed examples of how ICT can play a role in decoupling cities' socioeconomic development from increased resource intensity (several of which are mentioned in this report). However, much remains to be done in this area.

Among the indicators, smartphone penetration best reflects a city's overall ICT maturity and performance in the triple bottom line dimensions. However, at higher penetration levels, that correlation weakens (see figure 2). This illustrates that with rising penetration rates, the proper use of technology becomes a more important factor in maximizing the technology's effect on socioeconomic wellbeing.

Another factor that correlates strongly with a city's triple bottom line performance is the combination of government e-services and open data with the use of



RANK	CITY
1	STOCKHOLM
2	LONDON
3	PARIS
4	SINGAPORE
5	COPENHAGEN
6	HELSINKI
7	NEW YORK
8	OSLO
9	HONG KONG
10	TOKYO
11	LOS ANGELES
12	SEOUL
13	TAIPEI
14	MUNICH*
15	MIAMI
16	BERLIN*
17	MOSCOW
18	BARCELONA*
19	SYDNEY
20	WARSAW*

RANK	CITY
21	ROME*
22	DUBAI*
23	ABU DHABI*
24	ATHENS*
25	SAO PAULO
26	BEIJING
27	ISTANBUL
28	SHANGHAI
29	JOHANNESBURG
30	MEXICO CITY
31	BUENOS AIRES
32	MUSCAT*
33	MANILA
34	JAKARTA
35	CAIRO
36	DELHI
37	MUMBAI
38	LAGOS
39	KARACHI
40	DHAKA

Figure 1 – Comparison of ICT maturity to triple bottom line performance for all index cities. Newly added cities are marked with stars in the ranking list.

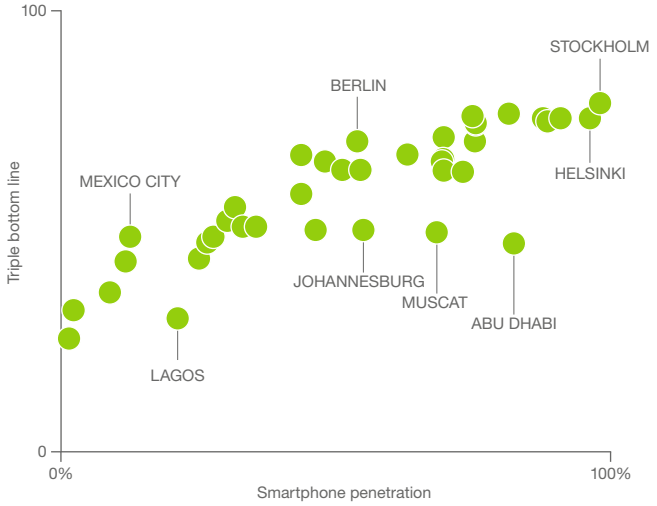


Figure 2 – Correlation of triple bottom line performance with smartphone penetration

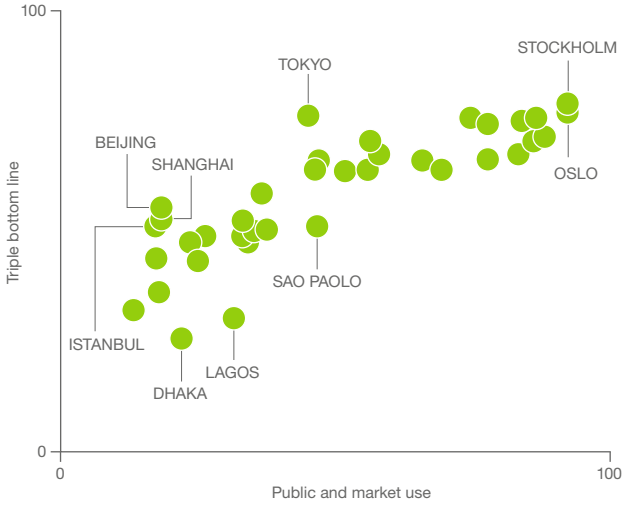


Figure 3 – Correlation of triple bottom line performance with ICT public and market use

electronic payment methods (figure 3). However, education levels among residents are important for the spread and use of these services.

WELL-BALANCED PERFORMANCE IS THE KEY

Cities vary greatly in both their comparative levels of triple bottom line performance and ICT maturity, and in their consequent economic development stage. So, while cities share many common opportunities and challenges, the actions each city should take to advance to the next stage of development will also vary.

ICT maturity is measured by how well cities perform in ICT infrastructure, usage and affordability. For example, prices for mobile phones, fixed broadband and IP transit are low in most cities. But Cairo (where prices are almost the same as in Seoul and Taipei, relative to income levels) lags behind Seoul and Taipei in service access and quality levels. So, importantly, the index is created in such a way that cities with a well-balanced performance in all dimensions are given a higher ICT maturity score than cities that perform well in one dimension but not in another.

The same is true when it comes to cities' performance in the triple bottom line index. A city that performs well in all dimensions – social, economic and environmental – is considered more sustainable than a city that, for example, performs well in economic terms but at the cost of the environment. Indeed, the top-performing cities in the index are at the top of the index because of their high performance in all dimensions.

Stockholm and London, the top-two cities in the index, both register very high ICT usage compared to other cities. Both also enjoy extremely well-developed open data and e-services. ICT technology penetration rates among their residents are also high. Stockholm, as number one in the index, enjoys high-quality access to both fixed and mobile broadband, thanks to extensive infrastructure rollouts. Stockholm performs much better than London when it comes to access to and quality of fixed and mobile broadband. London and Stockholm are also the best-performing cities in the economic dimension of the index. However, Stockholm's impact on the climate and environment is better compared to its economic performance, and its air quality is also higher than London's.

Paris has climbed in the rankings and is now number three in the Networked Society City Index. This is explained by broadband quality improving faster in Paris than in Singapore. Paris has also caught up with Singapore in fiber and smartphone penetration. However, Singapore still outperforms Paris in fixed broadband speeds and, in fact, on this measure is topped only by Hong Kong.

Paris and Singapore perform equally well in the triple bottom line dimensions. As such, Paris' third position in the index is not secure and could well change in the future. Nevertheless, London and Paris perform very well for large cities. Many top-performing cities in the index are rather small in terms of population in comparison to the index average. This may be an advantage, allowing easier implementation of city-wide ICT solutions. As Singapore is a city state, it also enjoys increased autonomy and authority compared to other index cities.

These results suggest that city leaders can spur positive urban developments in both the triple bottom line dimensions and ICT maturity if they address their city's specific challenges. Indeed, striving toward networked urbanism requires that ICT development and improvements in the triple bottom line dimensions occur simultaneously.

SHIFTING FOCUS FROM IF TO HOW

To prepare the Networked Society City Index each year, we review the leading research literature and case studies exploring the connection between ICT and sustainable urban development. This year, we noted a clear shift in research emphasis, away from proving the case for ICT benefits to a focus on how city governments can maximize those benefits. As ICT is accepted as a natural springboard for growth and development, the 2014 City Index will follow that same focus.

Furthermore, researchers are also concentrating less on infrastructure investments and more on the importance of leadership and governance. Greater understanding of ICT's impact on city development has also increased the realization of the challenges facing successful ICT implementation. To get the full benefits of ICT infrastructure, city leadership needs to master its use of ICT to boost the city's economy and competitiveness; provide services; and develop urban environment, quality of life and community collaboration.

Hence, as pointed out by Brookings[3], it is not enough to simply invest in new ICT infrastructure. For this infrastructure to be fully utilized, it must be applied in new ways and turned into a vital resource for innovation involving people, businesses and city governments. Without compelling and useful applications, there will be no benefits for the individuals and the city as a whole. Today's leaders must continue to engage broadly and foster innovation of new products, services and user experiences to maximize the benefits from the new technologies.

The CUSPE study[4] reached similar conclusions, recommending strategies that improve the ability of policy makers, business leaders, and ordinary people to use the technology and take the networking opportunities that arise from it. This study also stressed the need to ensure participation in innovation and change.

Figure 4 – Summary of literature review, the role of city leadership.

Other research, including that by the UK government's Department of Business Innovation and Skills[5], highlights leadership as a critical success factor. In many cities where ICT solutions have been implemented on a large scale, we can witness strong leaders who have, through a clear strategy, put their city on the path to ICT-enabled development. These leaders have enjoyed a political mandate and have been supported by a clear vision of the role of technology and smart solutions in their city's urban development.

The findings from the literature review inspired us to dig deeper into an analysis of the role of leadership and the importance of strategies and visions to support a city-wide increase in digital capability. To this end, we reached out to stakeholders from different cities and experts in relevant areas. The resulting discussions identified the need for smart leadership and stronger inter-city collaboration.

SMART LEADERS, SMARTER CITIES

There is significant potential to develop ICT capabilities both within municipal organizations and more broadly in the city. City leaders need to ensure that they are capable of supporting, adopting and applying smart ICT solutions that serve people and businesses. In this chapter we will discuss, from a leadership perspective, how mayors can take advantage of the possibilities of digital transformation.

The mayor as entrepreneur

Transforming a city into a networked city improves urban life in many ways, and is an important part of adapting to the creative economy. Cities are capital assets for companies – only cities can provide the diversity required for the level of creativity and innovation that companies thrive on.

City leaders are the farmers responsible for growing the creativity that companies harvest. Mayors have a greater opportunity to meet the needs of businesses, and those of individuals, if they adopt an entrepreneurial mindset. Mayors must take the opportunities of technological advances and social and cultural shifts, and constantly rethink and improve their cities for the benefit of all. It is also crucial to be highly agile and pragmatic and to unsentimentally disregard old conventions and party politics.

Innovation charity Nesta, with Bloomberg Philanthropies, developed a concept called 'i-teams': small task force teams working with innovation. i-teams are embedded in governmental structures, but operate independently with their own set of goals, methods and cycles, like 'skunkwork' projects. Their mission is, typically, to solve specific challenges, create engagement in the local community, transform government processes or culture, or achieve broader policy or system shifts. Initiating i-teams is one way for mayors to spark an entrepreneurial spirit within their municipal governments.

ICT is a 'gateway' to civic engagement

A smart city thrives on civic engagement. Digital services can be effective in creating such engagement if they provide instant user value and employ gamification strategies to make services fun to use. ICT can also depoliticize local governments and bring governance closer to the people, contributing to a higher sense of inclusiveness and participation.

City leaders have much to gain from viewing themselves as service providers, much like companies. Residents are, in a sense, customers who must be kept satisfied with their experiences of the services provided to them.

> "Cities are central to innovation and new technology. They act as giant petri dishes, where creative types and entrepreneurs rub up against each other, combining and recombining to spark new ideas, new inventions, new businesses and new industries."
>
> Richard Florida, Professor at University of Toronto and Editor at CityLab.[6]

> "The only time citizens in democracies participate in self-governance is during elections. When it comes to daily activities, the majority don't know how their city is run. We need an apolitical platform for citizens to participate in governance regularly, regardless of who is in power. We need a more inclusive and collaborative model that places citizens at the center of running cities and deciding their futures."
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> Pronita Saxena, Chief Growth Officer, NextDrop

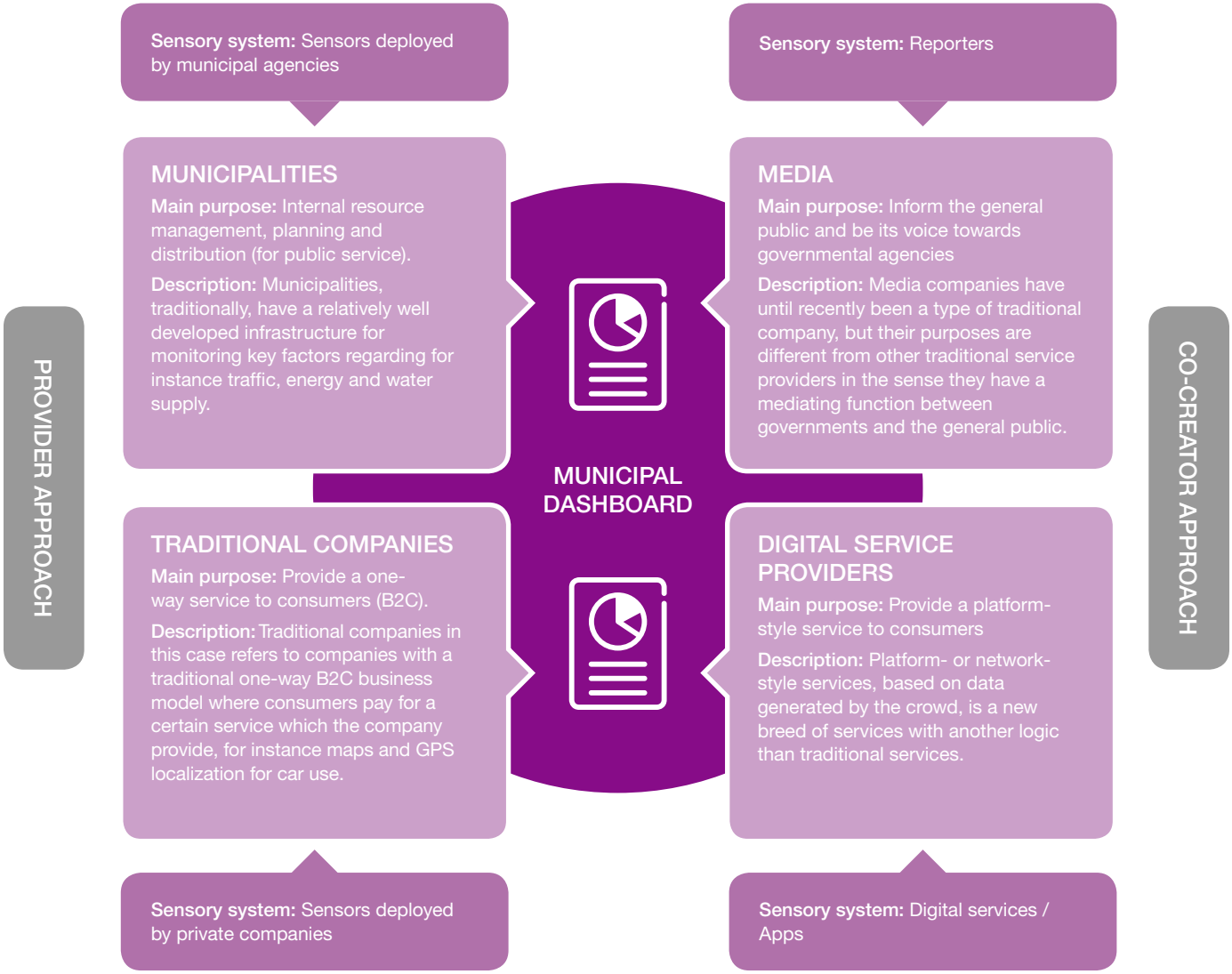

Figure 5 – Municipal dashboard systems aid efficient, responsive resource planning.

Bangalore-based NextDrop provides its users – living in areas where water supply is both scarce and highly irregular – with information about when water is available nearby. The information is collected from the water authorities and sent by text message. This enables users to plan their lives, since they don't have to stay at home waiting for the chance occasions when water is available. The social impact is significant, especially for women who traditionally stayed at home waiting for water to be available, but now have the opportunity to work or engage in other activities. NextDrop also enables users to report delays or other problems with water delivery, informing the water authorities about the state of the water grid, which is vital since minor pipe damage can lead to major contamination.

Cities need to use the entire information ecosystem

As cities transform digitally and become connected, the possibilities of monitoring and analyzing performance indicators increase. Many cities are developing dashboard-type monitoring tools to more efficiently and responsively plan and distribute municipal resources (see figure 5). Typically, such services aggregate and compile data about energy and water supply, traffic and transportation, weather forecasting, street maintenance, emergency services, and other factors. One of the most notable examples of a city dashboard is Rio de Janeiro's Centro de Operações (Center of Operations), which captures about 30 different types of data, drawn from the following sources:

- Municipal agencies and authorities, which provide data based on their jurisdiction and expertise.
- Media organizations, which provide a link to the public when important information must be communicated quickly and give access to street-level-observations from people reporting sightings of smoke, accidents, or other notable events.

- Urban service providers, typically traditional, one-way B2C companies, which provide data relevant to people's behavior (such as GPS and maps).
- Digital services aggregating urban crowd-generated data (such as that arising from smartphone apps), which provide data about public behavior.

The latter type has emerged in recent years, following the digital transformation trend. NextDrop, mentioned above, is an example of this type of service; another one is Google's traffic planning service Waze. Motorists using Waze connect through a smartphone app, which tracks data such as speed, routes and stops, and provides the motorist with real-time traffic information and calculates the most efficient routes.

Even though combinations of all the elements exist today, some challenges remain, for example:

- Silo thinking within municipal organizations prevents the holistic approach necessary for an efficient dashboard system.
- Unclear lines between public infrastructure and free market services create gaps where neither municipalities nor private companies offer services requested by the general public. In Stockholm, for example, an open city-wide Wi-Fi network has been demanded by residents, but the City of Stockholm is legally hindered from providing that because of regulations preventing public authorities from competing with private companies in a free market.
- Concerns about privacy and the integrity of personal data are important and need to be considered, especially because the potential harm to individuals flowing from misuse are much greater when several data sources are combined.

> "The intention is not to have an all-knowing government; it is to encourage everyone to participate and to enable them to collaboratively improve their city. We are developing an app that allows citizens to inform Centro de Operações directly, which will make our information network even more extensive."
>
> 
>
> Pedro Junqueira, COO, Centro de Operações in Rio de Janeiro

New cities and new thinking

In many ways, we remain in an explorative phase, finding out what a smart city can be and what the processes for making it smart should look like. Today's pioneering smart cities function as living labs where both visions and processes can be evaluated and refined. One major challenge with making cities smarter is the massive heritage of urban settlements: cities are composed of old buildings, extensive grids of streets, tunnels, and power lines and well established sets of regulations, routines and habits. In recent years, however, it has been shown that new cities, smart from birth, can be designed and developed quickly. One such example is Songdo, just outside Seoul.

Songdo was developed in just four years, and the developer (Gale International) has further shortened the time for developing a city of this type to a mere six months. Being able to deploy this type of 'instant city' is important for relief work after natural disasters, for harboring climate refugees and for managing ultra-rapid urbanization in certain rural areas. When creating a city that is smart from birth, the possibilities of exploring what smart cities can entail are more extensive. ICT can be incorporated everywhere and nothing has to be demolished or excavated to make room for the infrastructural elements. These cities do, however, come with some challenges for their leaders to address. A crucial driver of innovation and growth, according to Richard Florida, is a high level of diversity and bohemianism, which is likely to be entirely lacking in brand new cities. And Jane Jacobs, the most influential urban thinker of the 20th century, claimed that new thinking requires old buildings, since old buildings ensure a diverse population. But leaders of instant cities must find other ways to foster diversity and bohemianism, as it cannot be through old buildings.

Cities must become even smarter

The next step for the smart city is the automated city – one that is predictive and responsive without human intervention. Such a city could avoid traffic congestion before it occurs and distribute resources, such as emergency services and maintenance, without time-consuming human decision-making.

Another natural step for cities is to redefine their key performance indicators. There is a need for holistic and more meaningful KPIs, expressing, for instance, a city's livability, which would take into consideration how expensive it is to live there, how healthy the air is, how well the healthcare system works, how easy it is to find a job and a decent home, how many cultural and social events take place, and other similar factors. Indexes applying holistic KPIs exist, but they are typically created by magazines and designed to attract readers.

> The next generation city needs to be able to respond faster and more effectively than it ever did – in real time and without human intervention. The margin for error in cities with ever growing populations is almost zero. The automated city knows instantly if there is a problem, predicts outcomes that may be disruptive, and can apply self-corrective measures."
>
> Ebenezer Thomas, Smart Cities Specialist, Singapore

City leaders would benefit from defining and tracking holistic KPIs themselves, with the clear purpose of understanding and improving their cities.

INTER-CITY COLLABORATION IN THE NETWORKED WORLD

In the 2013 version of the City Index we identified opportunities in more extensive inter-city collaboration. Many urban challenges are shared by many cities – and ICT solutions are often highly scalable – so many city challenges can be more efficiently met by combined effort. In this chapter, we discuss how cities can develop their collaborations and increase their ability to meet the challenges at hand.

Digital transformation helps shift focus from talking to doing

Traditionally, inter-city collaboration has primarily focused on organizing forums for discussions and establishing sister cities and town-twinning for cultural exchange. Numerous inter-city networks exist, discussing various topics and challenges, such as climate change, traffic solutions, public safety and other issues. There are also many examples of ongoing knowledge-sharing between cities, where municipal agencies learn from each other to increase capabilities. Rio de Janeiro's Centro de Operações – which we described above – helps other cities to develop their own dashboard systems, and Mayor Eduardo Paes is an active ambassador for the service, inspiring other cities to take on the challenge of such a venture.

However, another form of inter-city collaboration is yet to display its full potential. Today's digital tools allow more hands-on and pragmatic collaborative exchanges. To use these tools, cities must fully understand what forms inter-city collaborations can take in a digitally transformed and connected world. Principles like sharing, platform thinking, open source and crowd sourcing have all had major impacts on business models and on the general public's expectations of services. But the full potential of this new business logic has not yet been applied to new public service models.

One leading example showing just what can be achieved is MuniRent, a utility sharing service based in Ann Arbor (US). MuniRent enables municipalities to share equipment in a network, since a substantial part of a city's equipment is unused for long periods. The service also entails an extensive exchange of knowledge: cities not only share equipment, they share processes, best practices and, to some extent, personnel. Applying the sharing model within municipalities not only lowers local government spending, it also brings these municipal entities closer together, which can result in other collaborative ventures.

Many of the sharing services available today address transportation issues. There are multi-city car-sharing services, allowing customers to use cars in different cities. However, multi-city public transportation collaborations – allowing people to use public transport in different cities with a single card – remain rare. In a globalized world, where people are less likely to spend their lives in just one city, such a service would make public service sense.

As we have seen above, cities benefit when mayors adopt an entrepreneurial mindset. Such a mindset includes the ability to see opportunities, small and large; to adopt innovative digital solutions; and to constantly improve public services. Leaders must recognize that people's expectations of digital services are now set by the likes of Google and Facebook, regardless of whether the service in question is provided by a public authority or by the hottest company in Silicon Valley.

> We are empowering governments to be more collaborative. Sharing equipment and personnel between local governments allows them to learn new ways of doing things from one another."
>
> Alan Mond, founder and CEO, MuniRent

The need for a common language

Inter-city collaboration could benefit greatly from easy comparisons of relevant performance parameters. Unfortunately, cities often use different measuring points and methods, resulting in incompatible data sets. Compounding the problem, the measuring points and methods are often stipulated by national law, and are beyond the cities' control. Even international organizations, like the OECD and the World Bank, use different systems.

But, despite the challenges of inter-city collaboration, on national and (more significantly) global levels, cities do find ways to work together. The open source and open data movements play an important part in finding common ground, allowing both public and private initiatives to use and combine existing services into solutions that improve urban life.

> "The 'open source mentality' and its aim for openness has already been an influence and UN-Habitat has started to work with open source initiatives and open standards."
>
> 
> Photo by Mawang Ko-ah
>
> Thomas Melin, Senior Policy Advisor, UN-Habitat

UN-Habitat – the United Nations' program for creating a better urban future – shares its data unprocessed, so governments, academic institutions and other organizations can use the data however they want. Furthermore, some cities collaborate closely with organizations like New Urban Mechanics and Code for America to improve their ICT capabilities. Principles and methods arising from the digital culture – such as open source and 'hackathons' – are important parts of what these organizations advocate.

The full potential of open source and open data as collaborative tools is yet to be seen, and this approach is still relatively new to municipal interaction. A common language – a standard methodology for KPI definitions and monitoring – could be something that organically grows bottom-up from various open source initiatives. The open source culture may also speed up global harmonization of data, since this movement stresses pragmatism over politics.

> "In the long term, open source solutions will be a more efficient way of approaching urban challenges. They encourage collaboration and provide a platform for a new generation of innovative ideas."
>
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>
> Margarita Angelidou, Urban Planner and Researcher, URENIO

It is interesting to consider the notion of 'doing' as common language. In Stockholm, the Center for Architecture and Design ran a project called Blockholm during the spring of 2014. Blockholm is based on the platform Minecraft, a virtual open world in which players can build things and interact with each other. Data from the land and property registries of the City of Stockholm were entered into the platform to create a true rendering of all inner-city areas and selected suburbs. The result was a virtual version of Stockholm, without any buildings. Stakeholders from municipalities, architects, developers, the business community and the general public were invited to collaboratively reimagine Stockholm. Instead of talking about how a city could be developed, the Blockholm model allows stakeholders to share their visions in a collaborative virtual reality.

A similar Minecraft-based platform was used by UN-Habitat in a global project aiming to reimagine and

> "A tool like this also has to do with playfulness. Playfulness is a good way of approaching a challenge; it makes things less dramatic and decreases the distance between people. If cities open up their projects to other cities and work together in a tool like this, that will open doors to much deeper collaboration."
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> Markus Bohm, project manager and curator, Blockholm

develop different areas across the world. The open development process, allowing different stakeholders to be part of or to follow all aspects of the project, helps to create a strong consensus around solutions since it creates involvement and understanding of decisions made along the way. If a tool like this were used by multiple cities, it could enable them to share ideas and knowledge, and learn from each other's processes.

Transformation is slow, but the tipping point is in sight

In the short term, inter-city collaboration will not benefit from digital transformation to the extent that it could. A strict top-down mindset still predominates in municipal governance. Digitally transformed inter-city collaboration relies, however, on peer-to-peer interactions and – to some extent – the absence of top-down processes.

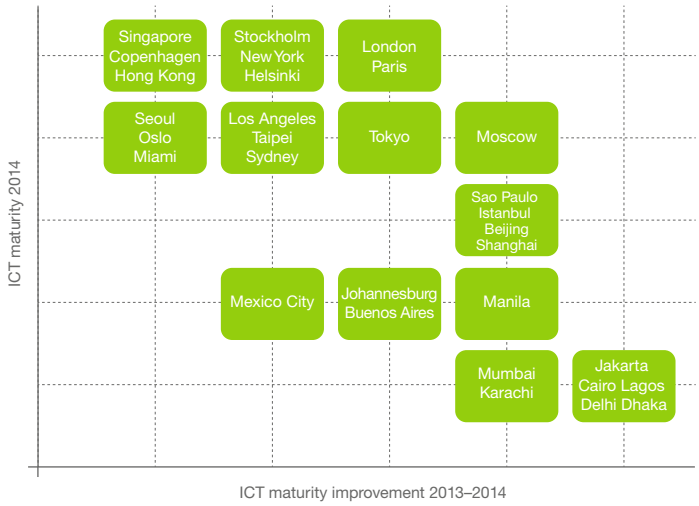
The current rate of digital transformation is not yet as fast as it could be, given the opportunities available now. A cultural shift within municipal government is required and legislation needs to be updated in some areas. There are a few forerunners among municipal governments, but others need to follow their lead. As the number of city leaders with a digital mindset increases, many cities are likely to reach a tipping point in the near future.

NETWORKED CITIES ARE MAKING PROGRESS

The 2014 Networked Society City Index reveals rapid changes in technology and its uptake by people in urban centers worldwide, as cities shift toward an even more Networked Society.

The current data show a clear improvement in ICT infrastructure in cities around the world. At the same time, ICT technology has become significantly more affordable, with a decline in tariffs and IP transit prices. The general developments in infrastructure and price levels have in turn increased the number of people using ICT and changed the way new technology is used. The Internet is increasingly accessed via new technologies such as smartphones and tablets, and social media sites are changing the way people interact with one another.

Interestingly, cities with low ICT maturity tend to mature faster than higher performing cities (see figure 6). This indicates a catch-up effect among several cities. Jakarta, Cairo, Lagos, Delhi and Dhaka are cities that experience low ICT maturity levels today and also face several social, economic and environmental challenges.



However, the index shows promising improvement rates in these cities. Although starting at a low level, they are progressing in all ICT dimensions of the index: infrastructure, affordability and usage. Cities such as Moscow, São Paulo, Istanbul, Beijing and Shanghai are also experiencing substantial improvements in their ICT maturity, a development that can bring triple bottom line progress if managed sustainably.

	ICT maturity improvement rank 2013-2014	Networked Society City Index rank 2014
LAGOS	1	38
DELHI	2	36
CAIRO	3	35
DHAKA	4	40
JAKARTA	5	34
BEIJING	6	26
SHANGHAI	7	28
MANILA	8	33
MOSCOW	9	17
KARACHI	10	39
SAO PAULO	11	25
ISTANBUL	12	27
MUMBAI	13	37
BUENOS AIRES	14	32
JOHANNESBURG	15	30
PARIS	16	3
TOKYO	17	10
LONDON	18	2
STOCKHOLM	19	1
SYDNEY	20	19
HELSINKI	21	6
TAIPEI	22	13
MEXICO CITY	23	31
NEW YORK	24	7
LOS ANGELES	25	11
HONG KONG	26	9
COPENHAGEN	27	5
MIAMI	28	15
OSLO	29	8
SEOUL	30	12
SINGAPORE	31	4

Figure 6 – Comparison of ICT maturity 2014 and selected cities' ICT maturity improvement between 2013 and 2014; comparison of ICT maturity improvement ranking and Networked Society City Index rank 2014.

Developing cities can also take advantage of the efforts of those more economically developed, by copying methods and technology. They can, in effect, leapfrog technological stages by not investing in the types of infrastructure and technological solutions that are becoming obsolete and inefficient. Instead, they can implement new business models and systems such as smart grids, sharing economies and other innovative solutions.

However, access to mobile and fixed broadband remains prohibitively expensive in some cities in relation to local purchasing power. Regulatory bottlenecks and a lack of ICT infrastructure also hamper ICT maturity improvements in different parts of the world. For example, Mexico City (with relatively high ICT prices) and Johannesburg and Buenos Aires (where ICT infrastructure is less developed), should consider taking actions to avoid falling behind; also, highly developed cities such as Singapore, Copenhagen and Hong Kong need to address their low ICT improvement rate. These cities are today top performers in the ICT dimensions, but with a low ICT improvement rate, they risk less favorable development outcomes in the future. In cities that are developing their ICT maturity, governments, businesses and people can use the transformative power this brings to make public services more efficient, to enable the growth of new and old businesses, and to expand and strengthen social networks.

The data also show that index cities are experiencing economic growth (although several of the cities are recovering from the recent and still ongoing economic crisis). Their recovery has a positive effect on the cities' performance in the social dimension of the index, due to lower unemployment rates.

MOBILE SOLUTIONS SPEED UP SUSTAINABLE DEVELOPMENT

Looking deeper into the literature, we see that ICT solutions can support sustainable development in all stages of a city's development. The index shows how some cities, however, perform better than others in the triple bottom line dimensions, given the same ICT maturity. We also observe cities that have different levels of ICT usage despite equally developed infrastructure. Consequently, cities with lower usage levels may not perform as well in the triple bottom line dimensions as those that effectively use their infrastructure (see figure 7).

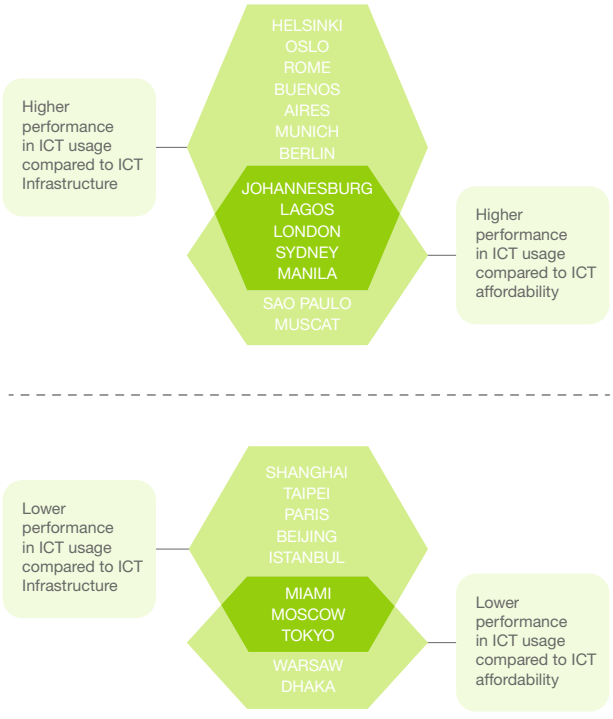


Figure 7 – Performance in ICT usage in relation to ICT infrastructure and ICT affordability.

ICT usage is mostly influenced by the state of a city's ICT infrastructure, with affordability having less of an influence. Therefore, we can observe that the lack of well-developed ICT infrastructure is an obstacle to further development and value creation.

Many European cities achieve higher scores in ICT usage than in infrastructure and affordability. This is mostly due to the high average income levels of the city's inhabitants and their high educational attainment. Indeed, education is a key factor for the spread and use of e-services. The use of open data is also dependent on how knowledgeable the city's business sector is.

Lagos and Johannesburg provide very good examples of cities where the populations, in the absence of well-developed fixed infrastructure, use new mobile technologies to enable a connected life, including the use of social networks and mobile payments. These cities have the opportunity to pass others by, for example, choosing not to set up formal banking systems and other expensive physical infrastructures and instead using advanced mobile technologies.

In contrast to Lagos and Johannesburg, the index also identifies cities that experience low ICT usage compared to their infrastructure and affordability.

The relatively low performance in ICT usage of Beijing, Istanbul, Shanghai, Tokyo and Miami is largely due to their less developed e-governance compared to other index cities. By developing better e-services, these cities could improve many aspects of daily life for their residents. Developing their open data resources could also spur innovation.

Taipei is a well-developed digital city, but its ICT usage has not caught up to its rapid high-speed broadband development. Taipei, like many other cities, suffers a digital divide among its residents. Digital divides – between and within cities – also reflect broader socioeconomic and urban development challenges. This problem is even more pronounced in cities like Lagos and Johannesburg (see figure 8), where there remains much to be done to improve inclusion, such as addressing the low ratio of women to men who are connected.

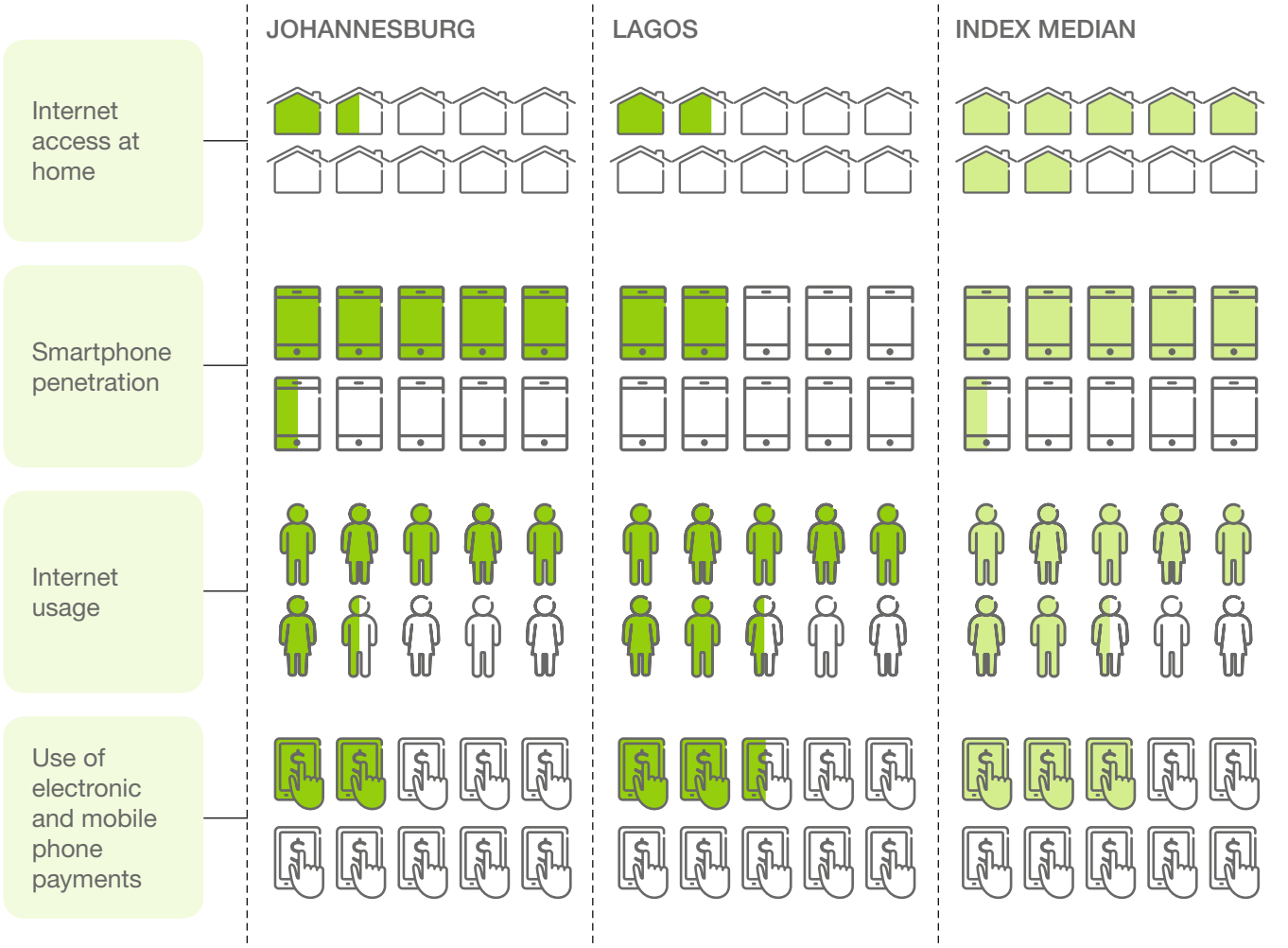


Figure 8 – Comparison between Johannesburg and Lagos in a selection of ICT maturity indicators.

GLOBAL TRENDS AND CHALLENGES FOR THE FUTURE

Economic stagnation, rising demands from aging populations and unemployed youth, climate change problems, and geopolitical unrest frame the urban agenda ahead. And in a globalized economy, it appears unlikely that continuing the industrialization model of the past will deliver prosperity to the less affluent parts of the world.

The world is becoming more connected, more city-focused, and more polarized between the rich and poor, and the demographic challenges facing cities will increase. The climate will change, economic power will shift, and the global trend toward urban living is shaping new consumer markets and placing new demands on city administrations.

Fortunately, ICT offers new approaches to many of the current and future challenges facing cities. To take advantage of the new technological solutions, we need strong leadership and joint work between cities toward a new form of urbanism – a networked urbanism that better harmonizes with the conditions of our time.

In this future, ICT offers possibilities for improving efficiencies and cutting costs in current systems, freeing up resources that can be reallocated to more productive areas. ICT further provides a foundation for more radical innovation to bring fundamental changes in how needs are met and markets are defined. Typically this involves more interactive and individualized solutions and greater transparency of service quality and results.

DEMOGRAPHIC AND SOCIAL CHALLENGES MEET THE NETWORKED CITY

The combination of lower birth rates and longer life expectancy is a result of improved living standards, better education and more advanced medical care. This development will eventually lead to a situation where the world population stops increasing and the working age population will start to diminish – a trend already visible in more economically developed societies.

ICT affects social services directly by improving the availability of and communication within social service systems. Developing, deploying and adopting e-health services or online education tools will also improve access to health and education services, spread information, and make it possible to communicate in new forums.

Technology-enabled solutions can increase efficiency, reduce administration costs, improve access to and coordination within public systems, and increase revenue streams.

Telehomecare is care and treatment in a patient's home by health professionals, with the support of Information and Communication Technology. A telehealth monitor can collect and transmit data about the patient's blood pressure, pulse, weight, oxygen level, lung function, and other vital signs. Health care professionals can use telehealth monitor boxes installed in patients' homes to monitor their condition and provide advice without the need for clinical visits. The TELEKAT research project has been using these technologies to provide health care services in northern Denmark since 2012.

NEW COMMUNITIES IN A MORE INDIVIDUALIZED WORLD

Throughout the world, in developed and developing cities alike, societies are shifting to a more open society where conventions and established ways of working are being challenged. In a more individualized society, people will expect goods, services and experiences to be more tailored than ever.

ICT will be a game changer for people's ability to influence both public and private actors. The drive toward a more responsive and transparent society will be steered by people with greater access to information, and powered by more effective communication. In

Figure 9 – Comparison of ICT maturity and the corruption perceptions index.

response, public institutions, faced with diverse expectations, must be able to create dynamic structures open to interaction at all stages for their work, from planning to completion.

Furthermore, open data and e-governance can help cities to expand transparency, reduce corruption and improve internal efficiency as they deliver public services. Indeed, most cities with high levels of ICT maturity have low levels of perceived corruption (see figure 9).

A counter trend to a more individualized world is the flourishing of new communities. Groups of like-minded people are becoming increasingly involved in specific issues that are important to them. Social media offers people new opportunities to gather, share experiences and express opinions in new forums. ICT breaks down geographical and institutional boundaries. We expect that unprecedented levels of inclusion will drive social transformation, rapidly extending cooperation, participation, and knowledge sharing to previously excluded groups.

THE WORLD IS BECOMING LARGER AND SMALLER

New technology and innovations are reducing the importance of geographical distances and boundaries and challenging many of the foundations of our society. The emerging new economic geography will shift local and regional conditions for individuals and businesses, affecting both the private and public sectors. Global networks and value chains are evolving as people and businesses reach new international markets and societies. At the same time as the possibilities are expanding, the world is also becoming more accessible and is perceived as being smaller.

Location-independent solutions such as teleworking, telecommuting, video conferencing, as well as e-commerce solutions and e-services, are becoming more important to improving firms' and cities' economic competitiveness. It is, therefore, unsurprising that the data show a strong correlation between ICT maturity and economic competitiveness (figure 10).

An example of ICT use promoting transparency is the initiative by the government of Singapore called GeBiZ, an online "one-stop" government procurement portal which aims to improve efficiency, standardize processes, and increase transparency in procurement. The site also serves as an intranet (GeBiZ Enterprise) for government agencies and departments to use for all their procurement and supplier needs.

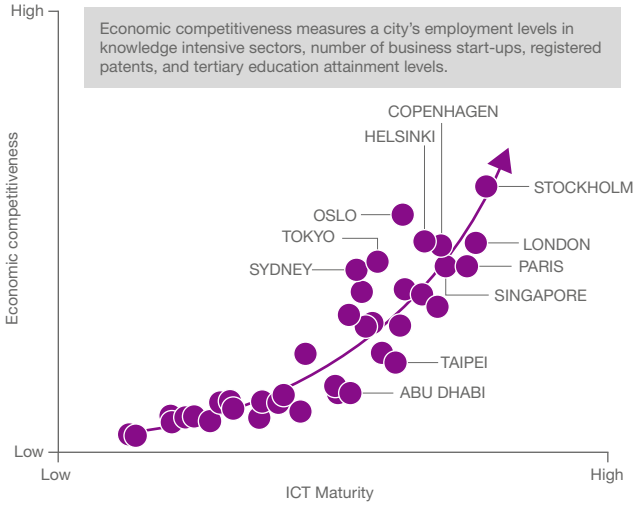


Figure 10 – Comparison of ICT maturity and economic competitiveness

In a more connected world, competition increases and new business models emerge. The business sector will be required to step out of traditional models and mindsets and face new opportunities in a networked society. As explained in our predictions, we believe this trend will continue, with organizations becoming less dependent on location and more dynamic in shape and content. They will become more fluid in form, and we expect to observe various types of collaborations, including constellations of companies and self-employed people working together on projects.

For the public sector, cities must understand and adapt to these changes. Cities will face fiercer competition from other cities as the world becomes more accessible. But at the same time, new opportunities will arise for collaboration within and between cities as they jointly seek to create better experiences for highly mobile people to be served by whatever city they are in at any given moment.

ENVIRONMENTAL CHALLENGES FACING THE CITIES OF TODAY AND TOMORROW

Unsustainable use of resources, increasing pollution levels, and the existential threat posed by climate change are three demanding and interlinked environmental challenges for cities throughout the world.

Pollution from a city's industrial activity, heating, cooking and transport harms people's health and creates economic inefficiencies. This is a widespread problem facing both developed and developing cities. As the political and economic realities of developing cities and the living patterns of their residents have transformed in the past few decades, the negative aspects of increasing pollution levels are clearly visible. Economic emergence also brings rapidly increasing energy use per capita. And emerging cities tend to have less developed infrastructure to deal with the associated problems. Moreover, the changing climate is increasing the frequency and severity of extreme weather conditions such as torrential rain, heat waves and cold snaps. This puts an increased stress on cities' infrastructure and their public and private service providers, such as hospitals and energy utilities.

Many new ICT solutions help to mitigate the impacts of climate change, and in our study we identified examples such as intelligent water infrastructure projects, which can help cities meet various climate challenges. For example, faced with increasing water stress, Thames Water, a water utility in London, engaged the services of Takadu, a firm that uses readily available data to detect leaks in the city's aging water infrastructure.

ICT solutions are also able to analyze a city's use of resources and enable a collaborative or sharing economy to address overconsumption and decrease waste creation. An example is the Sunfleet car-pool app which allows members in multiple Swedish cities, including Stockholm, to locate, book and unlock cars using only their mobile phones. ICT solutions can also increase recycling efforts, such as those seen in online secondhand stores.

Intelligent traffic management solutions combine real-time and historical data to change behaviors, improve logistics and reduce traffic-related pollution.

The BigBelly system uses connected trash cans and a city's mobile network infrastructure to notify headquarters about trash collection. The system can calculate an optimal collection route to reduce environmental impact. These connected trash cans can reduce collection trips by garbage trucks by over 50 percent.

To summarize, ICT offers many solutions to help cities both address these environmental challenges and work for a more environmentally friendly city.

THE INCREASING IMPORTANCE OF CITIES

The world is entering a new era where both the economic and political importance of cities is growing quickly. Today, the majority of the world's population lives in cities and urban concentration is accelerating. Therefore, cities are vital for solving major social, environmental and economic challenges.

Both in literature and the index results, we see a clear trend toward more ICT investment, more affordable ICT, and higher ICT usage in cities. However, although ICT is a natural springboard to urban development, global development can suffer from the digital divide both within and between cities, and between urban and rural areas. Therefore, city leaders need to address the importance of a city-wide digital capability and foster continued innovation in products and services that maximize benefits of new technologies.

In our analysis, we see some clear trends in how ICT is reshaping city life, verifying the need for city leaders to adjust accordingly. For example, the index shows that ICT is improving fastest in less economically developed cities. As we have described previously, these cities can avoid many of the challenges facing more developed cities by applying existing technology to radical innovations and sustainable solutions.

Also, as noted in the predictions, ICT offers people new opportunities for taking the lead. Through ICT, innovative solutions can scale rapidly for significant impacts on city life worldwide. Grassroots initiatives will drive urban innovations more than ever before. ICT can also be a game changer in people's ability to influence both public and private actors. We are moving towards more connected people-centric governance where individuals participate to a greater extent in urban planning, information sharing and decision making. The future also presents radically altered conditions for organizations and businesses alike. Organizations will have to step out of traditional models and mindsets as our societies get more connected and individualized.

To benefit from the possibilities presented by new technology, we need a broad discourse on how to restructure our societies. As such, an enlightened, educated and more open leadership is a prerequisite for an even more Networked Society. Focused collaboration and visionary leadership within cities is vital to develop and reform institutions and systems according to the new conditions in cities, and greater collaboration between cities is also needed to achieve compatible solutions for a globalized world.


7
ELEVEN

COMPOSITION OF THE INDEX

The Networked Society City Index 2014 measures the performance of 40 cities from two perspectives: their maturity in Information and Communications Technology (ICT maturity) and triple bottom line (TBL), specifically sustainable urban development in a connected society. This year, we have supplemented the index with indicators of equality and improved the indicators of e-government and access to fast mobile broadband.

ICT maturity and TBL development are both divided into three dimensions. The TBL dimensions – social, economic and environmental – reflect the three dimensions of sustainable development. ICT maturity is broken down into ICT infrastructure, ICT affordability and ICT usage. These three dimensions capture the complexity of the connected society: a well-developed infrastructure, a competitive market that offers affordable prices to individuals and businesses, and sufficient know-how to invent, adopt and adapt new ICT solutions (figure 11).

Each dimension is described by a set of variables. The variables are created by aggregating a set of indicators and proxies that are meaningful in terms of describing a city's performance in the variable. For further information about the composition of the index, please refer to the appendix on Methodology.

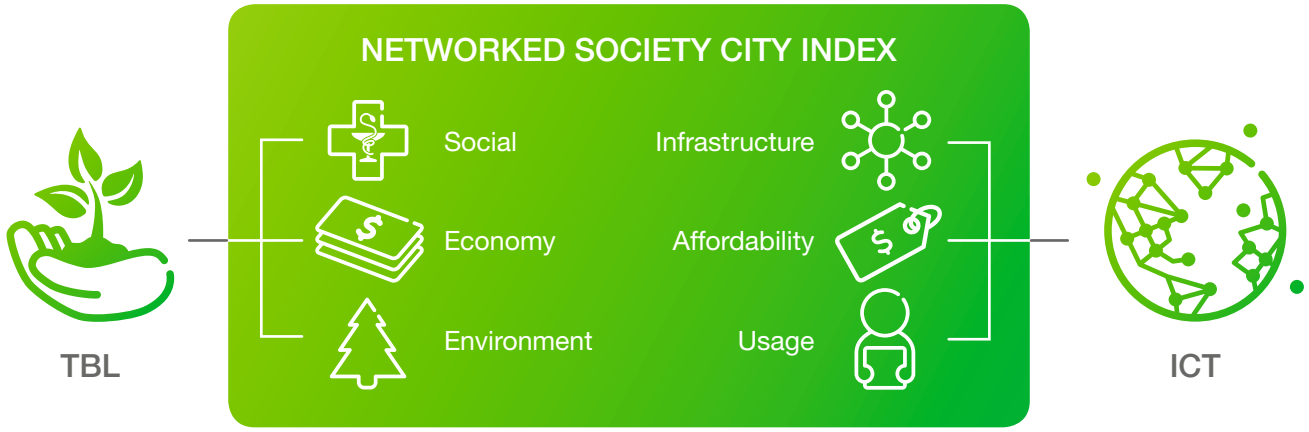


Figure 11 – The composition of the Networked Society City Index.

Triple Bottom Line: 8 Variables and 23 proxies.

- Social
  - Health
  - Education
  - Social Inclusion
- Economy
  - Productivity
  - Competitiveness
- Environment
  - Resources
  - Pollution
  - Climate change

ICT Maturity: 7 Variables and 18 proxies.

- Infrastructure
  - Broadband quality
  - Availability
- Affordability
  - Tariffs
  - IP Transit prices
- Usage
  - Technology use
  - Individual use
  - Public and market use

ERICSSON IN THE CITY

Ericsson's engagement in urban development goes back to our foundation in 1876. We have pioneered the communication industry since the 19th century, and built some of the very first telecommunication networks in cities all over the globe. Since then we have driven the evolution of communication by developing technology and providing communication networks and services.

Currently, Ericsson ranks number one in urban mobile communications infrastructure in the world's 100 largest cities (measured by GDP) – having a share larger than our closest two competitors combined. Now we're making sure these networks are capable of serving the current explosive growth in smartphones and app usage, seen particularly in urban environments.

Our cities are entering a new phase of technological development: one driven by the emergence of cloud based services, more powerful mobile devices, sensors, big data and analytics. Intelligent and capable networks will be critical to the basic functioning of cities around the world – a world increasingly defined by new digital infrastructures and the interactions they empower.

Ericsson is continuing to drive the development of tomorrow's urban networks to accommodate both new types of connected things – from electricity meters, through cars and sensors, to healthcare devices – and an ever-increasing range of services.

Such developments require a broad dialogue between stakeholders from all sectors of business and society. Ericsson is closely involved across a broad range of sectors, including power utilities and the emergency services. Ericsson is also advising cities on generic ICT benefits and implementation solutions, as well as expanding its solutions for transportation and municipal government, including innovative electric car charging, municipal administration and e-government solutions.

Examples of our involvement in urban development projects include Stockholm Royal Seaport, Smart Santander and Beijing.

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APPENDICES

Ericsson is shaping the future of mobile and broadband internet communications through its continuous technology leadership.

Providing innovative solutions in more than 180 countries, Ericsson is helping to create the most powerful communication companies in the world.

Ericsson AB
SE-126 25 Stockholm, Sweden
Telephone +46 10 719 00 00
Fax +46 8 18 40 85
www.ericsson.com