A META-PERSPECTIVE ON THE DIALOGUES ON EMERGING INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) AND THE IMPACT THEREOF ON PEOPLE, SPACE AND PLANNING

By

Jennifer Mirembe

|July 2017

A META-PERSPECTIVE ON THE DIALOGUES ON EMERGING INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) AND THE IMPACT THEREOF ON PEOPLE, SPACE AND PLANNING

By

Jennifer Mirembe

Submitted in partial fulfilment of the requirements for the degree Doctor of Philosophy (Town and Regional Planning) in the Faculty of Engineering, Built Environment and Information Technology, University of Pretoria, South Africa.

Supervisor: Dr P.J. van V. (Johnny) Coetzee

July 2017

DECLARATION OF ORIGINALITY

Full names of student: Jennifer Mirembe

Student number: 29575291

Declaration

I understand what plagiarism is and am aware of the University's policy in this regard.

I declare that this thesis is my own original work. Where other people's work has been used (either from a printed source, the Internet or any other source), this has been properly acknowledged and referenced in accordance with departmental requirements.

I have not used work previously produced by another student or any other person to hand in as my own.

I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.

Signature of Student: _____

Signature of Supervisor: _____

For James and Kira

ABSTRACT

ICT and related e-technologies have had an enormous impact, not only on people and people's spaces in all parts of the world, but also on urban space dynamics, the form and function of urban spaces and urban space networks and economies, and urban planning in general. Due to the rapid development of ICT in recent years, it is expected that these impacts will become more severe, unpredictable and complex in the future.

The main aim of this study is to explore the nature and properties of ICT, as well as the ways in which ICT and related e-technologies are influencing people, space and planning.

The study, which is exploratory in nature, draws on a meta-research approach, supported by a conceptual research approach, in an attempt to arrive at some meta-synthesis and perspectives of the various related discourses, studies and theories on the subject matter.

The study presents fresh perspectives on the challenges and dynamics of ICT, as well as the nature, extent and speed of the influence and impact (positive and negative) of ICT and related e-technologies on people's spaces, human conduct, emotions, urban space dynamics and morphology, and urban space networks. In relation to this, evidence is provided of the power of ICT, the ways in which the dominant e-powers are controlling society, and how ICT has (em)powered people, spaces and planning.

The study further highlights the complexity and challenges of the emerging hybrid e-spaces and networks, which have resulted from the merging of physical and virtual spaces and networks.

The study in the end also presents some realities and future possibilities (and threats), for both urban and rural regions in South Africa, with specific reference to the impoverished communities in remote rural areas that have been isolated and excluded from ICT opportunities.

This study has identified many gaps in the knowledge field and could create a new awareness, understanding and interest, not only amongst researchers, but also amongst the various role players involved with the planning, development and management of urban and rural regions.

ACKNOWLEDGEMENTS

I would like to thank:

- Prof Mark Oranje for his continued support and assistance,
- Dr Johnny Coetzee for his guidance,
- The members of the research committee: Prof Oranje, Prof Karina Landman, Dr Jacques du Toit and Prof Chrisna du Plessis,
- All the external examiners for their valuable comments,
- Desiree Homann for the editing,
- Staff of the library,
- Prof Eloff and Stefanie Steenberg who managed the final submission and examination,
- The staff of the Department of Town and Regional Planning,
- My Mother and father,
- My mentor Dr Julianna Mwesigwa; and
- My two children James and Kira.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ABBREVIATIONS AND DEFINITIONS

Cyborg: A person who is technologically driven – such a person is always in possession of a device and connected online.

E-technology, e-power, e-governance, etc.: Reference is often made in the literature to concepts such as e-administration and e-governance. The prefix "e-", in this context refers to the electronic nature of ICT, and has been used in this script to describe e.g. e-powers and e-technology, which are activated by ICT.

E-toll: This is a paperless, cashless system installed in 2013 by the South African National Roads Agency Limited (SANRAL) for motorists in Gauteng Province to pay their tolls.

Free Wi-Fi: Wi-Fi is signal-based communication between devices and satellites. In Tshwane, this has been installed free in selected institutions and public squares such as Church Square**.**

Gauteng Global City Region: The anticipated single city that formed because of the merger of the Gauteng metropolitan areas in the Gauteng Province, namely Johannesburg, Tshwane, and Ekurhuleni metropolitan cities.

Gauteng: One of the nine provinces in the Republic of South Africa**.**

Gautrain: Rapid rail service for the Gauteng Province**.**

GCRO: Gauteng City Region Observatory.

IDP: Integrated Development Plan. This is a five-year municipal plan that contains the targets of a municipality across different sectors such as Transport, Energy and Housing.

Medium Term Revenue and Expenditure Framework (MTREF): This is the three-year expenditure, performance, and budget projection plan of municipalities in South Africa.

Metropolitan Spatial Development Framework (MSDF): This is the spatial planning policy document for planning space at the metropolitan scale.

Regional Spatial Development Framework (RSDF): This is the policy document for planning space at the regional scale in a metropolitan city.

SNS: This stands for Social Networking Sites and represents the family of Facebook, Twitter, Instagram, Myspace, etc.

Virtual urban space: This is the invisible space that is created by the internet cyber system.

PROLOGUE

My space odyssey

The title “space odyssey” has been used by various authors in different ways, and it would probably be irresponsible not to refer to Stanley Kubrick's parable "2001: A **Space Odyssey**", and even the David Bowie song.

For me, this study was a very personal, spiritual, and intellectual odyssey into space. I ventured into my own mind and neurospace. Over many years, I have also navigated knowledge spaces, people’s spaces, urban spaces, along space corridors and through networks, and ultimately found myself entangled in a new (cyber) space, in virtual spaces and webs characterised by cyborgs, new powers and networks.

For me this odyssey was very much in line with the definition by Merriam-Webster, that describes an odyssey as an *“intellectual or spiritual wandering or quest, and an odyssey of self-discovery”.*

Like Odysseus, the hero of Homer's *Odyssey*, who spent 20 years traveling home from the Trojan War, this adventure, journey or actual voyage taught me much about myself and the “new” world and future.

Apart from this self-discovery, I, as the scholar and author, became very close to the study. During a period of seven years, I ventured through many different terrains, some smooth and some very rough. The more I progressed, apart from the confusion, which often took over my life, I increasingly began to realise that this was (going to be) a very complicated and challenging odyssey. For me this was an odyssey into different spaces, which I have never explored or even imagined. At some point in time I thought this was going to be a journey to nowhere.

Now that I am beginning to see “the end” or my destiny, I would like to share my odyssey, and my experiences, observations, lessons learnt, frustrations, and concerns with you, the reader, and invite you to re-live this voyage with me.

Because of my intellectual and spiritual experience, and also my intimate relationship with this journey, I will present my script as a narrative or story, and in the form of a journey.

I will do this with reference to my odyssey into space, inviting you along as I explore the various spaces and landscapes.

Let the journey begin.

CHAPTER 1:

PONDERING THE PREVALENCE OF ICT IN URBAN SPACE

During the past few years, with the rapid emergence of ICT, my personal life and space, as well as the ways in which I communicate and perform my professional duties, were grossly affected by ICT and the so-called new e-technologies. As an architect and spatial planner in Tshwane, Gauteng, South Africa, I became intrigued by the possible future impacts that ICT would have on people, space and planning (the essence and focus of my profession). This curiosity inspired me to explore the characteristics of ICT and the impact thereof on people, space and planning…and to ponder the prevalence of ICT in urban space.

For me, it was obvious that emerging e-technologies, specifically in the last three decades, have brought a fresh set of emotions, experiences and perceptions to urban space. These new technologies and the impact thereof on people and space increased the importance of understanding these transformations in urban space and urban space networks, and the impact of these emerging technologies on people and urban space networks.

Technology has become a very strong determinant of the urban space network. According to Orlikowski (1992), technology actually triggers the emergence of new patterns and formations in urban space. For example, technology can differentiate between mechanical transport, such as a train, and natural transport such as people on foot. Hickmann (1990:3) further argues that technology is indeed one of the many tools that human beings have used to solve problems. The application of technology increasingly improves and directs the functionalities of the network structure of cities.

Tschangho *et al* (2009), Dochtermann (2000: 4) and Chant & Goodman (1999: 212-213), illustrated that the first cities, prior to the use of mechanics and real technology, were characterised only by movement of people, who shared information by word of mouth, hence the reference to the "*Word of Mouth City".* By the twentieth century, automated machines, freeways and high-speed motorways as we know them today started shaping the city network space. This new city was called the "*Machine-Mechanical Metabolic City"*. By the twenty first century, a "*Conduit Free City"* known as the "*Informational City"* had developed, and it

was characterised by unseen borderless and timeless infrastructural networks that coexisted with the visible urban space networks.

The discussion so far shows that technology in general played a role in shaping cities. During the last three decades, technology, as we knew it in the 1900s and even before that, has transformed into a new construct, mainly shaped and informed by the evolution of computers and the informational revolution. The reference to this construct is Information and Communication Technology (ICT in short), which will form the basis and focus of my explorations and my journey, and ultimately this study.

Through my explorations with ICT and the impact of ICT on people, space and planning, it became increasingly evident that ICT is complex, unpredictable, silent, virtual, mysterious, and frightening. At the same time, ICT also became so powerful that in many ways it started to control urban space activities, businesses, economies, industries, institutions, people, the air space industry, satellites etc. It actually became so powerful that it controls and powers the whole world economy. Imagine a global shut down or "power failure" and the impact of this on society.

Apart from the inherent power of/in ICT as discussed above, the computer, smart phones and the worldwide web (www) also spawned new *communication powers* i.e. powers that people have to communicate, anywhere in the world, any time, with anyone – at a relatively cheap rate. This communication and information sharing power is enhanced by apps, images, video footage, music, internet information, etc.

Through communication technologies, ICT and related e-technologies produce information at high speeds. In addition, technological change takes place very fast, which results in circulation of information also taking place at high speed. In short, ICT and the way information moves in space, as well as the pace and speed at which it moves has had a major impact on people and people's spaces.

From the premise of the above discussion, it is already noted at this stage that ICT can shape and control cities and urban form. The nature of e-tools such as computers, smart phones and the internet made ICT very powerful. Smart phones and the internet created opportunities such as linking people globally to urban space. ICT has become an integral part of people's

lives and spaces. Paster (2010), in support of the above, also refers to how ICT connects people to new knowledge, entertainment, relationships, and capital.

When I started directing my journey towards the more complex urban dynamics, urban space networks and the urban space economy, it was interesting for me to note how these networks and economies were being affected by ICT. Scott (1988), Muller (1997), and Freestone & Murphy (1998), furthermore provide evidence of how ICT has increased the GDP of several countries. The economy of Qatar, for instance, has increased to a GDP per capita of $102,100[1] (one of the highest in the world) in 2013. Qatar attributes its economic success to investment in ICT. Lee (2006: 78) also analysed the Los Angeles metropolitan area for the period 1970-1990 and found that the new technologies in communication have prompted economic prosperity.

The impact of ICT has also penetrated networks and the structure of urban space. It is significant to note how innovations in ICT have led to the development of two types of urban space, namely virtual urban spaces and physical urban spaces. Lee (2006: 77-78) studied the impact of technologies in the urban form of metropolitan cities in the United States of America (USA), by investigating whether metropolitan cities have become more "edgy or edgeless" or "monocentric" or "polycentric", in terms of their networks and spatial footprint. These transformations and impacts began to show that there are various *prima facie* indications that ICT technologies have had an impact on urban dynamics, urban spaces and urban space networks. For me the challenge was to identify the nature of these impacts, specifically to determine which impacts are positive and which negative, and moreover to explore the possible challenges and opportunities for spatial planners who have to plan such spaces and networks.

A problem experienced in conducting this study was that ICT develops and expands at such a fast pace that it becomes illusive and difficult to analyse and comprehend. In addition, this technological and informational expansion continually impacts on people and space; there is

[1]See also other countries at the world fact at https://www.cia.gov/library/publications/the-world-factbook/rankorder/2004rank.html (accessed on 18 December 2014).

uncertainty as to where this will be going in the future and how it will really affect people and space as time progresses.

During the 21st century, South African cities increasingly shifted from an industrial mode to an informational mode of operation. Digital technology has become an important aspect of urban life with some urban cultures attempting to understand the potential of ICT technology. Attesting to this is the fact that South Africa is the fourth fastest growing mobile communications market in the world with 80% of the population connected to digital communications networks.

During the 1990s, South Africa started showing a new interest in ICT. By 1995, approximately 10% of people in South Africa had access to telephone through a landline network. Cell phone connectivity grew exponentially from 14 people per 1000 in 1995, to 252 per 1000 by 2002. By 2002, 11.2 million cellular phone users were reported and by 2006 the figure was 21 million. From 2002, there was deliberate investment in the installation of digital networks infrastructure in many parts of South Africa, especially the larger metropolitan cities. In an attempt to provide capacity for ICT to function effectively, both in South Africa and elsewhere in the world, Intelsat Company established a commercial satellite communication network with 22 geo stationary satellites, and the undersea SAT-2 cable digital network infrastructure was installed to connect Africa, Europe and Asia.

Makau *et al* (2010: 3) stated that South Africans increasingly connected to the internet and this made it possible for them to actively participate in e-governance, web portals, public libraries with internet access, and mobile cyber facilities. Rogerson (2001) and Donaldson (2006: 344-352) make reference to deliberate investment in digital transformation by the Gauteng Provincial Government.

After having engaged with many discourses on the subject matter, it became clear to me that this study is original and that it can present a fresh perspective on the relationship between ICT, people, space and planning, and the positive and negative impacts of ICT. Although this study resulted in more questions than answers, it is my viewpoint that the study has started to build a new platform for planners and planning, and that this could ultimately improve planning in the near future, and the way we study the new dynamics of cities.

Within the context of the above, many new challenges and possibilities are emerging and this triggered many questions amongst researchers and development professions, such as: What

are the dialogues on recent emerging technologies and effect thereof on the transformation of urban space? What is the relevance of such transformations in urban space for the South African landscape? How have the new emerging technologies affected urban spaces over the past three decades?

Therefore, the aim of my study is to start to unravel these (and other) questions, emerging from the relationship between ICT and urban space. My focus is further to explore the opportunities and threats of ICT in terms of space and people, and the current trends and dialogues.

In an attempt to provide clues to the story that follows, to provide a broad overview of what to expect in the forthcoming script, and to entice the reader, the following paragraphs present a glimpse of some of the most pertinent observations: The findings in this study indicate that ICT continues to open up fresh opportunities for cities. It is clear that ICT has had and will in future have a major impact on people, human conduct and emotions, and the way in which people communicate. In addition, the study also shows how ICT, and specifically the complex nature of ICT, influenced urban spaces and urban space networks. ICT also became associated with the city beautiful movement and in particular the smart city movement. ICT and related e-economies also influenced the larger urban space economy. In addition to the above, ICT in recent years started having a major impact on urban planning and planners, as well as the e-way in which cities are planned and managed.

The study in the end also revealed a number of new e-powers associated with ICT such as the power of technology, the power of communication, and the power of the new e-technologies over people, spaces, governments etc., as well as the ways in which ICT has (em)powered people, spaces, politicians, governments and even economies.

A possible concern for me, specifically in the South African context, is that ICT is creating a new space, and new activities “in the cloud”. While we have good and bad powers on the ground or in the physical space, we might be witnessing in future possible destructive powers and undesirable power networks in the cloud. We are now moving away from apartheid in South Africa. The last thing we want to see is another apartheid “in the cloud”.

The relevance of the above for the South African landscape and the City of Tshwane will be indicated in Chapter 4.5.

This study also explored various suitable methods to execute this study, as will be discussed in Chapter 3. However, after much exploration and deliberation with other scholars, I decided to use a meta-research approach, combined with other methods such the conceptual research support approach, and a spatial analysis of the networks in the city of Tshwane. In short, the meta-research approach implies "the research of the research of others", in an attempt to extract common themes for further research. In this case, the research related to a study of discourses on ICT, and the impacts of ICT on people and space (in short). See Chapter 3 for more detail on the research design.

This first part of the journey, so far, aimed at providing the reader (and participant in this journey), with a brief summary of, and introduction to, the nature of ICT and its relationship with people, space and planning. The journey will now take us to "the problem", the rationale and inspiration for this study, whereafter we will navigate to the actual aims of this study, the core focus and the research questions that provide the road map for the rest of the journey.

CHAPTER 2:
RESEARCH PROBLEM

2.1 Unpacking the problem (and inspiration for this research)

ICT developed and expanded at a very fast pace. Because of this rapid development and expansion of new technologies, ICT started influencing people and space, in a way that was difficult for me to imagine. This problem is exacerbated by uncertainty about how ICT will further expand in the future and how this expansion will influence people, people's spaces, urban dynamics, urban space and networks, and urban planning and planners.

The emergence of ICT created many frustrations and challenges in relation to how the confusing and complex new terminologies and language have started influencing communication. There is uncertainty regarding how ICT and the related new e-technologies are affecting people, human conduct, the culture and emotions of people. As a user of e-technologies, and someone who also became completely entangled with smart phones and the internet, it was interesting for me to observe the changes in culture and identity and the ways in which people in urban space take pride in associating with new technology brands such as the i-phone, and the ability to use the (#) hash tag, in both written and spoken communication. My observation is that people also experience a sense of belonging when they connect to social media and networking groups through social media such as "Facebook" (and the many other media). The e-culture, which started to develop in many parts of the world also resulted in services becoming instantly available to people, as opposed to people having to go out of their way to find a service. A good example is the Uber taxi service and online shopping trends, online banking, online education, online dating, and online commerce.

However, as the journey unfolded, I began to realise that ICT technologies have the potential to connect people, but at the same time they can also disconnect and isolate people from opportunities and communication, e.g. isolating poor people, or people in remote rural areas, that do not have access or cannot afford access to the internet. This raised a concern and also highlighted the relevance and value of this study for planners.

As I navigated through the various readings and discourses, I found that there is also much uncertainty about the implications of the complex dynamics, properties and powers of ICT on urban space and urban space networks and that this creates a challenge for development professions and urban planners. The manner in which people connect with the internet and ICT, the pulse of the city, and the speed at which people connect, has resulted in a "time confusion" and a "time disjuncture". For instance, in addition to the instant connectivity of activities, people in urban space can actually be present in two worlds at the same time, in the same physical space.

The new illusive, invisible and somewhat mysterious spaces and networks created by ICT (commonly known as virtual spaces and networks) have also complicated the urban space networks and urban dynamics in cities. These new virtual spaces and networks raised a number of questions and concerns in terms of the dynamics and e-powers related to them and the interaction of people and information between them (see Chapter 4). It remains uncertain, for example, how the city's urban spaces function in conjunction with virtual networks and the physical network structures within a rapidly changing ICT environment.

With increases in innovations in ICT, and with more trade conducted through the internet, the urban space economy also became affected by ICT – both in a positive and negative way. ICT provides a connection (and in some cases a barrier) between people and wealth. The negative side is illustrated by the way in which levels of unemployment and poverty remain prevalent in South African cities (Reporter, 2014). Although ICT has the potential to connect people to economic opportunities, it can also disconnect and isolate people living in cities from these opportunities. It is my opinion that scholars, particularly in South Africa, are not doing enough to study the reasons for and implications of these challenges.

If we look at the rapidly changing and complex dynamics and impacts of ICT on people and spaces and urban space networks, it is obvious that these impacts and changes must have had a major impact on urban planners and urban planning in general. Based on my planning experience and also having read many readings on the subject matter, it is my opinion that the urban planning and development professions have not yet fully exploited the new opportunities presented by ICT, as well as the possible e-tools that could assist with data capturing, planning etc. The urban planning profession (at least in South Africa), has not done enough to comprehend the new e-dynamics and the new DNA of urban space and urban

space networks and the implications thereof (see Chapter 4.3). Although urban planners make use of various software solutions in planning, many of these tools and innovations are for example specifically designed for smart cities and not always suitable for developing countries. It is my opinion that we as planners should be careful not to develop a smart planning system that is too complicated to use, for instance by illiterate communities who by law have to participate in planning.

As the study and journey unfolded it also became clear to me that ICT could affect the growth of the city and the future structure and function of the city, e.g. in the way in which cities are becoming "smarter". The problem however is that we do not really understand this, and what to expect in the future. This creates new challenges for planners. Looking at the pace at which ICT and the related new e-technologies are developing and impacting on urban space and urban planning, a major concern is that perhaps the planning and development fraternity is not keeping up. My observation is that, while ICT has presented many new e-technologies in cities such as driver-less cars, electric cars, internet-based street furniture, and internet-based service delivery systems such as a smart electrical metering systems in urban space, comparable shifts in urban planning are not yet as visible (and do not keep pace), with the innovations that are emerging in metropolitan cities. There can be no doubt that new ICT technologies should be adopted in order to enable faster urban development and smart growth. If we consider the complexity that comes with the uncontrollability of ICT (e.g. through constantly mutating technologies), and the consequences thereof for urban spaces and urban space networks (and people), it is clear that ICT mutations have created spaces that hold both fresh opportunities and challenges for urban planning.

Innovations in ICT are increasingly becoming more difficult to comprehend and predict, specifically in the cyber-cities of tomorrow. If we argue that the future of ICT will become more unpredictable, it can also be argued (and this is the concern), that the future function, dynamics and experiences of cities, and the impact of ICT on city space will also become more complicated and more unpredictable. This will make urban planning and specifically strategic planning (and visioning) and longer-term forward planning more complex and challenging.

Another way to view the challenges and opportunities is to look at how the e-powers emerging from ICT and related e-technologies can be exploited, applied and interpreted to

benefit people and the development of urban spaces and urban space networks, specifically within the new virtual e-context. A concern is that it is not clear whether e-powers emerging from ICT and related e-technologies can also have a negative impact/power on people and urban spaces, or how such powers should be controlled and contained. It is my submission that planners have not yet managed to understand the consequences of the ICT distortion of power relations in urban space and how ICT powers can actually stimulate urban developmental opportunities in the interest of South African cities (see discussion on power in Chapter 4).

When looking at the overall and cumulative nature and impact of the various e-powers associated with ICT, it is obvious that these powers can improve the quality of people's lives, but that they can also destroy the lives of people. By the same token, ICT and related technologies have actually empowered people and this resulted in a situation where people now possess more powers through the internet, smart phones, social networking sites, and apps.

In conclusion, it is clear that ICT has developed and expanded at a fast pace. There has been an impact on spaces and people. In essence, there is confusion regarding how these impacts and powers, associated with these fast developing e-technologies, will influence people and spaces in the future (especially in South Africa with its unique and diverse landscape). At this stage, it is difficult to predict the impacts of this illusive and powerful phenomenon.

2.2 The aim of the research

The problems, challenges and concerns as discussed above, not only stimulated and inspired me to explore these uncertainties and opportunities, but it also refined and framed the aims of the study and the research questions as will be discussed in the following section.

Initially, when I started with this study (with a limited knowledge then on the subject matter), the initial broad aim of the study was to "study discourses on ICT, in an attempt to assess how ICT as a construct has developed during the past two centuries and how it has changed during these years, specifically the last three decades". My initial aim was also to assess what the impact of ICT was on urban space, urban planning and cities in general and in particular on a metro area such as the City of Tshwane.

However, as the study evolved, and as more information and knowledge became available on the subject matter, it became evident that this construct of ICT is a very complex and extremely dynamic system, with many different components and sub-components, influences, powers etc. As the study unfolded, I started gaining more clarity and knowledge on the structure, dynamics and complexity of ICT. This new knowledge and expanded view and understanding of the subject matter not only shaped my thinking, but also gradually and ultimately framed and refined the focus of the research (and the research questions). The aims and focus of the study, as well as the broad content of the research, after many readings, discussion, and iterations, spurred and framed the following main research question and five sub questions.

2.3 Research questions

Main research question:

What are the current discourses and dialogues on the construct of Information and Communication Technologies as far as they pertain to impact, power and relevance thereof for people, space and planning?

Sub-question 1:

What is the impact of ICT on people and people's spaces, with specific reference to communication, new and confusing lingo and terminology, human conduct and culture, and emotion?

Sub-question 2:

What is the impact of ICT on urban dynamics, urban spaces, urban space networks, with specific reference to complexity, time, networks and structure, the city beautiful and smart city movement, and the urban space economy?

Sub-question 3:

What is the impact of ICT on urban planning and planners, with specific reference to urban planning trends, discourses and tools?

Sub-question 4:

What are the e-powers associated with ICT, and how do these powers empower and affect people, urban space, urban space networks and urban planning?

Sub-question 5:

How do the impacts and powers of ICT (within the context of people, space, planning and power) manifest in the South African landscape and the City of Tshwane?

These research questions provide the structure or the script for the story and also the road map for the journey to follow. When we get to the end of our journey and when we reach our destiny (Chapter 5), I will reflect on these questions and provide answers (and possible further questions). In this chapter, I will also provide an overview of "the academic contribution of this study". However, already at this stage, when looking at "the problem" and the research questions, it is clear that the study has the potential to make a significant contribution to the body of knowledge.

In summary, this study aims to explore the current trends and dialogues on topics related to ICT, the opportunities and threats of ICT in terms of space and people, as well as the impacts (positive and negative) of ICT on people, space and planning. After having explored the impacts, I also discovered that impacts are very much associated with different powers – the power of ICT and e-technologies and the way in which it gives power to people (empowerment), government and urban spaces. As we progress, I will also, as and where appropriate, pause to show you parts of the South African landscape and the City of Tshwane, in as far as they relate to the purpose of our journey.

At this stage of our journey, I am sure that you are keen to move on to the real areas of interest (the main content of the study). However, we first have to make a quick detour to visit an important destination, namely the methodology and research process part, which informed and supported the research.

CHAPTER 3:

RESEARCH METHODS AND THE EVOLUTION OF THE STUDY

3.1 How it all began

The purpose of this chapter is to provide an overview of the various research methods that were explored for this study and the various methods that were finally selected. The chapter further presents a reflection on how I went about executing this research, as well as a reflection of my experiences, frustrations and lessons learnt.

If I now look back at where, when and how I started with this study, the context at the time, how little I knew about the subject matter, how confused I was then, it was obvious that this was going to be a complex and somewhat different study. What makes the study more complicated and challenging is the fact that the subject matter of ICT is associated by rather complex terminologies and complex and illusive dynamics, which were not always easy to understand for someone like me with a background in architecture, urban design and planning. For me, it was never the idea to unravel the technicalities of ICT hardware, software, systems, and e.g. the electronics and technicalities of cyber space, the internet and the movement of data. This obviously is the field of IT specialists. However, after having done much pre-reading for the study, and being an affected user of ICT and its related technologies, I soon realised that this new, somewhat unfamiliar construct of ICT has some influence on urban space (and planning). I soon realised and hypothesised that ICT would in future affect urban space and that this impact would escalate with the expected rapid expansion of ICT in the future.

In view of this curiosity and urge to better understand this possible challenge and "problem" (as discussed in Chapter 2), I ultimately embarked on something very different (within the context of architecture and planning), but something that later proved to be extremely relevant for planning and other built environment and development professions.

Every research project at one point will develop a series of methods that will assist in the development of findings related to its research question. This chapter therefore also presents

a discussion of the research methods that were explored, discarded and those ultimately selected for this study.

The primary research tools/methods used, as will be discussed in this chapter are: the extensive literature study; the meta-research approach, conceptual research support approach, exploratory research, and a spatial and historical analysis of spatial plans, maps, photographs, etc.

3.2 Viability test

As a first step (and as part of the initial preparation and probing process), I decided to embark on a viability test. The purpose of this test was primarily to "test the ideas" and to obtain views from other scholars and professionals in the field on their opinions on the focus of the research, the initial aims etc., and also to validate whether this study was feasible and whether indeed there was a problem to be investigated, or material for research at the PhD level. I subsequently structured a questionnaire and interview survey framework for this purpose. In some cases face-to-face interviews were conducted (with the questionnaire as the basis) in order to test the viability of this research. In other cases, respondents preferred to complete the questionnaire at their leisure. The sample that was selected to be interviewed included experienced urban planners from around the Gauteng province. This sample allowed me to probe when answers were not clear. The findings were positive and supportive of the study. The comments also provided some direction and ideas for the research. All urban planners interviewed conceded that there was a problem worthy of investigation, within the field of ICT and urban space. See Annexure 1 for an example of a completed questionnaire.

Other scholars who have argued for viability tests include Yin (2009) and Rowley (2002: 21). They argue that a research project was valid if the collective evidence obtained from a multitude of resources was used in order to construct patterns of evidence that are anticipated to reveal common findings. Yin (2009) and Rowley (2002: 21), in support of the above, state that research is viable if it can explain the findings chronologically over a number of years. Research findings must be grounded in theory. In the unexpected event that another independent scholar undertook the same study, the same results should be obtained.

3.3 Readings and literature (and the structure of the research and the story)

During the course of the study, as I navigated through the various, often rough, terrains, I read and analysed various published and unpublished research articles, accessed and explored various online searches by Google and Google scholar, e-journals, working papers, blogs, social media (Twitter, Facebook), web sites, videos, scholarly books, news on radio and television as well as online newspapers, photographic observations, historical maps, policies and also plans in e.g. Tshwane.

The biggest challenge for me when I embarked on my journey and even as the study evolved through the initial phases was to "make sense of everything", to actually frame and define the subject matter, and to explore and "find" the structure and focus of this study. This made it challenging for me to find the most suitable and appropriate set of methodologies for the study, given the unique and complex nature of the subject matter and the study. This just indicated that more reading was needed, more explorations, consultations…and thinking. What was interesting and exciting about the study, was the way in which the structure and focus (and the actual construct or subject matter), became clearer to me, as the study unfolded during the phases/years. To this end, the conceptualisation, analysis and writing of this script was very much an iterative process, as I moved forward, backwards, sideways, and sometimes in circles.

Based on the complexity of the study and the large volume of material that emerged, I devised a framework (and a number of themes) to guide the content and focus areas of the study. Scholars such as Huh (2001: 116) also undertook research by developing a framework, and then filtering common themes. See also the work by Ewing & Cervero (2010: 5) on meta-research that emphasises the need to extract common fresh themes from discourses. Huh (2001: 116) also states that selected themes include "the pattern of flows, measurement of distance", the "hierarchy of controls", and the levels of "spatial independence". As part of the framework, I ultimately categorised the data and discourses into different themes and landscapes, which formed the basis for the analysis part of the study, see also Chapter 4. These themes also provided the framework for the whole study, the structure of the "story" and the road map.

3.4 Historical spatial mapping and tools used for analysis

During the initial phases of the study, there was a strong focus on analysing the history of Tshwane, and how ICT, during the past two centuries, has changed the spatial form in the city. As part of the framework, various maps were arranged in chronological order. In addition to the above, I used digital maps, archaic maps, maps from the University of Pretoria's GIS library, National Library archives, Tshwane's Geographic Information Systems Resources, maps obtained from urban planners in private practice, photographs from documents, historical documents, and annual reports. Some of the historical maps were scanned and geo-referenced into the Geographic Information System program and then redrawn to the most accurate reference point. In the case of Tshwane in particular, I attempted to analyze available spatial data over three (3) decades and made some inferences about the effects of technology events that have happened over time and in urban space (see findings in Chapter 4).

It should be noted that, prior to this PhD study, I also explored (as part of my master's study in Urban Design in 2005, at the University of Cape Town), the changes and transformation of urban space in the City of Cape Town. While this was not in the context of ICT, it did provide some understanding of the changing urban dynamics in urban space.

Furthermore, within the conceptual research umbrella, I traced the historical paths of events associated with technology, or the way in which technology has influenced urban space and urban space networks. Masucci, Stanilov & Batty (2013) also explored alternative ways of testing networks using the historical method. They analysed the growth, among other cities, of London's networks for 224 years by using graphs to interpret the data obtained from geometry.

Scholars such as Leedy (1989: 125), and Leedy & Ormrod (2009: 164), also argue that qualitative historical approaches can support the meta-research approach as will be discussed in the following section.

Historical research methods in conjuntion with theory were also used by Batty (2003) in a research that looked at the characteristics of, and relationship between the component parts of the city over a period of time. He was able to craft the argument that there was a rate at which

new cities were forming, and old cities were disappearing, which needed to be documented and monitored. In short, the historical research method provided an understanding of the pace of the historical development of the city structures and spaces.

The advantage of historical mapping for this study was that it assisted me in identifying the cause-effect patterns in the network space of the city of Tshwane, and facilitated the answering of the "how and why" questions. The historical research and the interpretation of historical maps also made it easier for me to identify patterns from sequences of activities over a period. These historical references and trends provided some understanding of how the different forces and innovations over time have influenced urban space and cities in general.

As part of this study, I proceeded to sieve the tools that would be needed for effective research in the area of ICT and urban space. One such tool was the Geographic Information System (GIS) software that was used to extract quantitative information from the maps of Tshwane, e.g. with regard to scale, length of roads, densities etc. The GIS also enabled me to present information and even graphic illustrations, of how urban space has changed over time within the ambit of innovations in ICT in the City of Tshwane.

Batty (2003) used GIS in the CASA working paper 63 publication *"Network Geography: Relations, Interactions, Scaling and Spatial Processes in GIS"*. In Batty (2013) the use of GIS assisted in the analysis of lines and points in the network space, and indicated how the development of networks was a dynamic process ascending from the parts (the bottom) to the whole (the top). For me, GIS was useful for the study, but only to an extent, in the analysis of the Tshwane maps.

The smart phone and computer were also essential in enabling me to access real time data on Google, Google maps, "tom-tom", and the apps data on a daily basis. These tools provided me with an understanding of the experience, capabilities and power of these tools (within the context of this study). The use of the smart phone and the internet also assisted me to understand the extent of e-life referred to in Chapter 4, as well as the emergence of e-powers referred to in section 4.4.

Lastly, the art of personal observation also served as a thematic area. The ability to observe the urban environment enabled me to keep a record of the infrastructural changes in South African cities and this was very critical. The consequence was that, from 2009, I was an

active participant in urban space, observing the various network constructions implemented simultaneously to ICT technologies. The connection between what was observed and what was trending on my cell phone on social media platforms and activities such as cell phone banking, was foundational to the critical informative data analysis that emerged.

In some ways, I was very much "a participant observer", as I also participated in many of the interactions and communications on internet, Wi-Fi, and an active participant in the e-activities in space – both the physical and virtual spaces. See also Coetzee (2005) on participant observation as a research method for analysing transformation.

3.5 The meta-research approach

The use of meta-research methods is often associated with a researcher who intends to do research on existing research. In this case, my intention was mainly to read published journal articles, unpublished scholarly articles, and completed PhD studies and research reports in the area of ICT and cities. I subsequently analysed various PhD studies that focused on a similar or related focus area as that which is presented in my study, namely the impact of ICT on urban spaces, cities etc. In the end, by using other PhD studies, I was able to reveal and reflect on some underlying factors that informed the impact of ICT on urban space, people, the economy and urban planning in cities. The titles of the following studies indicate the relationship and associations with the focus of this particular study:

- Incorporating the Impact of ICT on Urban and Regional Planning by Juha Talvitie (2009) linked to PhD study at the Helsinki University of Technology in Finland in 2003.
- The Impact of Technological Innovations on Urban Spatial Structure by H. Filiz Alkan Meshur (2013), PhD Faculty of Engineering And Architecture, Department of City and Regional Planning, Selcuk University in 2006.
- Planners' Attitudes Toward the Spatial Impacts of Information and ICT by H. Filiz Alkan Meşhur, Selcuk (2013) PhD Faculty of Architecture, Department of City and Regional Planning, Konya University.

- The Impacts of New Technologies on Urban Transformations by Antigone Katsara (2008) Department of Planning and Regional Development, University of Thessaly, Volos, Greece.
- The Spaces Between: ICT And Marginalization in the South African City by Nancy Odendaal (2010) Ph.D. University of Witwatersrand, Johannesburg, South Africa.
- Urban Form and Planning in the Information Age: Lessons From Literature by Da-Mi Maeng, Zorica Nedović-Budić (2008): Paper written for the Spatium Journal.
- Information Technology and Urban Form: Challenges to Smart Growth by Ivonne Audirac (2005) Department of Urban and Regional Planning, Florida State University.
- Beyond Connectivity: The Impacts of Social Media in Urban Development in Puerto Ayora, by Laura Pinzón in Ecuador (2013).
- The Effect of Information and ICT on Urban Structure by Yannis M. Ioannides, Henry G. Overman, Esteban Rossi-Hansberg And Kurt Schmidheiny (2009) Tufts University, London School of Economics, Princeton University, *Universitat Pompeu Fabra.*

According to Spinunit (2016), meta-research refers to the investigation of how spaces, people, and the data they produce interact with each other and how this recreates the experience of the spaces.

Ewing & Cervero (2010: 5), refer to various other studies that have used meta-research in urban planning, namely: “Babisch 2008; Bartholomew & Ewing 2009; Bunn, Collier, Frost, Ker, Roberts & Wentz 2003; Button & Kerr 1996; Button & Nijkamp 1997; Cervero 2002b; Debrezion, Pels & Rietveld 2003; Duncan, Spence & Mummery 2005; Graham & Glaister 2002; Hamer & Chida 2008; Lauria & Wagner 2006; Leck 2006; Nijkamp & Pepping 1998; Smith & Huang 1995; Stamps 1990, 1999; and Zhang 2009”.

Ewing & Cervero (2010: 5) also argue that the meta-research method is used to compare and contrast a number of different studies into a single research project. For example, the proposed process is that all relevant available literature is first collected and then common themes are derived from both published and unpublished literature. In the end, this creates a fresh integrated sample of research for analysis.

According to Crombie & Davies (2009), the meta-research method involves the evaluation of various studies that answer a common question. This approach is similar to the process I followed. I also sampled a number of PhD studies that had the same or a similar research question (see Chapter 4).

Other scholars such as Thomas & Bertolini (2017: 4) also argue that the meta-research approach can be used used for the comparison of various illustrations in order to obtain common themes and to highlight any contrasts that may emerge. Furthermore, the approach by Thomas & Bertolini (2017: 4) suggests the use of both qualitative and quantitative data in order to present a combined view. In support of this position, Leck (2006: 42) also states that the use of the meta-research method is also vital for combining similar research questions from different studies to form new research areas.

In contrast with the above, Bartholomew & Ewing (2009: 5) are of the opinion that the preconditions for using the meta-research method are that the new research must *"(1) aim to be empirical (2) be conceptually comparable, (3) contain quantitative data (4) be encodable, and (5) aim to be configured in statistical forms."* This, in my opinion, is in contradiction to what other scholars have argued. Perhaps the views of Bartholomew & Ewing (2009: 5) are applicable to empirical studies and more quantitative studies, but this is not applicable in the social science or to the typically qualitative nature of this research.

However, further studies such as that by Worthington (2013) reveal that the meta-research method is an American research style for undertaking a systematic review of literature. In this case, a systematic review implies the combination of pieces of evidence from various studies in order to draw unbiased inferences and conclusions that will further enhance research. This description of the meta-research method captures the essence of the process that informed my study.

From this discussion, therefore, it is evident that the meta-research method was most appropriate for the aims of this unique study.

3.6 Conceptual Research Support

It is essential to note that the meta-research method was also supported by another method, which is the conceptual research approach. The reason additional approaches were adopted was the complexity and scarcity of data.

By definition, the conceptual research approach becomes useful when the nature of the problem cannot be completely resolved through empirical evidence, as was the case for this study. The conceptual research approach therefore enables the combined use of *"theory, philosophy, psychology…, imagination, fantasy",* and extensive use of images for representation and symbolism (Robey & Bakersville, 2012 and Monette, Sullivan & Defong, 1989: 34). It was largely based on this approach, that so much effort was put into the study to identify, conceptualise, visualise and imagine possible areas for interventions, questions that needed attention, actions that needed to be addressed and completed, and lastly new specific areas for research.

At the end of each section in Chapter 4, I presented a few questions to ponder and future images. The purpose of these questions is mainly: (1) to present some findings, but stated in a different more simple manner (less empirical), and in the form of a question; and (2) to challenge the reader to think beyond this study and each of these themes; (3) to encourage action on a specific issue or question in search for answers; and (4) to stimulate further research. I believe that these questions and images already began to shape and inform the contribution this study intends to make.

In certain sections of this study, attributes of the conceptual research approach, such as the reinterpretation of existing theories, use of assumptions as well as the use of imagination will be evident. Suffice it to state that this study dealt with forces and powers that are not visible to the naked eye, which demanded that imagination, and emotion, came into play in order to enrich the data used. In this way, the conceptual method supported the meta-research method.

Viewed through the conceptual research lens, therefore, theory can be used to provide explanations for the complex urban structural systems. In this case, I was not obliged to have empirical evidence to support their position. In addition, the use of theory can serve as a backdrop to explain the relationships between e.g. networks and power. It was within this

context that I explored some theories relating to the subject matter, e.g. some theories of Hegel, Marx, Foucault and Habermas.

3.7 Discarded Methods

3.7.1 The case study

Initially (when the study was conceptualised), I intended to use Tshwane as a case study. Various scholars have presented the view that a single case study method is used in circumstances where the scholar has little control over the events and when the central questions are "how" and "why", rather than "how much" and "how many" or "where". Said differently, this method is used when there is a question that needs to be answered (Yin, 1994: 4; Rowley, 2002; Crowe, Cresswell, Robertson, Huby, Avery & Sheikh, 2011; Neale, Thapa & Boyce, 2006).

The decision to discard the case study as a method is in contrast to other scholars who have argued that case studies increase the success rate of a research project. A good example is the research on "Macro and Micro Dynamics of City Size Distributions: The Case of Israel" by Benguigui, Blumenfeld-Lieberthal & Batty (2008). Their research presented evidence that the questions "how and why" provided the success factor for the research. Additionally, they revealed that the combined use of historical methods and case studies increased the research strength and they therefore mapped a ranking of cities over time using population data between 1950 and 2005 using the "rank clock" software.

Yin (1994: 13) also argues that a case study is used to "focus" on a single object while ignoring its complicated context. In support of the above scholars, Tellis (1997: 3) also argued that a case study actually provides the balance between "problem, investigation and solution". In addition, Duminy, Andreasen, Lerise, Odendaal & Watson (2014) argue through a series of discussions from Ghana, Malawi, Nigeria, Uganda and South Africa that the best way to ensure theoretical robustness and practicle applicability of research is to use the Case Study method.

However, as the study evolved and as the focus became more clear, it soon became apparent to me that it would be too difficult to effectively execute a case study of Tshwane, mainly

due to the focus of the study, the complex nature of the subject matter and the limited information on Tshwane (in the context of ICT).

In view of the interest and relevance of Tshwane as a metro region in the South African context, I thus decided to keep Tshwane as part of the study, not as a case, but rather as an example or point of reference, and also "a space" where typical ICT challenges in a typical metro urban region in South Africa, can be illustrated.

3.7.2 Mathematical models

I also explored many other methods, such as models. Models are typically used in research to test discourses in various contexts (Darke, Shanks & Broadbent, 1998: 275). The use of models in ICT related research is demonstrated for example in the Land Use Transportation models (LUT), Integrated Urban (IU) models, Integrated Assessment (IA) models, Cellular Automata (CA) models, Agent Based Urban (ABU) models (ABM) and Modelling Urban Morphology as used by the Centre for Advanced Spatial Analysis (CASA) (Batty 2010). In South Africa, Cellular Automata models have also been used under SLEUTH (Slobe, Land, Exclusion, Urbanisation, Transport, Hillshade) to test whether spatial inequality in the City of Johannesburg could be bridged (Wray, Musango, Damon & Cheruiyot 2013: 43). In addition, a Cellular Automata urban change model of the City of Johannesburg was developed by Dr Abu-Taleb who monitored urban growth from 1995 to 2010 and then simulated the growth to 2030 (Wray, Musango, Damon & Cheruiyot, 2013: 47).

The use of models however incorporates the adoption of symbols to represent sets of information and relationships and impacts. Initially, when I still considered the use of models and symbols to illustrate relationships and impacts, the following symbols were created for the various components of this study:

- **δ:** the mathematical symbol for change (called delta)
- ∞**(** the symbol for direct proportion
- **δTt:** the symbol representing the change in the network web as a result of innovations in ICT

- **δTict:** the symbol representing the change in the network web as a result of innovations in communication technologies (telephones and computers and the internet)
- **δC:** the symbol representing the texture and form of the network web structures based on the grid
- **δP:** the symbol for political power.
- **δC:** the symbol for changes in communication technology
- **δW:** the symbol for networks

It soon became clear to me that the symbols above would not carry any meaning unless extended into an equation, such as δP. Such equations made the text (which was already complicated by the ICT language), too complicated and confusing. I also argued that (within the specific focus and content of this study) the use of symbols and mathematical equations could potentially have caused more harm than good in communicating the findings of my study.

In conclusion, therefore, the primary method that informed this study is the meta-research method. The meta-research method was also supported by the conceptual research support methods, as well as the spatial analysis of historical maps and photographs of the City of Tshwane.

3.8 The author, the story and the journey

Because of my personal relationship with this complex study and also the particular nature of the study, I opted to present the script as a narrative or story. This implied that I had to write the script in the first person as the narrator or person telling the story. According to Coetzee (2005: 35), and (Lewis, 1998 and Watson, 2001), in Coetzee (2005: 35), *"this style of writing, with its variations and story lines also has the potential to provide a friendlier and more effective way of communicating the facts (and the story) to the reader"*. Coetzee (2005: 35) also gives various examples of academic studies that were written and presented in the narrative style and the first person and the value of this style of writing academic scripts.

As stated in the prologue, this story will also be presented in the form of an odyssey, a journey and exploration. For me this study was an odyssey into different spaces. Using the metaphor of a journey made it possible for me to present this complex story and journey in an appropriate, interesting and understandable manner.

The limitations in this journey were the available software for ICT research, funding, limited time as per the university regulations for the completion of the study, and funding.

Now that we have covered the introductory and procedural paths and parts of the journey, it is time to move on…to the more exciting and "deeper" parts of our journey, and the actual parts that deal with ICT and its impact on people space and planning.

CHAPTER 4:

DIALOGUES ON ICT…AND THE IMPACT THEREOF ON PEOPLE, URBAN SPACE NETWORKS, URBAN SPACE ECONOMY AND URBAN PLANNING

After having read many journal articles and both published and unpublished scientific material on a wide range of topics related to the subject matter, and after many alterations and thinking, I devised a number of common themes and sub themes, which frame some of the major dialogues on the subject matter and also the landscapes of our journey, see Table 1.

Table 1: Table indicating the main themes and sub-themes that frame the study

MAIN THEMES	SUB- THEMES
4.1 Impact of ICT on people and people's spaces	4.1.1 Communication, new and confusing language and terminology
	4.1.2 Human conduct and culture
	4.1.3 Emotion, privacy and personal safety
	4.1.4 Some questions to ponder and images for the future
4.2 Impact of ICT on urban dynamics, urban space and urban space networks	4.2.1 Complexity of e-interactions in the urban space networks
	4.2.2 Time, speed and pulse of e-activities in urban space networks
	4.2.3 Networks and structure
	4.2.4 City beautiful and smart city movement
	4.2.5 Urban space economy
	4.2.6 Some questions to ponder and images for the future
4.3 Impact of ICT on urban planning and planners	4.3.1 Urban planning trends, discourses and tools
	4.3.2 Some pondering questions and images for the future
4.4 The emerging e-powers associated	4.4.1 From ICT e-impacts to e-powers
	4.4.2 The e-power over people and people's spaces

MAIN THEMES	SUB- THEMES
with ICT, and the constructs in 5.1, 4.2 and 4.3 above	4.4.3 The e-power over urban space and urban space networks
	4.4.4 The e-power over urban planning and planners
	4.4.5 Some questions to ponder and images for the future
4.5 The reality and future possibilities for South Africa and a metro region such as the City of Tshwane	

(Table compiled by author)

In the following chapter, each of these themes and sub-themes will be unravelled in terms of the dialogues of scholars, with specific reference to possible effects and/or impacts on people, space, and planning.

On this part of the journey, I will frequently, as and where appropriate, point out some prominent features of the South African landscape and also the City of Tshwane. The story to follow will also unpack the challenges for development professionals and the possibilities for the future.

I am fully aware that various other disciplines, such as Law, Sociology, and Psychology (to name a few), could and should also be engaging in a study of the possible impacts of ICT on people – from the different perspectives. My story however, is specifically concerned with the impact of ICT on people in terms of potential spatial development, investment in space, or the development and understanding of people within the context of urban spaces. It is within this people/space/planning landscape that I decided to (through an exploratory investigation and meta-analysis of discourses), flag areas that seem to be important and those that need more investigation and research.

As we move and progress though the various landscapes (themes), I will also demonstrate how the impact of ICT culminates in different powers. I will talk more about this in Chapter 4.4.

4.1 Dialogues on ICT…and the impact thereof on people (and people's spaces)

This part of the story (Chapter 4.1) will lead us to three thematic areas where ICT has had an impact on people. The first area presents aspects of communication, specifically the emergence of new language and new terminology, the second area focuses on human conduct and culture, and the third area on the impact of ICT on the emotions of people.

4.1.1 Communication, new language and terminology

Let me share some knowledge and discourses from other scholars and start with the impact of ICT on communication.

During the past few years, ICT has spawned almost a new language, a new way of communicating, and a plethora of strange and new terminology. This had a major impact on the way in which people communicate and behave. This confusing new language and new terminology had a major impact (positive and negative) on people, specifically those people who are not so familiar with ICT and for which ICT is not that accessible. For these people this new language and style of talking and writing created frustration and confusion. What I am observing though, and something that concerns me, is that for those more fortunate and those actively involved with these technologies, the new language became some sort of a trend – and almost a second language. As I navigated and travelled through the large volumes of literature I was amazed to see, and also confused by the plethora of neologisms and buzz words that are being used to refer to cities and spaces.

Many new names emerged for cities such as the Global City, Eco-city, Smart City (Watson, 2015: 36, 37). The use of the words "Smart" and "Intelligent" increasingly became part of ICT jargon (Datta 2015: 10). As a result of new technologies and trends, a large number of new words related to cities and urbanism were created, *viz:* Dubaisation (Abaza, 2011), Uberisation, Assemblage Urbanism (Brenner, Madden & Wachsmuth, 2011), Technocratic Nationalism (Datta, 2015a), Technocratic Urbanism (Datta, 2015a: 49), Speculative Urbanism (Goldman, 2010), Cyberjaya Intelligent City and the Putrajaya Intelligent City in Malaysia (Bunnell, 2015). Others also include Dholera in India, which at different stages has

been referred to as the Knowledge City, Global City, Eco-City, and Smart City (Datta, 2015: 12).

Meshur (2013: 477) also lists other new names such as "Telecity", which refers to a city functioning through Tele-Systems for living, working and playing. Kasarda (2000) refers to the "Aerotropolis", which is a city that is characterised by airport centred industries and high-tech industries that cluster around an airport. Horan (2000) refers to "Digital Places", which are associated with the emergence of virtual spaces, detached from physical spaces (see also Özdemir, 2014: 8). Reference is also made to concepts such as "computer city, plug-in city, cyber city, fibre city, software city, wiki city, wired city, and digital city" (Arribas-Bel *et al*, 2015), and the e-city or smart city (Paskaleva, 2009).

Apart from these many new concepts, I also picked up a number of others that relate to specifically urban spaces, namely the "TeleVillage" used in the United States, the "Electronic Village Halls" used in the United Kingdom, the "Telecities network" utilized in the European Union, the "Technology Corridor" used in Singapore, and the "Multimedia Super Corridor" used in Malaysia (Graham & Marvin, 1996; Huang, 2012: 42). Floridi (2007: 59) refers to the "infosphere", which associates with spaces of information, and Byrnes (2015: 61) refers to participatory urbanism.

Foroozan & Foroozan (2014: 176-178) also use the term "e-life" referring to the electronic nature of the spaces in which people live, work and play. Within this "e-context", similar references are being made to amongst others the "e-organisation", which refers to the systems in urban management such as legislation and policy and, "e-power", which refers to the government and administration and the e-relationships and communication between the state and its citizens and business (see Chapter 4.4 on e-power). I would like to mention at this stage of my journey that I was quite intrigued by the various ways in which the prefix "e-" was used by many scholars (referring to the electronic or ICT nature of certain concepts), and hence borrowed and applied this to various other concepts, which will I will present later on.

In terms of new language in verbal communication, ICT has also changed the verbal correspondence style of people. For instance, Mitchell (1996: 10) highlights that individuals who associate with the internet utilise a digitised coded dialect in order to interface with data. People are increasingly starting to speak like robots.

All over the world people are talking a different language and they are using a huge number of new and very strange terms, words and symbols, such as: tweet, twitter, SMS, WhatsApp, etc. and people would frequently talk in these contexts with statements such as "like me," "follow me", "WhatsApp me", " tweet me". Incidentally, I also started speaking like this, and it makes me wonder how this will influence the way we speak in future.

In South Africa, the symbols # and the "must fall" became part of the verbal communication lingo in cities with the code # preceding and the phrase "must fall" ending a variety of statements. A good example is the recent (2015) #RhodesMustFall movement, followed by the #FeesMustFall in October 2015.

I was amazed to note how many new cyber space online forums are being created in South Africa. Some of these are: #askMmusi hosted by the Democratic Alliance political party leader on 13 May 2015 (Twitter, 2016), and #AskRamokgopa by the Mayor of the City of Tshwane held on September 4, 2015 (Kgobokoe, 2015). Social meetings also became digital, for example the *Digimbizo's*. These *"Digimbizo's* was led by #AskRamokgopa utilizing Twitter, Facebook and video via Tshwane Wi-Fi TV (Tshwane, 2015). The term *Digimbizo* emerged from the combination of the words *Imbizo* (a Zulu word meaning a gathering of communities and leaders) and the prefix *digi* taken from digital.

On 23 March 2015, *Digimbizo* reported a participation of approximately one million people (Skelton, 2015). Internationally, the Arab Spring movement also used new buzz words and ICT technologies to manipulate power relations in cities (Michel, 2013).

Apart from the new language, ICT has spawned a whole new e-way of communication and a new communication culture, which is effective, powerful and fast. ICT and the use of internet, PCs, and smart phones have made communication much faster and effective. It was partly the extreme speed of this developing technology that frightened me and inspired me to consider the future impacts of these technologies. The provision of free Wi-Fi hotspots in various parts of the city and the distribution of cell phone networks in most parts of the world have made it possible for people to connect anywhere and anytime and this facilitated and enhanced communication between people across the globe. This type of communication not only played a major role to connect people, but it had a major impact on the economy, education, medicine, research etc., and the way in which cities and spaces in cities are functioning (more about this in Chapter 4.2.).

Pinzon (2013) researched “how online networking influences power connections around urban space” in Ecuador. This research indicates how social networking has an immediate bearing on the way in which individuals connect and associate in urban space. The internet in Ecuador has improved correspondence and connections between individuals. In Ecuador, physical spaces and digital spaces became important “assembly points” for activists who wanted to draw in universal support for a particular issue, in an attempt to challenge local decisions and oppression (ibid: 16). Facebook, Twitter, Messenger, and the SMS also assisted with the democratization of urban space through helping individuals to gather at specific places. Examples of this (ibid: 21) in Equador, is the "Un Cambio Por La Vide: UCPV-a change forever" which played a major role to attract people and to connect people at a specific gathering.

As I explored and unravelled the various readings and discourses, I came across two extremely relevant PhD studies, namely that of Talvitie (2003) and Meshur (2013). Both these scholars indicated the relationship between ICT and communication and the ways in which e-communication changed government and leadership structures. For me, it became obvious that the emerging e-technologies and the way in which they impact on people and communication, imply that people have more opportunities to communicate and to connect, both in cyber space and in physical space. Talbot (2016: 1) also refers to the increase in emphatic urban societies and to how internet usage has made space for sharing, planning, and engaging in a way that makes it hard to “assault” or “close down” the internet. Assertive urban societies give credit to the electronic administration that fortifies the relationship and communication between individuals and government (Ramana, 2016: 75). Taipei, for instance, presents the TapeiCyberCity, UI-Taipei, WiFlyTaipei, which daily communicate to individuals through remote systems, and e-administrations (Huang, 2012: 47).

Castells, who in my opinion did ground breaking work to unpack “the network society”, refers to this new era as the making of the "fourth world", which comprises of prohibited, detached, non-proficient, and un-financed individuals living in spaces of exclusion (Sheerwood, 2016: 16). These perspectives show that it remains difficult to connect people, to integrate societies and to achieve a democratic space.

Let us pause for a moment and reflect on the journey so far. Yes, it is a strange territory, but we certainly observed the effect of ICT on communication, and the influence of this

communication on people and organisations. It is clear that attribution of new names and terminology related to ICT is implausible and somewhat strange and unfamiliar. In many ways, the new language has made some people more powerful as it enabled them to communicate in a specific, powerful and faster way. For others, and again this is one of my concerns, for those that do not have access, and those not familiar with the technology and new lingo, the e-way of communicating created frustration and made it difficult for people to engage with society and to compete.

Whilst so much effort is made to create new jargon, it is my opinion that not enough effort is made to actually understand and refine the language and technology and the opportunities presented by this technology. In a country such as South Africa, it will become imperative to simplify the challenge of ICT and perhaps to speak a language that appeals to everybody, and a language that everybody can understand, specifically in this divided country. This however will require major efforts and capacity building in all sectors and at all levels.

It was interesting to look at how communication culture has changed in recent years in South Africa – both verbally and physically. In 1864, there were information and learning streams that emerged at the same time as the construction of the post office (SAHO, 2015). In addition, by 1876, innovation of the first landline phone largely advanced communication and enabled people to communicate over a relatively long distance (Telkom, *n.d*). In terms of the physical space and behaviour of people in this space, the post office buildings, technological innovation of the radio, and technological innovation of television broadcasting radically changed space, and human behaviour. Although these technologies had a major impact on spaces and human behaviour, the way in which people communicate, behave, the social structure of communities etc., this impact seems relatively minor when compared to that of the more recent technologies on the way in which people communicate.

The government transformation in South African in 1994 presented an opportunity for the South African government to invest in the development of ICT with the intention to place South African cities back into to global arena. Web portals, libraries, digital labs, telecommunications service centres, multi-functional cyber centres, and portable digital offices were installed in South African urban spaces.

By the new millennium, South Africa's eight metropolitan cities have invested substantially in new technologies and specifically ICT infrastructure, so much so that these metros are

branded as wired, or digital, cities. Ekurhuleni Metropolitan Municipality, for example, has a Digital City Strategy. It is my opinion that the future efficiency of South African metropolitan cities will largely depend on how these cities exploit and adapt to the opportunities presented by ICT, also taking into account the pace at which ICT develops. I also want to emphasise that South African cities in future will have to take cognisance of the particular post-apartheid urban challenges and the ways to address these challenges, with specific reference to poverty alleviation. I will further elaborate on this later on in Chapter 4.2.4 and 4.5.

E-communication also created the opportunity for government to connect with impoverished people in both urban and rural areas. In South Africa, with its extreme diversity, segregation and poverty, this certainly has created numerous opportunities, not only for government to communicate with its people, but also to use ICT and novel communication technologies to empower and educate people. The challenge in South Africa, however, is that the majority of the urban poor do not have access to these to these resources.

As we know, municipal administration and planning, government and administration in South Africa is concerned with the strengthening of community-based participatory planning and democracy. As stated by the South African Department of Telecommunications and Postal Services (DOC, 2013), e-administration has three parts:

- E-organization: the connection of government to government (G2G),
- E-administration/society: the connection between government and community (G2C) and,
- E-business: the link between government and business (G2B).

I also noted that other government investments included the Eastern Cape Province's Department of Cooperative Governance and Traditional Affairs (COGTA), and the United Nations Development Program (UNDP), which executed an e-administration model to improve communication (UNDP, 2007). I also picked up other examples in the Western Cape such as e-administration procedures and e-governance strategies that aim to advance community-based planning in the Western Cape (WCG, 2012).

According to Slum Dwellers International (SDI) (2012), some visible ripple effects of how ICT has changed communication include the introduction of electronic Community-Based

planning processes applied in the upgrading of informal settlements. In one particular instance the SDI movement, instead of waiting for government to perform, used e-communication to mobilize their communities, to upgrade their settlements, to upgrade their infrastructure, to apply for government subsidies, to improve their security, and to negotiate with the government for land ownership (SDI, 2012).

The opportunities that ICT presents to community-based planning in the upgrading of informal settlements also makes developments and actions more visible. With the emergence of new ICT software, organized communities also have opportunities to hold government accountable to promises made. Specifically, the level of commitment in reaching out to the urban poor through ICT in governance is an indicator of how ICT can transform South African urban spaces.

As I continued to explore more, I became convinced that the way in which ICT has influenced communication in South African cities has potentially created two sets of people, namely the set that understands the coded language and new terminology, and the other set that does not understand this. Similarly, another two sets of people are the set that has access to such technology and the other set that does not have access to such technology. In both these groups there could be those who are completely informed and know how to use the technology, and those who do possess the technology, or have access to it, but do not know how to use it. I like to refer to this as the double-edged sword or "the divide", and will talk more about this later on.

On a positive note, I was relieved to note how ICT has the opportunity to connect people and institutions and how it can improve communication, learning, business and the way people negotiate. My concern however is that the millions of South Africans that do not have access to ICT, or those that do not have the skills to access ICT, or the skills to use the technology are still disconnected and cannot communicate in this way. The problem in my opinion is that that, the more ICT develops, the more it becomes the norm of daily life and communication and learning…and the more the disadvantaged people are cut off and isolated from the system and reality, the more they will perish evermore. This is a crucial aspect, which needs to be addressed by government leaders, city leaders and development professions, specifically in South Africa, where there are backlogs and challenges in specifically the remote impoverished areas.

As I studied and explored the impact of ICT on communication, I became exposed to the powers of ICT and how this has enabled communication. I will speak more about this in Chapter 4.4, when we look at powers in more detail.

Now that we have looked at communication (still part of the people's landscape), we can move on to explore the impact of ICT on human conduct and culture. I was often confronted with the question: Why so much focus on people if this journey is primarily about ICT, space and planning? My answer to this is simple, namely that planning is ultimately about people and for people, but we should also not forget that people make up the spaces we plan, and said in another way, spaces and networks (as will be discussed later on), influence the way in which people communicate and behave, but this will become more clear as we move on.

4.1.2 Human conduct and culture

Closely related to the aspect of language and terminology, as discussed in the previous section, is the way in which ICT and its communication(s), have impacted on, and influenced human conduct (and human behaviour), human culture, and also the way in which it presented challenges and opportunities to people from all walks of life.

If I look at myself and the people around me, it is obvious that cell phones, email, internet, cell phone software, apps, etc. have largely changed human conduct and human behaviour. A simple illustration is the way in which people in coffee shops would work on laptops and cell phones wearing earphones etc. The various, often vary complicated, options presented by cell phones and the internet have had a major impact on the way in which users make decisions on how to access information, and how to use information appropriately. These options often create confusion and frustration amongst users, who do not find what they were looking for on the net. This spurred technologists and users to explore other and alternative ways to access information or to improve the technology.

In recent years, ICT and the related cell phones and computers, all linked to the internet, have created many opportunities for individuals to interact, through e.g. Social Networking Sites (SNS) such as Facebook, Twitter, LinkedIn, Pinterest, Google+, Tumblr, Instagram, and others. It is within these spaces, where people have freedom to express their views, where they can share new knowledge and meet new people and where they can interact with people in various ways. This networking and social interaction impacts significantly on human

behaviour and it is expected that this impact will increase in future in various ways, which cannot be predicted or even visualised at this stage.

Individuals in urban space are not only observers but also 'journalists' and participants. Individuals continuously look for the chance to record data that brings fame or fun. People are continuously searching the net to explore and to browse interesting, valuable and/or even distasteful data and footage. Viral videos are increasingly circulating in urban space and in cyber space. While these videos have major benefits in terms of education and recreation and entertainment, my concern is that such viral videos most often spread distasteful footage and information, such as nude sexual movies or scenes of harassment and crime, or just sick humour. The problem is that it has become difficult to control and filter such content, and as can be expected, this type of communication has major impacts on people and human conduct in particular. Mandarano, Meenar & Steins (2010: 125) also point out this change in human conduct by stating that there is a growing national news-casting culture, where people record and circulate activities through ICT in a viral way.

According to Huang (2012: 59), ICT has caused not only a 'faster' or more dynamic human culture, but also a somewhat more unusual culture. Brooks & Longstreet (2015: 1) and Guan, Subrahmanyam, Linares & Cheng (2015: 1) affirm that cell phones have removed the requirement for eye-to-eye, or face-to-face meetings and collaboration in physical urban spaces. However, my observation is that virtual space has also increased the need for individuals to meet. Servon (2002: 225) further contends that innovation has not only supplanted eye-to-eye contact, but also serves as an impetus for urging connection. The more individuals interface, the more they will meet. In support of this, Blinka & Mikuška (2014: 1) argue that internet games and multiplayer internet amusements also have an effect to the change in human conduct. Gaming sites report high-net revenues and add to the lessened enthusiasm for face-to-face entertainment. It is also interesting to note in a similar vein, how shopping and specifically in-person shopping has expanded through the extension of shopping centres (Chant & Goodman, 1999: 248, and 255).

Seeburger (2012) researched the "Experience of People in Urban Public Places through Mobile Mediated Interactions", and specifically examined the connection between human conduct through emotions, ICT, and urban space. Seeburger (2012: 88 - 90) further demonstrated that the utilization of ICT gadgets, for example phones and any device that

plays music, in space, has created a typically private virtual space. People increasingly started moving away from real people and started collaborating with 'virtual friends', music etc. People and specifically the younger generation continuously seek and search for new music, new movies, jokes, or any information that would create fun for them. In many cases people browse for specific information (videos, photos, sound clips, and text) with an educational, emotional and spiritual value. People would typically share this information with others in the same physical space (pubs, coffee shops, lecture rooms etc.) or even with people far away in another part of cyber space, possibly even in another country. For me it is obvious that this has severely started to dominate and change human conduct.

This way of communicating, searching for, receiving, sharing, absorbing and experiencing information in both cyber and physical space, has created entertainment, recreational and educational experiences for many people in modern day society. I have no doubt that ICT (and everything that is attached to it) had a major impact on human conduct, specifically through the feelings experienced in urban space. For many people this became almost like an addiction.

Through "Capital Music", Seeburger (2012: 91- 92) showed how and to what degree, tunes that were played in an individual's space have increased the excitement of individuals' experiences, the level of relaxation and the positive emotions and sentiments of individuals. Seeburger (2012: 125) also explored the utilization of "Space Tagz" (space tags) and demonstrated that there was an aggregation of memories of places through the photos individuals took of such places. "Space Tagz" were embedded in various points of parks and structures in order to demonstrate that individuals increasingly capture and share data on their experience of space. Seeburger (2012) intended to make story lines of events in urban spaces. In particular, he set 'Tagz' in Brisbane, Australia and at the University of Queensland. The finding was that (ibid: 153-163) the utilization of digital screens in open public spaces had a major influence on the state of mind of the people in the space, and that it added to individuals' enthusiasm for sharing their encounters about the space. In sum, Seeburger (2012) demonstrated that ICT influences human conduct through the feelings experienced in urban space.

If we look at Google (a space that everyone is familiar with), it is interesting to note how individuals are urged to demonstrate their feelings, and share story lines through content and

visual pictures about the spaces they are in. Google also urges individuals to become storytellers about the places they visit through audits. Google also presents incentives to encourage people to survey places and to make stories about places, for inclusion on Google. The intention of this is to keep up a digital record or followership inspired by perusing stories, and stories will be saved in various different spaces/libraries of the Social Networking Sites (SNS), e.g. Facebook or Twitter (Petko, Egger, Schmitz, Totter, Hermann & Guttormsen, 2015: 2).

If I draw from the previous discussion and observations, and specifically look at the impact of ICT on human conduct in urban space, it has to be clear that ICT has the ability to empower people and to enable them to share moments, stories and events as they unfold in urban space. It is further my opinion that such e-technology and opportunities presented by this, should be exploited by planners as this could influence the way we plan, design and develop urban spaces. I will elaborate more on this later on when we visit the parts on urban space in Chapter 4.3.

Another observation that attracted my attention relates to the fact that individuals in urban spaces are increasingly seen with headphones on their ears, suggesting an association with neurospace. For instance, these people are predominantly noticeable in Tshwane, in Wi-Fi hotspots, for example, the Union Buildings, Church Square and around municipal swimming pools.

For many people across the globe, ICT, cell phone communication, or whichever of the many media used, created many positive impacts, positive experiences and emotions, and positive relationships. However, in many cases, it has resulted in negative impacts, disasters and even bad human conduct and behaviour. This, in my opinion should be a concern to not only psychologists and sociologists, but also to planners who are concerned about people.

I also observed other behavioural examples such as motor vehicle collisions brought about by individuals using the internet while driving, driving and messaging/texting, and individuals tumbling off walkways while they were utilizing telephones while walking – to name but a few. Cell phone or internet communication has resulted in unlawful gatherings of gangs or drug dealers, and even fights and major crime scenes. This is the negative impact of ICT on human conduct.

If we look at the impact from a different perspective…for people and specifically young teenagers and schoolchildren who are addicted to drugs, searching to obtain drugs, it has become much easier and more accessible by accessing the web or communicating with a network. For those wanting to quit drugs, as part of a rehabilitation programme, it can be a challenge to resist such easy access. The conduct and behaviour of these (already extremely vulnerable) people can be changed forever, by just by one SMS, telling them where and when to pick up free drugs. In this regard, my concern is that ICT can have a direct and immediate negative impact on human conduct, and it has the potential to radically affect human conduct and human nature in a bad way. If we look at the relevance of this for planning, we should not forget that these actions take place in space, again emphasising the need for planners to understand space dynamics and to create quality spaces and even alternative opportunities for recreation and interaction.

It also became obvious to me how ICT has changed human conduct in the way in which some people have changed or organised their routines, and the way in which they make use of time in urban space. For some people more time is available during the day because of online banking, online education, tele-conferences, skype meetings etc.

If we look at the way in which individuals interact and connect with their phones and with each other, particular conduct and emotions can be observed. In Tshwane's public spaces, for instance, emotions were observed and noticeable in the way in which people have stamped their feet while listening to music or even gestured with their heads. Social interactions on SNSs are characterized by sharing photos and encounters of the urban spaces that individuals have been to through ICT coordinated activities, and their feelings in urban space. ICT apps can indicate the number of people that are simultaneously in the same place or part of that particular activity and this can improve and even form new relations in the social web.

When talking of ICT and human conduct and behaviour, it is important to mention the trend of people deriving pleasure from the use of ICT in urban space. Tiidenberg (2014) for example examines "self-shooting", which means the craft of taking a photograph of oneself with the intention to mirror an immaculate picture of one self that is acceptable to the audience on the internet. This new character is active in urban spaces and ultimately finds a space somewhere in Social Networking Sites in cities.

Change in human conduct also incorporates the shift to internet shopping; telemedicine, and the capacity to analyse and treat diseases through "virtual restorative specialists" with medicinal examinations done remotely and patients examined and even treated utilizing video and automated instruments. There is also a shift from group-based entertainment to home-based smart phones, PCs and TVs that give intelligent and smart entertainment. Many people would telecommute using workstations, videophones, and the internet web (Mitchell, 1995: 45; Thorns, 2002: 71).

While these examples presented above in some way indicate the positive impacts of ICT, some people may want to argue (from an educational, spiritual or ethical viewpoint), that ICT has had major negative impacts, that it spurred bad and inappropriate human conduct, and that it created many challenges for society and people, specifically vulnerable people.

One example where ICT and its properties have had a major (possible/perceived) negative impact on human conduct relates to sex on the internet. Activities, for example, sexting, which is, “the private trade of self-created sexual pictures using the phone or the internet”, have become common in urban space (Döring, 2014: 1). Pornography as a digital urban space movement increased radically in urban areas. It is interesting to note that 81% of men in Sweden have reported their involvement with explicit internet entertainment through an ICT medium, when contrasted with 18% of women. This trend is specifically visible in urban space where ICT technologies are high (Kvalem, Træen, Lewin & Štulhofer, 2014: 1).

In South African cities, yet another new ICT related culture has emerged, namely the emergence of a ‘blesser” culture, where in most cases men are the “blessers” and women are the “blessees.” Anyone seeking a sexual encounter can, through Facebook and other social networking sites, access as many people as they desire. In a 702 radio interview on 4 April 2016, a “blessee” indicated that the arrangement involved purchasing of properties where “blessers” and “blessees” meet (Gwala, 2016).

There is no doubt in my mind that ICT has embraced pornography as an urban lifestyle in many parts of the world. What concerns me most, is the open and free access to such sites, which makes it accessible to e.g. schoolchildren. According to Jonsson, Svedin, & Hydén (2014: 1) it is more efficient, safer and cheaper to exchange sex on the web. The exchange of sex online is often more discreet and therefore less stressful because many times coded dialect is utilized that cannot be understood by those not involved. ICT in South Africa

certainly created a new awareness amongst communities and in cities and a new exposure to sex exchange spaces, almost as an essential part of public infrastructure and place improvement.

Just to refresh, the previous parts primarily looked at the negative impacts of ICT on human conduct. Obviously various associations and institutions should be concerned, and should attempt to mitigate or eliminate such negative impacts. However, now that we have looked at some of the ugly and scary terrains on our journey, let us move to greener pastures and more positive areas.

Unlike the challenges presented above, ICT has also created numerous opportunities for society. For many people in the world, ICT has created numerous opportunities for fame and fun in the urban spaces of cities or in cyber space. Viral data on the web has introduced the opportunity for anybody to become famous. Fame and fun have increasingly become the aims of activities on the internet. For instance, the culture of posting recordings of activities happening in urban areas has become stylish. Similarly, various artists from all walks of life are posting their own videos, songs, poems, art work and the like, in an attempt to attract attention, and possibly to become famous. Although it somehow seems as if ICT only has a potential impact on human conduct (when someone becomes famous), ICT created numerous opportunities for people to present their own creations on the internet (see also Servon, 2002: 225). YouTube also had a major impact on human conduct and behaviour through the way in which so many people are currently actually working towards these opportunities, or exploiting the possibilities of the internet. For many people in the world, this has created a new career and even full time jobs, or the expectation or possibility of a new career.

I have no doubt in my mind that ICT has changed human conduct in terms of emotional expressions and reactions, behaviour, the way in which people seek collaboration, opportunities and other forms of entertainment, fame and fun.

Now that we have looked at how ICT has influenced and benefited human behaviour in so many different ways – positively and negatively, it is perhaps time to pause, to take a breath...and then we can move on to another important challenge of our odyssey.

During my navigations, I noted that there were many areas, specifically in South Africa and Tshwane, where ICT, cell phones, internet etc., for various reasons, did not have an impact or

interface, or areas of society in which the opportunities presented by ICT have not yet been presented and exploited. The one area that comes to mind and which concerns me most is the poor or the impoverished communities in South Africa and the poor in the remote rural areas where there are no networks. If I look at the vulnerable poor communities in South Africa, within the context of ICT and the foregoing discussion, I want to argue that the poor is better off without being connected (if one looks at the negative impacts on human behaviour). However, if I look at what ICT has added to my life and the lives of others (the positive impacts) and opportunities for us to connect and to communicate, I want to argue that the potential ICT related advantages, far outweighs the disadvantages. The potential advantages of ICT, specifically for the poor, are countless. My opinion is that we have not yet explored and exploited these opportunities.

Unfortunately, ICT, and ICT related gadgets and networks, are often associated with urban areas, wealthy cities, urban and rich communities, and those who can afford these technologies. South Africa has the fourth-fastest growing mobile communications market within the world with 80% of the population connected. Over fourteen million individuals participate in social media alone. Nationally, ICT penetration is as high as 128%. However, a large number of the population does not have full and complete access to the internet and everything that is associated with this.

More or less 40% of South Africans reside in poverty – with the poorest in an exceedingly desperate struggle to survive (Reporter, 2014). The growing urban space economy favours the affluent over the unskilled poor. The poor cannot afford to be connected. This brings me to my point of the digital divide, which exacerbates aggression of human conduct in urban space and reinforces the general divisions between the wealthy and the poor. My biggest concern is that this divide amplifies the underlying urban conditions that exist in the major cities regarding economic or social divisions and fragmentation. For a country such as South Africa, with its fragmented landscape, this is a major issue that needs to be addressed at all levels. I will reflect on this later on in Chapter 4.2.3.

While we are still traveling in the “people’s landscape”, I would like to direct our journey to a different part of the landscape, namely that of “emotion, privacy and personal safety”.

4.1.3 Emotion, privacy and personal safety

Closely related to human conduct and culture, is the aspect of emotions. The main emotions affected by ICT in urban space, relate to aspects such as fear, freedom, the right to privacy, the concern for personal safety and the safety of urban spaces in cities.

With innovations in ICT, there has been a development of new types of crime that are hard to control in urban communities such as advanced cyber criminality, computerized wars, cyber bullying, stalking, and hacking.

Many urban communities and spaces in South Africa have cameras, sensors and sophisticated ICT systems for surveillance. However, city spaces in most parts of the world are not safe. It is common to hear through the media of individuals that were murdered in urban spaces, by other "obscure" individuals. The viral nature of data and the utilization of apps by the police in these urban areas should create secure cities but this is not the case.

As we all know, numerous urban groups have set up WhatsApp groups or Facebook clubs in an attempt to communicate on safety aspects and to create safe spaces. In spite of these efforts, crime is still rife in various urban spaces.

Even with the placement of robots in urban spaces and the introduction of drones in the airspace, cities have not achieved enhanced safety measurements (Pettitt, 2015). One would have expected that advancements in ICT should have indicated some decrease in crime in some urban spaces.

While ICT and technology such as drones in airspace present numerous opportunities to combat crime and manage safety, it should be noted that, looking at this from another perspective, these instruments could also enhance crime because criminals can also abuse them. This could also create emotions and specifically fear amongst people that feel their privacy is being threatened and intruded upon. This gives rise to a new challenge for urban planning to design and manage airspace zoning laws and regulations to regulate intrusion into private space, and the possible risks to public security.

Various scholars have contributed to the subject of ICT and its impact on urban safety. Brack & Caltabiano (2014: 1) indicated how in cyber bullying, the harasser and the casualties

cooperate online and how one accepts more control over the other, with the less powerful succumbing to activities they ordinarily would not have succumbed to.

Rotman (2015: 56) also adds that the overall impact of ICT in urban space is not as alarming as it is portrayed to be. Contrary to some perceptions on the alarming impacts of ICT, these impacts are not that significant, as we have not yet experienced a major presence of e.g. robots and the like that are operational in many urban communities. Another opposing explanation is presented by Atkinson (2013: 9), who argues that the impact of ICT has been downscaled by amongst other things, the large number of small machines, which are only operational in some urban spaces. It is my view, however, that we should not underestimate the potential e-power of these so-called little machines and gadgets.

An aspect that attracted my attention and flagged a possible concern relates to the rights to access an individual's space. Individuals possess the power and the right to regulate access to their physical and virtual space and personal property. Emerging ICT gadgets and new software, however, now have capabilities that have the potential to breach such privacies and security systems and this creates a risk and threat to people, and a possible infringement of their constitutional rights. This further highlights the enormous current and potential impact of ICT on people (and people in space). It became clear to me that the impact of ICT on people also relates to the infringement on the rights to people’s spaces – both in physical space and virtual space.

The deluge of online networking sites operational in urban space, and the access that individuals have to these spaces have set off arguments around whether it is conceivable, for anybody to have free access to another's online space.

According to Cranor (2014: 10), ICT innovations and software sophistication make it somewhat impossible to ensure the safety of individuals in space. It has become possible to access any site in spite of security codes and software product licenses. In agreement with this, Brody (2016: 96) argues that it has become extremely difficult to really secure sites and access, as it has become possible to supersede security systems that prevent such access. Talbot (2014: 35) supports this view, and refers to the more current models of cell phones that use specific software and technology to control access to their virtual space through initiating security alternatives on their cell phones.

However, the control of access to one's virtual space also relies upon other variables, for instance the gender and age of people. For instance, older individuals are more introverted than young individuals are, and will less likely want others to access their virtual space (Kezer, Sevi, Cemalcilar & Baruh, 2016: 4, 12).

Within the context of emotions and the desire of individuals to protect their private and virtual space, it should be noted that the privacy of these spaces can actually be threatened if other e-communicators such as "internet cars" or similar devices compete with, or enter the particular space of that individual (Knight, 2015: 38) (see also Oz, 2015: 10)).

ICT can furthermore empower people, not only to interact in urban space, but also to protect their privacy and security…and the access to information. Coleman (2015: 11), for example, demonstrates that people prefer to stay anonymous in online networking, in an attempt to protect their privacy and private and virtual spaces. This implies that individuals are empowered to take different measures to control access to their virtual spaces.

There now seems to be an increasing sense of empowerment and awareness in the way people are managing and protecting their virtual spaces, privacy and information. Along these lines, there is no doubt in my mind that ICT has provided the capacity for one to manage access to their virtual space.

In sum, it has to be obvious that ICT can have a major impact on emotions as it has so much e-power to manipulate virtual spaces and ultimately also the privacy of people. We now have some idea that ICT does have an impact on the emotions of people – specifically in terms of the fear of people entering their private spaces, and the fear of crime.

If we now reflect back on our journey, where we started, and how we have manoeuvred through the various planes and fault lines of the people's landscape – language, communication, human conduct, emotions, privacy and safety, it's now time to try and make some sense of the impacts, discourses, observations, lessons learnt and experiences. This now brings us to our first summit, where we can unpack and present some questions to ponder in an attempt to assess and evaluate this part of our expedition.

4.1.4 Some questions to ponder and future images

The previous section mainly dealt with the impact of ICT on people, in terms of the new lingo and terminology, and the impact on human conduct and emotions. For me, it is obvious that this discussion is only starting to scratch the surface of the body of knowledge and that much research is needed to fully unpack and explore these technologies, impacts, issues and challenges. However, while it is not possible at this stage to really make scientific and credible deductions and propositions, this initial meta-analysis and exploration of current discourses on the subject matter, certainly provided "enough" for me to actually start pondering questions and imaginations about the challenges and opportunities of ICT, specifically for the future.

The problem with this discourse however, relates to the fact that ICT has developed so fast in recent years and that it is still developing and expanding at an enormously fast pace – so much so that research on the subject matter cannot stay abreast. It is therefore obvious and somewhat frustrating and challenging to note that there are so many unanswered questions and concerns. What makes this more frustrating for me is the complex nature of the technology, the speed in which it develops and unfolds, and the uncertainty and unpredictability about the possible impact of ICT on people in the future.

While some of the questions presented in the following section could be somewhat "tongue in cheek", others could be from a "devil's advocate" perspective, probing some thoughts that are relevant or of concern. The fact of the matter is that these questions are relevant and could individually, or as a whole, indicate a new interest and a possible structure and direction for further research – not only for urban planning, but various other related fields.

If I view this discussion from the perspective of ICT, and the impact of ICT on people, specifically within the context of people's spaces, I would hence like to present the following questions and images:

How can ICT be used and exploited in cities to bridge the divisions between South Africans and foreigners, the rich and the poor, the skilled and unskilled, and the urban and rural?

By the same token, how can ICT be applied and exploited to integrate the fragmented communities and spaces in South Africa?

How can ICT be exploited to reach out and communicate with the peripheral impoverished areas?

How can ICT and the related e-powers be used to provide much needed basic services such as education, health care, and support in remote poverty stricken areas?

How can ICT and related technologies, gadgets and software be developed and applied to actually create and ensure safer urban spaces, drug free spaces, etc.?

Are we as development professionals doing enough to exploit the opportunities of e-communication and ICT within the context of urban development and urban management?

If ICT interactions are so concentrated in urban space, and if urban spaces become the laboratory, classroom or stage for so many e-interactions, the question that comes to mind is, do urban planners and development professions have sufficient understanding of these spaces and how they are impacted upon?

By the same token, how should such urban spaces be planned, designed and managed in order to effectively facilitate the e-interactions, and to bring out the best in these spaces, e.g. in terms of Wi-Fi, digital screens for the public etc.? ICT convert story lines into a digital configuration because trails of information portraying activities of space are left by cell phones, which have GPS, camera, and voice. The challenge for urban and regional planning will be to design spaces that match the velocity of information discharge in urban space.

Do we really and fully understand the impacts of ICT on people and/in urban spaces, and the current and future potential that ICT is currently presenting/will be presenting in the future?

Do we perhaps have to create different spaces, other spaces or new spaces in areas where spaces do not exist?

What is the relationship between virtual or cyber space and physical urban spaces? How can these spaces be integrated?

Do we realise that ICT is an emerging (invisible) infrastructure “above the ground” for which we need to plan, and that we have to manage and control?

Are we aware that ICT nodes or spaces of major e-interaction can possibly be threatened, or possibly become areas for inappropriate conduct, crime, political gatherings and strikes…and even the headquarters or meeting places for criminals and terrorists. How can this be planned and managed, and which measures could be implemented to mitigate possible threats?

How can the privacy of people's private spaces, virtual spaces and information spaces be protected?

What can authorities and various role players do in the future through e.g. policies and legislation to ensure that such privacies and spaces are secured?

How should public spaces in urban areas be planned, designed and managed to ensure and secure the privacy of individuals, and to protect them from intruding technologies such as drones that could impede on their privacy? Perhaps urban planners and related professions should investigate ways and measures to design and manage airspace zoning laws and regulations to regulate intrusion of private space, and the possible risks related to public security.

How can ICT, network operators and designers of software develop the necessary protection measures and codes to ensure that people's privacy – both in private space and virtual space is protected and secured?

More importantly, how can people be empowered and capacitated to effectively challenge and manage these possible threats of intrusion into private and virtual spaces?

Moving on…from questions to ponder, to some imaginations, fantasies and future images

Imagine…if ICT in cities could become the platform and space that the South African government used to negotiate and consult with its people in a more effective way, and to negotiate e.g. better wages in cities.

Imagine…if planners could actually create new public realms and e-spaces/places for communities and citizens, or rather find ways to actually integrate physical urban spaces with cyber spaces in order to create "real" (and real time) spaces and places, where people could gather, work, live, play and communicate in a different e-way. If this was planned correctly and if ICT was effectively exploited, such spaces could create a myriad of other opportunities

for people and society and cities in general. The opportunities in South African cities for development professionals are countless.

Imagine…the possibilities of ICT in urban space to heal, uplift, educate and integrate communities.

Imagine…how ICT could provide fun and entertainment to distressed poor communities, and specifically the youth and children in rural areas. Perhaps such entertainment and fun could change the conduct of the people and result in people staying away from alcohol and drug abuse, which incidentally characterises most rural areas in South Africa.

Imagine…how easily and effectively, ICT networks in these communities could contribute to harnessing these troubled communities and to enhance communication between individuals and groups.

Imagine…the possibilities to strengthen democracy, to create social stability and to improve integration of fragmented communities in the urban and rural spaces of South Africa, if we can provide easy access to ICT in all urban and rural regions?

When looking at the South African context, I would like to imagine the possibility of all people, from all cultures, and all ages, having access to the net and virtual spaces, as well as the opportunities presented in these spaces. As stated earlier on, the advantages and opportunities of such access, specifically for the poor, are tremendous. However, I am concerned that technology such as ICT and all that is attached to it, which on the one hand could have major benefits for all people and the poor and disadvantaged, if applied and managed wrongly, could on the other hand also have major detrimental and even psychological effects on people.

If we look at the South African situation and fragmented urban landscape and the digital divide as discussed earlier on, it is obvious that the full spectrum of ICT opportunities for people has not been explored and exploited in full. Compared to water systems, sewerage and electricity, ICT networks and systems are significantly cheaper to build and to operate. It is somewhat ironic that governments have not yet realised the opportunities of ICT in remote impoverished areas. Whilst the City of Tshwane, for instance, has installed free Wi-Fi in most parts of the city, this does not imply that the poor have access to ICT and the opportunities presented by ICT. If we can provide easy and affordable access to specifically

the poor areas on the periphery of urban regions that are so isolated from the main stream urban activities and opportunities, then we can create and provide a myriad of services and opportunities through ICT, such as online education, medical services, possible job opportunities or online careers.

Therefore, the challenge for future research would be to explore how ICT could be exploited to positively impact on society and people's spaces, and how the possible negative impacts of ICT on people could be mitigated.

I am fully aware that various different professionals such as IT specialists, psychologists, researchers, teachers etc., should be concerned about such possible impacts of ICT in the future, and I understand that much research and product development are being done to address these (at least some of them). However, as stated in previous sections, a strong relationship exists between virtual space and e-activities and physical urban space and the actual presence and behaviour of people in such spaces. For this reason alone, the case is made that urban planners and related development professions should improve the understanding of such challenges to find ways to deal with this from a spatial and environmental perspective as well. This certainly also flags a much needed research area in the fields of urban and regional planning, in view of the current and emerging relationship between ICT networks (and related activities), and urban and rural spaces.

If we look back and reflect on the journey, we have now completed the first part of our journey and covered and explored people's landscapes within the context of ICT. It is now time to move on to a different landscape where we will explore urban dynamics, urban space networks and the urban space economy. In this part of our odyssey, you will note and experience an interesting aspect, namely how physical spaces and networks are being influenced by invisible and virtual networks.

4.2 Dialogues on ICT…and the impact thereof on urban dynamics, urban space and networks

In the following part of this journey, I will expose you to the dialogues of ICT about urban dynamics and networks. In this part, I will also point out and unpack the related landscapes (sub-themes) of complexity, time, architecture and branding as well as the changes in urban networks and structures.

In the area of communication technologies, innovation has changed from desktop computers in the 1950s to the birth of faster mobile computers in the 1980s and 1990s and smart phones in 2000s. Notable urban changes included the installation of sensors in cities in order to present to city dwellers new information about services in their cities.

Let us now start by looking at the complexity of the e-interactions in the urban space networks.

4.2.1 Complexity of e-interactions in the urban space networks

The first aspect of ICT in urban space relates to the complexity of this emerging technology. While the advancements in ICT in urban communities are developing at such an extraordinary pace, it has become increasingly complex.

Within the context of urban structures and networks, the 1800s marked the introduction of the automobile, which started shaping the form and structure of what was then predominantly a rural landscape. Although this automobile created new networks and connections between places and people and new types of urban spaces, it also resulted in many undesirable and unsustainable footprints and networks all over the world. The direct and indirect environmental impacts were very severe and lasting.

Contrary to some perceptions, ICT, has actually not (yet) done much to change the planning and design of South African cities, or the structure or physical networks of cities. The market and urban space economy still sets the tone for business opportunities and the commercial value of urban land. In addition, transport systems still predominantly dictate the design and

structure of cities and their networks. I would like to point out, however, that urban spaces and their functions have become increasingly complex, which makes these spaces very unpredictable and difficult to plan for.

The new millennium has now presented ICT and it remains unclear whether this technology could be the solution to the creation of functional, equitable urban spaces, and whether this technology will result in undesirable urban forms and distorted networks. The impact of this technology on people, for instance, was presented in the previous parts of this journey.

This confusion or uncertainty is further complicated by different viewpoints, amongst others, those that argue that "physical urban space will not exist in the future", or those that argue that "innovation will crash and will cease to exist". Other viewpoints included that new technologies will be extinguished, or that technologies will escalate to such an extent that it will be utilized more than ever before.

Although it is difficult at this stage for me to even imagine the nature of future complexities and impacts, it is my view that these emerging technologies will in the future continue to penetrate the urban space and networks in various ways. A case in point is a documentary on the City of Tokyo, aired on 10 December 2015, (Courtesy of the British Broadcasting Company (BBC)), which cautioned that innovation in ICT had penetrated city space in depths past what the human mind can fathom.

The complexity of ICT and the impact thereof on people and space, also created a mystery around these emerging virtual cities and spaces, which for some people have become imperceptible, dimensionless and ubiquitous. It is exactly this mystery, complexity and vagueness, which make it so difficult and almost impossible to anticipate activities in these spaces and to plan and manage urban spaces and cities. The frightening part for me, is that this mystery and complexity in space are escalating as new ICT technologies and influences are affecting these spaces.

ICT development in recent years has changed urban space into instructive and informational spaces that predominantly manufacture and distribute new information. Virtual systems in these spaces have become very complex and viral. In the City of Tshwane, for instance, systems use data from sensors, cell phones, and the internet. The creation of data in these spaces at a large scale and extreme speed is overwhelming.

ICT operations in cities have now enabled urban communities and urban development to "leapfrog" urban growth and urban space through innovations (Datta, 2015: 10). In other words, ICT has created the opportunity to develop and invest in other areas, e.g. peripheral areas, or areas and spaces which were previously not ripe or desirable for development.

To further add to the complexity, the depth of innovation in ICT, on the one hand, has made available and opened up opportunities in space, but on the other hand also placed limitations on urban spaces and networks.

As I indicated in the previous parts of this journey, ICT operates as a double-edged sword bringing unique experiences in urban space networks, but also inflicting pain on people. For example, the same technology that includes individuals in communication in urban space excludes individuals from urban space. In South African cities the acquisition of new cell phones is based on contracts, which are based on proof of employment. The majority of the poor population in the cities, however, is unemployed and cannot provide such proof. However, there is also another group of people that acquires phones without contracts. These people typically purchase airtime in different forms to activate connections. Most of the poor people do not have the funds to buy sufficient airtime to continue to be connected. The problem, however, is that, irrespective whether you have a device or not, and whether you are connected or not, the majority of poor people cannot afford sufficient data to access urban and virtual spaces and the opportunities presented by these spaces. These two extreme worlds make it a challenge to integrate and link more people with urban networks and spaces. These challenges are very complex and this complexity makes urban dynamics and networks difficult to unravel and understand.

The way in which people increasingly link and communicate with each other via technologies of smart phones, computers and the internet, also resulted in an complex situation where physical urban spaces are being integrated with virtual spaces, and physical networks integrated with virtual networks.

Urban spaces are increasingly becoming engines of international monetary growth. This is due to the fact that the exchange of information and expertise is concentrated in these spaces and this consequently stimulates the economic competition among major cities (Jassem, 2010: 1; Tranos & Gillespie, 2011: 36; Castells, 2013: 295-296; Castells, 2000: 442; Castells, 2010: 118; Mitchell, 2007: 145; Rutherford, 2011: 217; Mitchell, 2001; Gu, 2008: 250).

As a result of ICT, urban space also began to feature as excessive technology innovation hubs, with additional financial growth possibilities via “chains of production” ultimately providing individuals with opportunities to connect rapidly to urban space possibilities (Marceau, 1995: 131, 142; Huh, 2001: 101-104).

Prior to innovations in ICT, the function of public space was to facilitate connections between people. As ICT innovations in the new millennium expanded, and with the emergence of virtual space, electronic activities such as e-shopping and online entertainment, physical urban spaces started separating people. The activity of populations in public areas also shifted from physical activities to more virtual activities (Abdel-Aziz, Abdel-Salam& El-Sayad, 2016: 216). The dilemma of this is that, while ICT should aim to integrate people, spaces and networks, it rather resulted in separating people.

ICT also resulted in many new variations in the networks of cities. For example, in Tshwane, subsequent to Dark Fibre Africa’s installation of high numbers of fibre optic cables and light waves in South Africa post the year 2000, countless mobility routes were constructed nationwide (Bogart & Ferry, 1999; Gordon & Richardson, 1996; Pfister, Freestone & Murphy, 2000; Lang & Le Furgy, 2003: 74-75).

I also observed that complexity is associated with the urban development expectations of urban communities. Although there have been perceptions and expectations that cities would grow faster with ICT and related technologies, I can refer to a number of examples that indicate the contrary, *viz:* Byrnes (2015: 60) refers to Songdo, Masdar City, Abu Dhabi, and Paredes where high-tech innovations have not attracted the populations that were expected. In Tiang in China no population development is foreseen to build up the economy (Bloomberg 2015).

I also want to point out that the complexity of ICT (and its impacts) relate to the emergence of apps (applications) in urban space and the way they have been used by people who are active in the city. The development of apps (applications) in the year 2000 revealed more data about the potential of ICT to improve efficiency in the operation of the networks in the city. For example, apps contain data on "who is coming to the city, and how, why, when and where”. Apps can provide guidance about the most efficient way of moving in urban space networks.

In the case of South Africa, the 25 year ICT Master Plan for the Gauteng Global City Region published on 22 September 2012 indicated that the Department of Communication would launch a mobile phone app with timetables and calendars of rail, fast travel and transport operations in the Gauteng Province (Financial Mail, 2013). This app was to work in conjunction with the innovative advancements of the Bus Rapid Transport (BRT) system.

Since the year 2000, various new apps applicable to urban functions have emerged in the City of Tshwane. In addition, by 24 October 2014 at 12h16 there were 53 apps connected to the name Pretoria and two connected to the name Tshwane on the Apple app store. Examples are Tshwane Free Wi-Fi (Zuydam, 2013) and GoGauteng. GoGauteng apps give data to individuals through innovation devices, for instance, Metrorail, Rea Vaya, Gautrain, Tshwane Bus, Metro Bus, Putco and Northwest Star Bus administrations (Apple, 2014). The relevance of this for the study, and specifically for this part that deals with ICT, urban space and networks, is that it clearly illustrates how ICT and apps are influencing urban space dynamics and the flows in networks.

In New York, for instance, apps have become route programmers utilized by the larger part of urban inhabitants. Apps have also changed the way individuals find their way around the city navigating congested zones. Cell phone apps have also empowered virtual versatility and this made it possible to move around and travel (virtually) in and around the city without actually using your own motor car. This in itself has a major impact on the urban dynamics and the planning, development and management of urban and transport networks. In support of the above, Molloy (2016) stated that apps on mobile phones make it progressively obvious that mobile phones have become one of most important innovations in urban spaces.

Through my explorations it also became clear that the complexity of urban space also defines the way in which urban spaces and networks have developed, expanded and reconstructed themselves. Urban communities and community networks have increasingly become part of the continuous worldwide web or global network. There are also similar velocities of advancement between the internet and city space (Mitchell, 1996: 8). For Mitchell (1996: 3) this was the internet-based reconfiguration of urban spaces. For instance, Mitchell (1995: 167) depicted individuals as "electronically broadened bodies" continually associated with the internet. If individuals are associated with the web, then changes on the web can alter the conduct of persons in urban space. What's more, changes can improve the urban experience

of people living in urban areas. Consequently, ICT increased speed and types of activities and movement patterns in the urban space networks.

For me, it has now become obvious that these positions affirm that urban spaces are presently more surprising and dynamic than before the appearance of advancements in ICT. In my opinion, the challenge for urban planning today lies in an understanding of the components of the internet and how it draws individuals to urban space and exerts e-powers in various parts of the city. I will talk about the e-powers in more detail when we reach the "power landscape" (Chapter 4.4.).

Urban space becomes more complex when ICT distorts physical presence with other multiple presences in the same space. For example, an individual seated at home will transfer funds in a bank and while simultaneously having a voice communication with entirely different sets of people in multiple countries through a cellular phone.

It is clear to me, that there is a distortion of dimensions in space and networks and this has become very complex. The increase in the sources of data in urban space has also contributed to the emerging complexities. Tranos & Gillespie (2011: 35) have cited data sources as "service companies, mobility and virtual networks", sensors, codes and tags placed on different objects in urban space. This complexity of e-connections (and "things") in urban space networks were also associated with new terminology such as the "IoT (Internet of Things)" and in other forums the "IoE (Internet of Everything)."

It was interesting to note Gartner (2014), which referred to 650 million "things" that came on line since 2013 as at 6 October 2014. These 650 million things created new networks in urban space. With the IoT and IoE, the virtual network connected machines and "things" to people. Things, like cars, walkways, athletics tracks, bicycles, and so on, if not already connected, can form an integral part of an integrated system of physical and virtual networks in urban space.

I also want to refer you to another illustration of complexity in urban space, namely the manner in which the internet has become an e-power that moves everywhere in the global network (Bliss, 2014; Quan, Heidemann & Pradkin, 2014).

The internet now contains "more than 4 billion IP addresses on a boundless interconnected system" (Quan *et al*, 2014: 1). What is more, the cell phone has also demonstrated a

mysterious power over individuals. I noted that in China, for instance, dedicated walkways are created for people with mobile phones with the intention to minimize accidents in the City (Mendoza, 2014).

If we move on to the South African landscape and Tshwane, it is worthy to note that the administrative capital, the City of Tshwane, boasts one of the biggest free Wi-Fi communication networks in the country. Twitter is a rapid electronic messaging communicator that has a vision "to offer everybody the ability to form and share ideas and data instantly, without barriers". In the City of Tshwane, the twitter handle @CityTshwane statistically has 7,274 tweets, follows 1,167 individuals, and has 11,500 followers (@CityTshwane, n.d). Tshwane's Twitter page also shows high data transfer speeds and intense discussions between the Capital and its on-line community with a response time of twenty-four hours. At intervals of twenty-four hours, Tshwane can provide an internet community member with a response on municipal requests.

Globally, the enormous scale of data emerging from various sources and networks has increased the complexity in urban space and the movement in the urban space networks. For example, between midnight and 11:08 am on 20 November 2014, 323,452,886 tweets were sent round the world at a speed of 6000 tweets per second.

According to IBM (2014), there are high bytes of information in circulation within the world every twenty-four hours. At 11:52 am on 24 November 2014 , globally social media activities/actions, measured per second, were an average of 8000 tweets, 1400 photos uploaded on Instagram, 1500 photos uploaded on Tumblr, 1592 Skype calls, and 91,752 YouTube video's viewed (See also InternetLiveStats, n.d.).

The journey so far showed us that there is yet another layer of complexity in urban space rooted in ICT technology and the scale of data streaming from urban spaces. The implication of this high volume and speed of data in the global and local networks surely indicates not only the complex urban dynamics, but also the powerful impact of the internet and the opportunities presented by these e-powers.

For me, it is natural that urban planners could expect the structure of the city to change because historical precedents of technologies such as the automobile, rail, and air travel have resulted in notable changes in urban structural layouts. In the case of ICT, these changes have

not been predictable. I have noted that some cities have become multi-nodal while others have become centric with one nodal focal point from which all networks are connected. There is no doubt in my mind that innovations in ICT and the new connections and e-interactions between urban spaces and within urban space networks, have changed the structural patterns of cities and the networks and spaces in cities.

In South Africa, for instance, the footprint of e-technology has increased in recent years. The Global Competitiveness Report 2012/13, stated that South Africa ranks amongst the top twenty-five in mobile telephone subscriptions. In the Gauteng Province, for instance, at least 90% of households have connectivity to a telephone. 56.1% of housing units have a telephone and cell phone within the habitation, 41.5% have connectivity to a phone nearby, and 2.3% have connectivity that is not close, or no connectivity at all; 65.7% have a TV, 15.1% own a laptop and 45.1% have a cell phone (Parliament, 2013). However, whereas ICT brings wealth, at the same time the quality of life of the urban poor deteriorates. Approximately 40% of South Africans live in poverty, with the poorest in an exceedingly desperate struggle to survive (Landman, 2003). One of the causes of urban impoverishment is the disconnection from ICT. If the urban poor is not connected through e-connections, and if they cannot access technology-based economic opportunities, then their quality of life is compromised. This however, does not imply that, if individuals connect with the internet, it would automatically improve their lives.

On reflection of my journey so far, and the most prominent landscapes I traversed, I observed the complexities of ICT and the e-interactions in the urban space network, and how the complex and even illusive nature of this phenomenon have influenced not only people, as discussed in the previous section, but also the urban dynamics, urban space and urban space networks. The journey so far also highlighted the complex nature of ICT and how this has influenced urban dynamics and networks. It also flagged the possible and perceived impacts that this could have on urban space (networks) in the future. What was also important for me, was the relationship between virtual spaces/networks, and physical spaces networks, as well as the limitations and opportunities of such networks.

For me, the overlap between physical and virtual space/networks has revealed paradoxes, specifically in South Africa. For instance, whereas new technology has attempted to create better urban spaces through remodelling the way individuals think, there has been an

excessive rapid flow of and accessibility to data. Cities in South Africa are in fact forming faster and becoming more complicated for the poor to connect in. The meaning of space and time therefore changes all the time. The poor still fight for their right to access these urban spaces through either the physical urban spaces or the virtual space or even neurospace. Many citizens in South Africa (mostly the vulnerable, those without jobs, and those from poor and neglected communities), aspire and wish to access both the virtual and physical spaces and networks in cities, and even rural areas. One of the paradoxes that I have noted, relates to xenophobia and the way in which some people want to protect their spaces, and protect others from intruding on a particular space.

One of my concerns is that, due to the complex and relatively expensive nature of ICT, it is not possible at this stage to make ICT and all that is attached to it, available and accessible to everyone in this country.

Now that we have explored the complexities in the urban space network, let us move on to explore time, speed and pulse as it relates to the e-activities in urban space.

4.2.2 Time, speed and pulse of e-activities in urban space networks

It was interesting for me to note that, while a huge number of individuals relocate to urban regions in the hope of discovering better work opportunities, more often than not, they find the pace of life in the city too rapid and too costly. It was my observation that people often migrate with the intention to make a profit in the city, only to find that, contrary to their expectations, the “cost of time” and the speed at which things move, have limited or restricted possible occupations and opportunities.

Therefore, with ICT innovations the priorities of life in the city for individuals living in urban areas has changed. Migrants go to the city looking for personal fulfilment, just to find it progressively hard to associate with the fast-paced technologically advanced urban space system. Such experiences have led to disappointment, sometimes leading to violent urban protest action.

I would like to refer you to SALGA (2015: 9), that argues that the internet and related e-technologies and the fast speed at which they operate, contrast strongly with the (slower)

speed at which physical infrastructure develops. In other words, e-infrastructure is developing at a faster pace than physical infrastructure. However, according to Eatough (2015: 691), it is unclear whether the South African Government has increased the pace of infrastructure construction in urban communities in line with the fast pace of ICT development (ibid: 692).

If we look at "time" within the context of ICT, we are now witnessing different and multiple time zones in urban space networks. For instance, the physical urban space network can change incrementally and simultaneously, while the virtual space network is highly automated and fast.

A good example to illustrate the speed of data in virtual space is the speed of internet availability. On 16 March 20xx in Tshwane, I observed that the internet speeds were 6.7 mbps (megabytes per second) for downloading data and 2.5 mbps for transferring data. Worldwide counterparts are working at around ten times this rate. For example, in 2015 Tokyo in Japan had an internet speed of 56.4 mbps for downloading data, and a speed of 55.8 mbps for transferring data (OOKLA, 2015). As indicated by Akamai specialists, by the second quarter of 2013, broadband availability velocity was at 35.7 mbps in the United Kingdom (London), 22.1 in France (Paris), 68.6 in South Korea (Seoul), while it was just 7 mbps in Tshwane. The virtual systems in Tshwane are operating at one-fifth of the velocity of that of London.

While the above section dealt with the speed of data in virtual space, the next section presents an example of the speed of one kind of infrastructure in physical space, namely the transport sector. The transport sector illustrates how ICT has distorted the notion of time in urban space. For instance, while the fastest public road transport in Tshwane, the Gautrain, has a speed of 100 miles per hour, the fastest train in the USA runs at 150 miles per hour, while the Maglev in Japan operates at 310 miles per hour. France's TGV is estimated to run at 350 miles per hour (100topdocumentary, 2014; Chu, 2014).

There is no doubt in my mind that there are exorbitant "speeds and movements" operational in the city and its urban and virtual spaces. However, fast trains present an example of "fast infrastructure" and an infrastructure that developed primarily through fast technology. However, if we look at other "slower" infrastructures in the physical space, it is obvious that there is much disjuncture between the pace of movement of these two seemingly opposing sets of infrastructure.

If we look at the even much faster pace at which ICT develops and the speed of data, I want to argue that physical infrastructure development in urban space networks will have to move at a faster pace to keep abreast with the pace of ICT developments in both virtual and physical spaces. For instance, cities with a well-developed and fast progressing e-infrastructure cannot afford for development and growth to lag behind due to the pace at which physical infrastructure and spaces are developing. Therefore, it is imperative for local systems to work at moderate speed in contrast with other systems and other competing urban areas in the world.

The speed at which infrastructure needs to be provided as well as the time it needs to be delivered, has become a major issue in developing countries and countries like South Africa with its backlogs and many challenges with regard to service provision to impoverished communities. This, in my opinion, requires new and faster planning and design processes, which could be enhanced by the use of e-technologies. I also want to refer you to Datta (2015: 3) and the reference to the Dholera comprehensive strategy in India, which was designed by Halcrow Company in the UK.

Castells (2010: 118) also alludes to time as an ageless time. This means that time is about the non-presence of a dimension structure for the operation of time. Time is reflected in the pace of connectivity that is indistinguishable from the speed at which information assembles and scatters. What is more, time is reflected in the versatility of connection. For instance, while waiting at a transport stop, individuals can connect to their workplaces and keep on working through ICT, especially in fast networks (Muller, Chapman, Young & Cai, 2013; Mitchell 2007: 145; Gu, 2008: 250).

As I navigated through the vast literature, it became obvious to me that urban places with virtual connections and networks are influencing the integration and scattering of activities of individuals, both locally and globally, and at rapid velocities (Castells, 2013: 294, Boix, 2003: 6). Tranos & Gertner (2012: 179) also support this view by arguing for the presence of instant transmission of data and information in urban space. Consequently, urban space networks have changed from mono-utilitarian spaces to multi-purpose spaces that adjust to the versatility of time (Huh, 2001: 104). Urban spaces are also increasing their strengths of virtual proximity (Maldonado, 2005: 4). In other words, spaces (and people) in the networks become closer to each other, which in turn enhances contact and faster communication. This

again emphasises the relationships between people and space and the rationale for looking at the relationship between ICT, people and space.

For me, it was overwhelming to note how urban spaces have become programmable and viral in order to adjust to time (Castells, 2012; Mitchell, 1996: 105). This is demonstrated in the way in which data is accessible in urban space, and the rate at which the world accesses information (Neuhaus, 2009; Batty, Crooks, Smith & Masucci, 2009).

At this point in time and space, it has to become clear that the convergence of physical and virtual spaces, changing urban dynamics, as well as the changing nature of urban space networks have ignited a new pulse in cities. These pulses, which are created by the effect of e-technologies and virtual spaces, almost like a heartbeat, largely provides the rhythm and pace at which actions, communication and development take place in the city. People and technologies have to adjust to these new pulses and rhythms. For cities to compete in the global space, it will become increasingly important to keep up with the global pulses, which provide the direction and benchmarks for future development. It is very unfortunate to note that so many South African urban regions, and in particular rural areas, are not in sync with these pulses. This for me again highlights the need for planners to adapt planning processes so that they align with the speed of the emerging e-technologies and e-pulses (see also Batty, 2012). I will also later on in the journey reflect more on the role of planners in Chapter 4.3.1.

I found that urban planners use pulse as a means to distinguish between cities, for instance between Johannesburg (in South Africa) and London. I also observed that institutions such as the University College of London had dedicated groups that monitored the pulse of cities using ICT.

The velocity of time is also evident from the pace at which information and people converge and scatter in virtual space. Mitchell (2011, 1-6) argues that people, whom he alludes to as “swarms”, converge at virtual urban nodes in the network where there is activity. The pace of activity in urban space therefore depends on the virtual context. For instance, communication is more intense in urban nodes equipped with internet and smart phone infrastructure (Muller *et al*, 2013; Mitchell, 2007: 145; Gu, 2008: 250).

I also found that there is more to the distortion of time. This is unpacked by Muller *et al* (2013) and Mitchell (2007: 145), who argue that spaces with rapid activity are those with

virtual systems and e-technologies such as PCs, smart phones and other internet based correspondence devices. These spaces connect between local urban space domains and worldwide urban space domains at rapid speeds (Castells, 2013: 294). Boix (2003: 6) also adds that systems work across local and global scales. Tranos & Gertner (2012: 179) also emphasise the relationship between the systems in the urban space network (which are connected through time) and argue that these systems cannot be separated. Mitchell (1999: 7) states in support of this that the city is a hierarchical network of integrated systems and sub-systems that focuses on the coordination of all parts over the various scales in the hierarchy.

The pace of connectivity and the rapid flow of knowledge suggest a demand for a dynamic digital network planning style that can assess the profile, and activities in urban space, and development trends of the network, almost on an hourly basis. In short, this implies that we need to work and think faster.

At this point in time, there is no doubt in my mind that time and the new pulse in cities have developed as an imperative directing the experience of urban space. In addition, people live in both physical and virtual spaces with different urban space activities and rhythms. People therefore are dynamic participants in varying time zoned urban spaces.

I also found that there is continuous interaction between the physical urban spaces and the virtual space and the time zones in these spaces. The strength of the technology of ICT is the combination of virtual urban space structures and physical urban space that is connected in time, moving according to a pulse, and in motion. The urban space network is now being framed by different time(s) and pulses and a new velocity of actions created by virtual networks and e-technologies.

It also became obvious to me that innovations in ICT require a focus on how to analyse the new time dynamics in urban space. The gap in research is that there are relatively few discussions on how the time, pulse and speed in urban spaces should be analysed and exploited in the planning and development of such spaces. What makes the study of time so challenging, however, is the uncertainty about how the future of ICT will affect time and the possible impact this will have. In the context of time and space Castells (1996, 1997, 2000, 2010: 118), for instance, refers to immortal time, which attempts to explain the concept of time vanishing.

Overall, so far we can see that, while there is an affirmation of how spaces have adjusted to the complexities of time under ICT, the challenge for urban planning remains to connect the poor in the various time zones of the city and make spaces that integrate urban communities.

Now that we have explored the complexities of ICT in urban space, the aspects of time, speed and pulses in urban space networks, we should move on to explore the actual networks and structures and how these are being affected by ICT and e-technologies.

4.2.3 Networks and structures

During the past stages of my journey, I presented images on the relationship between urban space and virtual space, and urban space networks and virtual networks, specifically in terms of the complexity of ICT and the fast pace at which it moves within these spaces and networks. I we want to understand the impact on ICT on urban spaces and urban space networks, it is important to also look at some of the discourses and theoretical underpinnings of networks and urban structures itself.

Interest into urban space networks dates back as far as the 1800s in various parts of the world. In Rome as early as 1585 under Pope Sixtus V, Fontana in Rome demonstrated a web like structure that connected key landmark points. The next trace was a “model town” published in 1849 in England by James Silk Buckingham illustrating a typical connected landscape (Hall, 2009).

Urban space networks are almost like a web that covers the urban structure and which provides the framework within which the city functions. This web, almost like a spider’s web, can include the road or rail system or air paths of aeroplanes, communication systems or even the web, formed by the movement of data and information in cyber space – the so-called virtual networks. ICT has had a major impact on these webs and structures, not only on the formation of some of them, but also on the way people, machines, technology and information and data move in these networks and how they come together in the nodes or intersections of these networks.

Some network theories attempt to explain the attributes of networks, the ability of networks to bring freedom to the operation of big cities, and the transfer of power that happens at points in network webs resulting in a hierarchical network system. These variations in the

network (in combination) highlight the complex and almost mystical nature of urban regions, as presented earlier on.

Hogg (2013) argues theoretically that there are many network laws. I would now like to refer you to the two laws which in my opinion define the nature and performance of networks. "Sarnoff's law states that the number of networks grows with the number of role players involved." "Reed's Law states that large networks have the ability to grow exponentially especially when two unconnected networks are allowed to combine. This growth happens faster than the growth of individual participants". From Sarnoff's and Reed's Laws, it can be argued that networks are dynamic and that they can grow exponentially. Networks engineer social change through facilitating the merger of social groups by instantly distributing information to large masses of people without limitation. An important aspect of network webs is the points of intersection. Points in network webs can theoretically be viewed as "switchers". Switchers are the areas of interchange in a network web where forces of energy that enable motion of mobile things, people, and information are created (Geenhuizen, 2000: 199).

If we want to understand the impact of ICT on the network systems themselves, it is important to note the relationship and connection between the base structure and the super structure of networks as described by Hegel and Marx. The Hegelism school with German philosopher Georg Wilhelm Friedrich Hegel 1770-1831 as the source sought to provide a new form of logic in addition to the already existing philosophies of Aristotle, Kant, Fichte, and Schelling, among others. Hegelism sought the best explanation in terms of "dialect" in power and forces to prove that there is a difference between (1) the way something appears, and (2) the reality of that something and (3) how this applies to space (and even the mind space) (Krasnoff, 2008: 86, 89) (bracketed part added by author). According to Hegelism, these two structures (physical and spiritual), which exist in the world space, are in constant motion and in relationship with each other. Within the context of these two structures, Kemerling (2011) argues that there is an almost invisible "metaphysical force" present between the base structure and the spiritual network structure. Kemerling (2011) further argues that the spiritual structure is the perfect replica of the visible physical base structure. What is emerging so far on this voyage is that networks form a connected web structure where movement takes place within an energy field. When people move they create systems in the city landscape, and these different systems overlap. Some are visible, and others are

not. We also know that ICT has impacted on, and still impacts on these structures, and that it forms and shapes some of these invisible structures and networks. What we do not know however, is how to read, study and manage these invisible and illusive structures, networks and spaces, and how they affect people and future development in urban areas.

From a more economic, and socialist point of view Marx argued as early as the 1800s that the world as a society existed and operated within a base structure and super structure, which were in constant relationship. Marx contended that the base structure was associated with financial aspects, political issues, and culture (Katznelson, 1993: 71). For Marx the base structure was the centre of the production of an economy, and the basis for the super structure (Cole, 2015). Talbott (2011) stated that the base structure as presented by Marx, was also shaped by the methods of production, which strongly related to the work force. Smith (1984: 940) also supported the view of Marx that space contains a superstructure and a base structure, and that society consisted of the forces of production, which determined the performance of social, political, and cultural aspects of society. The theory of Marx articulated that society was made of a base structure, an economic structure, a legal and political superstructure, and an overall power of social consciousness, all of which were rooted in technology. These discourses also showed the power of production, and at the same time, that there was a relationship between the powers of production (Smith 1984: 940-941). It also became clear to me that strong forces exist, which connect the base structure and the superstructure, and that it is difficult to separate e.g. production, economy etc. and social relationships and structures (Smith, 1984: 644). If we support the theory of Marx, it is obvious that technology should be rooted in the base structure, and that this technology plays a major role to support and shape people, communities, relations etc. This highlights the direct impact of technology on the form of the base or substructure, which in turn determines how the other structures (and communities) will grow. This part of my story again points to the relationship between people and space, and the need to look at ICT in relation to people as presented earlier on in Chapter 4.1.

The operation in networks in urban and virtual space can also be read against the theory of Aristotle, the Roman philosopher. Aristotle argued that solids were composed of atoms, which were in constant motion. Each atom was composed of protons, neutrons, electrons.

Under pressure, atoms spontaneously exploded and formed invisible high speed atoms with new typologies listed as Alpha (2 protons and 2 neutrons), Beta (electrons), and Gamma[2] rays. The invisible atoms could not be contained[3], while the visible atoms vibrated within fixed positions[4] and made transmissions by induction. This is similar to the movement of cyborgs within networks in the city. Cyborgs are carriers of energy and, upon collision, they release energy into their environment.

Now that ICT so strongly dominates the virtual space and people's conduct and lifestyle, it can be argued that it will have more impact on the base structure (than possibly perceived by Marx in the 1800s, when ICT, as it is defined today did not really exist), and also more and direct impact on the superstructure.

If we bring this theoretical discussion closer to current practice and the aim of our journey, namely to explore people, space and planning, it is important to note Peet (1984: 564, 567), who refers to Marx's theory that capital can result in inequality and poverty in cities, and even social revolts. Peet argues, however, that the mechanisation of capitalism, which is based on ICT, is what should be altered. He argues that the reduction of the costs of production through increasing the power of technology, will increase the profit and hence grow the economies of cities (ibid: 566). The costs of production can be reduced by investing in technology (ibid: 566). If ICT has the capability to promote economic growth in cities, it could reduce poverty and unemployment, enhance employment opportunities and ultimately wealth.

Talbott (2011) confirms that Marx's theory was about the modes of production. He argues that history was the product of conflicts between classes in society. Progression in society therefore happened when there was irresolvable conflict between the classes in society. The success of the economy therefore was based on competition and the division of labour, which is technology driven. Castells also concurs with Marx that capitalism and economic forces built enclaves of "capital accumulation, investment, supply and labour" in urban spaces (Katznelson, 1993: 103).

---

[2] http://library.thinkquest.org/3471/radiation_types_body.html as retrieved on 12 November 2013, http://www.darvill.clara.net/nucrad/types.htm as retrieved on 12 November 2013,

[3] http://www.chemguide.co.uk/Cyborgss/properties/gcse.html as retrieved on 12 November 2013

[4] www.linesosspace.webs.com as retrieved on 12 November 2013

Merquior (1985: 110), very much in line with Marx, also refers to different power theories e.g. "social power theory", and how social power has created a class system in society and how this system largely directed the economy. Merquior (1985: 110) also refers to the "non-economic theory" of power and argues that, in this case, power does not really drive the economy, but that it is rather the product of a relationship between forces and the economy. However, according to the "power as war" theory, power creates inequality and exacerbates already existing urban space conflicts (Merquior, 1985: 110).

Castells (1989) also states that new technologies served as catalysts for capital redistribution through production. In line with the above, it would seem that, looking at Hegel's theory the super structure in urban spaces has a direct influence on the base structure and vice versa.

Moving on…from network theory to urban space networks.

Examples from other parts of the world such as Finland and Turkey show that there are varying sentiments around the relationship between ICT and urban form, space and texture. Talvitie (2003) in Finland and Meshur (2013) in Turkey investigated whether ICT had any effect on urban space networks. From their studies it became clear to me that ICT is changing space and urban communities. Talvitie (2004) also indicated the importance for urban planning professionals to understand these impacts. For instance, with the increase in data and ICT and related e-technologies, society is increasingly progressing to an electronic/informational working society, through working from home, teleworking, and asynchronous development of electronic spaces.

Meshur (2013: 474-478) also recognised that there was power in the "centralization and decentralization" that characterized urban regions. These almost opposing/clashing (de) centralization forces, not only had an impact on the overall urban space networks and movements in these networks, but also reclassified urban regions, as, for example, an "innovative city, eco tech city, and a smart city" (Meshur, 2013: 474-478). Similarly, Audirac (2005: 123), contended that there were conflicting powers in urban regions, such as the diffusive and "centripetal" powers. In line with this, Belitski & Desai (2016: 43) contended that there had been an adjustment in the global impression of urban space, which activated rivalry amongst urban communities, and this had reinforced the economic patterns of urban regions and cities.

As I navigated through the readings, it became clear to me that ICT does have impacts on urban space and urban space networks. There seem to be, however, some opposing viewpoints about what these impacts are. Contrary to some perceptions (and examples), that ICT development has a major impact on the movement of activities and e.g. migration of people and businesses, Kolarova, Samaganova, Samson & Ternaux (2006: 883, 886) and Kim (2015: 11) argues that this is not really the case. ICT in many ways has changed the design of urban space structures in urban and rural regions, in such a way that physical urban spaces and virtual spaces coexist. It became obvious that physical obstructions and mechanization have started to characterize the city. On the one hand, ICT has integrated activities, but it also resulted in the separation of activities. The study by Meshur (2013) in Turkey, for instance, reported that 43% of respondents indicated that ICT had influenced the separation of activities. Nonetheless, Talvitie (2003) in Finland, discovered that less than 10% of the respondents stated that ICT had influenced the separation of activities. In both cases, these responses are not sufficient to constitute proof that ICT actually does influence the separation of activities.

Some scholars argue that ICT actually influences the integration of activities in urban space networks in a positive and unifying manner (Gaspar & Glaeser 1998; Panayides & Kern, 2005; Maeng & Nedovic-Budic, 2008; Kotkin, 2000, Kotkin & Devol, 2001; Gordon & Richardson, 1997; Atkinson, 2001; Hall, 1999). Other scholars, however, argue that ICT fragments and separates activities in urban space networks (Webber, 1963; Pascal, 1987; Atkinson, 1996; Gillespie, 2002; Moss, 1998; Graham & Marvin, 1996). There is also a third group of scholars that argue that ICT can actually integrate and fragment activities in urban space networks (Talvitie, 2003a; Graham & Marvin, 1996; Gottmann & Harper, 1990; Castells, 2000). Then there are also those that argue that ICT had nothing to do with the fragmentation or integration of activities in urban space networks (Hall, 1995; Hall, 1999).

According to Audirac (2005), ICT always shows signs of change and so its consequences for the urban structure are moving effects and hard to detect. Overall, with the inundation of developments in ICT, urban communities have encountered expanded sprawl. Urban space and urban space networks became more complex, divided and scattered. Furthermore, the pace of association with urban space and transmission of data has expanded at an enormous rate. Virtual space incorporates living, working, training, and playing into a single digitized and almost virtual life. Individuals living in cities have more flexibility to live and work in

different places because of the expanded networks. These new trends and opportunities are expected to have a major impact on urban space, place, power and communities.

In aggregate, the above discourse proposes a whole new world in which the advancements in ICT have not yet been investigated. In addition, the delayed consequences of (dis) connected ICT in urban space are yet to be determined (OECD, 1998: 33). Urban areas have become entangled places to live in. For instance, Foroozan & Foroozan (2014: 176-178) contend that the structure, capacity, synthesis and movement of urban space and movement within urban space networks rely upon the proficiency of the base structure. The base structure therefore moulds physical urban space, and the urban space (networks) becomes stronger and more resilient as the technology advances and increases in the base structure. Jassem (2010: 1); Tranos & Gillespie (2011: 36); and Castells (2013: 296) also state that ICT has resulted in urban communities becoming "information highways".

When looking at the influence of ICT on space, it can safely be argued that the function of urban spaces, urban space networks and cities for that matter, has changed significantly, specifically because of the new relationships between the substructure and super structure, or the physical and virtual space networks, and the new emerging hybrid virtual/physical network.

Foroozan & Foroozan (2014: 176-178) demonstrates that there are three changes in urban space. The first change is associated with "e-life" and the electronic way of life where individuals live, work, and play virtually. The second change relates to "e-associations" in spaces, and the third change refers to "e-administration", which alludes to the relationship between the state and residents. The new types of space therefore are (1) non-stopped spaces that have no infrastructure, (2) versatile spaces which are old spaces with new ICT infrastructure introduced, and (3) the "change spaces", which are new spaces planned in the same branding as the most recent ICT infrastructure for the purpose of accommodating and integrating ICT in the space. The prevalence of these new spacesaffirm that ICT has increasingly started to change the role, function, character and image of urban space.

In addition, holding a similar position to Foroozan & Foroozan (2014), Ghorbani, Khiali, Zarankesh, Mosafarei, Sadegh, Davoodgholami & Dehghan (2013) contend that, if individuals are present in both physical and virtual space, the traditional roles for urban planning should be revisited. For example, the double presence of the same people in two or

more sorts of urban spaces has consequences for the traditional roles for urban planning of cities. Another relevant case is how virtual space re-orders the classes of privacy of urban space to open-closed, and semi-private spaces. When looking at the changes in urban space, it is my opinion that traditional techniques for urban planning and land use zoning cannot continue as before. I will talk more about this in Chapter 4.3.1.

Ioannides *et al* (2008) contends that, with the progression to more versatile communication lines and the internet, zones of convergence of human capital are being developed, and the power of the labour market ignited, by ICT developments. This perspective affirms once more that ICT advancements have influenced urban space networks. Barcelona (Spain), is among the important urban communities that have developed ideas such as that of the Internet of Things (IoT) and Internet of Everything (IoE) that speak to how the internet is changing urban spaces and planning. In Barcelona, which was once one of Europe's most innovative cities, a saving of $58 million was achieved in 2013 alone from investing in the expansion of the internet (Chambers & Elfrink, 2014).

A study of Katsara (2008) on Milan, Barcelona and Athens uncovered new structural thoughts, design proclamations and illustrations in urban space thanks to advancements of ICT. The advancement, articulation and utilization of high innovation progressively underscored the engineering configuration of urban space and demonstrated that ICT has changed and is changing the texture of urban space.

Mokhtarian (1997: 61) presents the view that ICT innovation and development could affect urban spaces in such a way that urban space as we know it today, could become so virtual and illusive that it will "vanish" in the end. The indicators that support this contention include internet shopping and telemedicine, which is the capacity to analyse and treat diseases through "virtual restorative specialists" with medicinal examinations done remotely and patients examined and even treated utilizing video and automated instruments. Another indicator is the shift from group-based entertainment to home-based smart phones, PCs and TVs that provide intelligent entertainment. It is estimated that many people would telecommute using workstations, videophones, and the internet (Mitchell, 1995: 45; Thorns, 2002: 71).

At this point in our journey, it has to be obvious that ICT is changing the significance of urban areas and the way in which public space structures function. Because of high pace of

innovation, urban space structures have “chains of production” and individuals are more able to interchange rapidly between the virtual urban space and physical urban space structures (Marceau, 1995: 131; 142; Frost & Dingle, 1994: 16). The two spaces are becoming one new space with a new identity. If this is true, then it is obvious that the overall urban space network will similarly be transformed into a virtual network. Soon we will have to coin a new name for this new space which is emerging (within ‘the other’ new space).

Therefore, innovation of the internet and the digital world in the 21st century have led to arguments on whether virtual space has supplanted physical urban spaces. The perspective communicated by Devriendt (2008: 6-15) is that e-activity does not supplant traditional activities. For example, the 1900s had seen the advent of advanced inner city urban space structures as well as increases in virtual space. Virtual space flourished thanks to vast transfer speeds and imperceptible networks (Devriendt, 2008: 18). In support, Devriendt, Derudder & Witlox (2008: 6-15) agree that e-activities do not supplant usual activities, but that there a digitized atmosphere has been produced that changes the DNA of physical space. Houghton, Miller & Foth (2014: 25) support the view that ICT has not supplanted physical space, but has reconfigured it. Shah (2015: 10) also contends that robots and people ought to supplement each other and not supplant each other.

There have also been changes to the capability of urban areas, and an increase in the formation of urban spaces because of the programmable and viral capabilities that ICT adds to urban space (Castells, 2012; Mitchell, 1996: 105). The velocity at which data flows suggests that urban spaces are viral and programmable. Ramana (2016: 72) and Huang (2012: 42) state that the computerized city coexists with the physical city and this is the reason why the ICT systems overlap with, and impose on, the built environment. For example, e-activities cannot supplant physical activities in urban space. According to Floridi (2007: 60, 62, 63) individuals and ICT gear, for example, cell phones, iPods, and digital TV, live as one in urban spaces. Rosedale (2014: 10), also adds that the virtual lens has changed the experience of space. Through a virtual lens, no space is hard to reach. For example, virtual reality supplants or even enhances video conferencing, and is used as a method for getting together with other individuals.

It is evident that activities in the virtual urban space cannot be contained, but rather manifest through physical urban spaces. What is more, there are numerous types of urban space half-breeds resulting from the overlaps between physical urban space and virtual space.

ICT has a part to play in the present structure of urban space in the city. There are distinctive perspectives on whether urban spaces have stayed conventional, or whether new urban spaces have emerged that are agreeable to new technologies. These new spaces are referred to as, for instance, dual urban areas (Meshur, 2013: 476), edge cities (Garreau, 1991), edgeless urban spaces (Kotkin & Devol, 2001), worldwide urban spaces (Sassen, 2001), complex web urban spaces (Castells, 2001), communicating spaces (Webber, 1964), "Electronic House" (Toffler, 1980), "telicity" (Fathy, 1991), smart cities (Kasarda, 2000), digital urban communities (Graham & Marvin, 2001), the City of Bits (Mitchell, 1995), and "e-topia" (Meshur, 2003: 477).

As will be presented later on, ICT also resulted in a number of new powers in urban space. ICT has connected the social environment to cities, for example, through legislative and financial aspects, society and private enterprise (Meshur, 2013: 480; Graham & Marvin, 1996; Pitkin, 2001). In this regard, ICT has penetrated administration and business operations in urban space and largely affected the base structure. ICT has given an unusual dimension to urban space mobility. Shifting perspectives have been introduced where some scholars contend that there is less travelling, while others contend that there is expanded travel, and that the urban space profile is presently more sprawled than before. However, different scholars contend that there has been an expansion in the virtual and digital densities in urban spaces.

If I look at the various opinions, and if I add my own interpretation and understanding to this rather illusive phenomenon, I want to conclude by saying that virtual space has not broken up physical urban space. Rather, an emotionally supportive network rendered by virtual space to the physical urban space structures has enhanced the capacity and availability of individuals and machines in the urban space. It also became evident that ICT innovations and imaginations have resulted in a transgression from the physical space to the virtual neurospace and the concurrence of the two. Against this backdrop, I want to argue that ICT can change the structure of a network. It is also my opinion that the frequency and density of e-activities can result in the formation of nodes and pressure points in the network space. The

higher the densities become around these points the more the pressure to expand these points[5]. One example is satellite radiation points and cell phone towers that develop as network distribution points that facilitate internet and cell phone connectivity, and the transfer of voice and data.

Alterovitz, Koenig, & Likhachev (2016: 76), argue that the planning of urban areas in which there are robots creates robotic planning and remains a challenge for the urban planning discourse. There is a need for a fresh outlook in planning science to develop models that mirror the movement in urban space to such an extent that there is an acknowledgment of machine support, for example, robots, that interact with human action in urban space. For Da Cruz (2014: 118) the future of urban planning is about the improvement of various plans where some are suited for real urban areas and others are suitable for the virtual world. ICT has opened up opportunities for a new type of urban planning (see also Graham & Marvin 1996). Brynjolfsson *et al* (2015: 12) contend that the 21st century needs an upgrade of plans and new models that would help the distribution of the advantages that originate from mechanical advancement to the lives of individuals. Wadhwa (2014: 11) holds a different view, namely that innovation advancements are too rapid for legislation and policy to be drafted in time and that this gap should be researched further with the aim of harnessing the advantages of mechanical developments for society. I will again reflect on the role of planning in a later part of our journey in Chapter 4.4.3.

Let us move on to the fragmented South African landscape with its digital divide fault lines.

If we look at the City of Tshwane in South Africa, it is interesting to note that this city like many other cities in the world started developing in a physical pattern, from the original Church Square. This grid and texture provided the structure and image of the city, as we know it today. Much as the grid provided for mainly transport and engineering infrastructure, it has become evident that the grid made it easier to install ICT infrastructure such as telephone and telegraph poles and cables. The grid texture extended both underground and above ground, noticeable in the city skyscape through unmistakable wires. Later in the 1800s radio broadcast became the dominant real virtual and invisible infrastructure in South Africa.

[5]See properties of air at http://www.engineeringtoolbox.com/air-temperature-pressure-density-d_771.html accessed 25 November 2013.

However, it was then, back in the 1800s, and still today, unclear whether these virtual technologies had directed or followed the urban grid shape and structure in cities.

If we look at the spatial development of cities in South Africa, it has to be clear that cities in South Africa, specifically in the early 1900s, were designed along the concepts of new technologies in transport and communication networks and the need for connectivity – physical and virtual. Historical maps of cities in South Africa display a network web based on new technologies in automobile and rail mobility. Although records indicate that planning of South African cities in the 1800s and even in the first part of the 1900s was mainly informed by the British modernist planning system, the metropolis web network has undergone enormous restructuring based on the automobile and also new technologies in communication networks. Cape Town, for instance, demonstrated a webbed landscape based on the automobile as early as 1884. This is not substantively different from the former Pretoria capital city map of 1878, or the Johannesburg capital city map of 1902. Although economic and even political factors have played a major role in shaping urban space networks, it is argued that networks were primarily shaped by the automobile, rail and emerging technologies in communication. Due to the virtual and illusive nature of ICT (back in the 1800s, and today), it is very difficult to accurately determine the actual and real impact of ICT on the formation of urban space networks. However, as stated earlier on, apart from the illusive networks, ICT related technologies and "hard" visible infrastructure such as computer labs, internet cafés etc., have increasingly started to influence the urban footprint.

In South Africa however, it is important to note that technology and ICT were installed to improve connectivity, communication, and ultimately the quality of life. The irony, in the former apartheid South Africa, was that the impoverished communities and rural communities that most needed such technologies were in some ways and in some areas excluded. The poorly developed and almost distorted urban space networks in these communities, rural areas and segregated (apartheid) townships provide some proof of the neglect of these regions and poverty clusters.

The texture of South African cities prior to 1994 was characterised by technological determinism. This means technology determined the role and function of urban space in the layout of the network landscape. Between 1940 and 1994, new technologies connected people of the same race, and at the same time separated people of different races. At the same

time, new technologies located minority races to higher resources i.e. "white" landscapes, and quickly returned them to the minority landscapes daily. Technology therefore determined the extent of power and rhythm in urban space. South Africa presents a unique challenge. Not everyone in the South African urban regions is connected to ICT. The impacts of ICT on the landscapes as argued in Chapter 4 are visible to a select population, and in selected urban landscapes.

The prevalence of an unequal landscape in the current South African regions continues to be an issue of interest to urban planners. While Odendaal (2010) demonstrates that ICT is vital for the achievement of informal trade, and shapes the streetscape through stopgap furniture, opportunities are identified for urban design to include the alternative business sector. Odendaal (2010) found that in Durban, South Africa, ICT encouraged the growth of electronic businesses that grew the relationship between government and individuals. For instance, Durban has unmistakable business opportunities, such as private internet cafes, makeshift containers of "spaza" shops, public buildings that provide internet service through libraries, and schools (Odendaal, 2010: 156). Odendaal (ibid: 176, 178) further demonstrates that ICT is utilized by informal traders for social and financial purposes and the new types of street furniture that characterise walkways, private, semi-private and open spaces. Phones, SMSs, calls, online networking, and email assisted the informal sector through news of new business thoughts or fears of xenophobia. ICT was key to working and maintaining connections with customers (ibid: 181).

According to the UNHABITAT 2015/16 report, in a study of selected cities around the world, three South African cities prime the list of unequal cities in the world with Gini coefficient values of 0.71 or more. These are Buffalo City, Johannesburg, and Ekurhuleni. The spatial landscape of South African cities is more unequal today than it was ten years ago. According to the Rawson Group, South Africa's Gini coefficient in 2012 was as high as 0.62, compared to other countries in the world. According to UNHABITAT (2016: 75) the Buffalo City Metropolitan Municipality, Ekurhuleni-East Rand, eThekwini- Durban, and Johannesburg, Port Elizabeth and Tshwane have Gini Coefficients above 0.7.

In the case of the Gauteng Province, which is the economic hub of the country, I found that 54.2% of the population does not live within walking distance of a bus or a station, and 9.5% uses rail to commute to work. Gauteng's spatial network-web pattern is expensive and

therefore the majority of the urban poor struggle to cope with the price of transport (OECD, 2015). By implication, ICT in the Gauteng province alone excludes two million urban poor. The statistics of crime in urban space have increased, and incidents of rage are becoming the norm. Certainly balancing the poor and the rich, or bridging the gap or divide between the rich and the poor, has become a major challenge in South Africa.

This brings us to the concept of the digital divide – or how this digital age (or even ICT) has underscored the divide between the rich and the poor. The digital divide is a term that describes how ICT connects some urban citizens whereas others (in most cases the poor) stay excluded, because they cannot afford access to ICT. The digital divide, therefore, represents the different levels of connectivity to data between the elite and the poor. The digital divide can also be observed between the urban poor and the urban wealthy and the developing versus the developed countries.

An appropriate explanation of the digital divide is presented by Da Cruz (2014: 118), in his book review, of the "The New Digital Divide" by Schmidt and Cohen. These authors express the view that the virtual world has changed the physical world. The effect of ICT is not the same and cannot be equal for all. Along these lines, with the advancement of ICT and related technologies and economies, imbalances are created that result in the divide. Governments connect with people to varying degrees and hence a digital divide is formed.

The urban digital divide, therefore, strains the relationship between government administration and the urban poor. There is growing aggression from communities that do not receive the basic services needed in South African cities such as water and sanitation. The factors that cause ICT to fail to play its expected role in bridging the digital divide and remotely communicating Government's plans for servicing the needs of the poor remain mostly unclear. However, the extent of the digital divide is an indicator of the potential of ICT for improving the lives of the urban poor. The digital divide is evident in urban space in various ways.

Although there is an increase in the number of individuals living in South African cities with smartphones, the dearth of free internet works against the capabilities of the smartphone. For example, Duncan (2013: 46) argues that the price of cell phones remain too high for the poor and unemployed. He also argues (ibid: 46) that "access to a traditional telephone does not automatically affiliate one to a paid-up network". Notable gaps within South African cities

are the uneven distribution of opportunity in the virtual networks. Whereas most institutions and main taxi routes are currently free Wi-Fi hotspots, some individual homes are not connected to the free Wi-Fi system. This is specifically evident in the rural areas and impoverished areas. People, particularly the poor, cannot afford to purchase this service (Muller *et al* 2013: 1).

South African cities such as Tshwane has a sophisticated ICT infrastructure that permits it to stay ahead of most African countries regarding the internet and "computer penetration". However, the cost of setting up ICT services makes it expensive and inaccessible for the poor. For example, Tshwane maintains a fragmented spatial layout at the periphery of which are the urban population that is unemployed and resides in slums. The price of bandwidth to connect poorer settlements typically situated at the outskirts of cities as compared to many affluent areas stays high and repulsive to developers. Thus poor individuals stay disconnected, and their settlements have the most aggressive behaviour in urban space. For instance, the urban space network of the City of Tshwane is often made up of varying hierarchies of networks, sometimes operating at different angles (see also discussion by Dewar 2011: 967) on the hierarchy of networks).

Scholars such as Simon (1989), Kridge (1990), Donaldson (1999), Dewar (2011), and Dewar & Todeschini (2004), have also published on the planning of South African cities and how road and rail mobility technologies have influenced the shape and form of cities. It is somewhat ironic to note that very little mention is made by South African planners and scholars on how ICT and recent e-technologies have influenced urban space in South Africa.

I now would like to guide us to yet another important landscape where we will explore the city beautiful movement and the smart city concept.

4.2.4 City beautiful and the smart city movement

While the previous sections dealt with the impact of ICT on urban dynamics, networks, spaces and people, the following part of our journey will focus more on how ICT has influenced cities as a whole, how it has influenced the overall look, image, architecture and brand of cities. More importantly, this part primarily attempts to show how ICT, through its multiple influences (as discussed earlier on), has made cities more digital, electronic, informational, and "smarter". The word smart in this context refers to both the meanings of

beautiful and smart in terms of advanced ICT. It is within this smart context, that I want to steer you through the concepts and plains of the emerging "smart city movement".

The idea to make cities smarter and more beautiful dates back to the late 1800s when reference was made to the city beautiful movement by Daniel Burnham – a concept that was later respected by many planners and architects all over the world (Paden 2003: 100). The development of normative planning theories and philosophies that unpack the imperatives needed to transform a city into a good, smart and liveable city are largely underscored by the popular writings by the late Jane Jacobs on "The death and life of great American cities" in 1961, and the work of Kevin Lynch's Good City form in 1981.

By definition, a city is defined as "smart" when technologies, especially ICT are used to address urban problems. A good example is the city of Amsterdam's intelligent lighting, the South African National Roads Agency (SANRAL) I-traffic, and New York's City24/7 programme. After having reviewed cities that consider themselves "smart", I found that smart cities demand digital connectivity between people. In addition, there is a prevalence of computer hardware, computer operating systems, and software. However, according to the City of Tshwane (2013: 113), the definition of the smart city refers to integrating people with capital and infrastructure through technology. As such, the City envisions improving quality of life through the smart approach focusing on "economy, mobility, environment, people, living and governance" by 2055.

By comparison, in the case of Barcelona, the Smart Barcelona (2014[6]) initiative demonstrates that in order to improve the quality of life of its urban citizens, urban planning was linked to information technology, and infrastructure as an "intelligent city infrastructure". Physical networks and spaces contain "smart lighting, smart energy, smart water, smart transport, smart parking" characterised by smart cyborgs such as electric cars and electric motorbikes. The city of Barcelona emphasises the importance of an efficient connectivity, speed and zero carbon emission. In addition, ICT was used to monitor the progress of all e-services rendered through the network space.

[6] Read more about Barcelona smart city at the City Climate Leadership awards 2014 finalists link at http://cityclimateleadershipawards.com/finalists-at-the-2014-city-climate-leadership-awards/ as accessed on 23 October 2014.

During the past century, a common belief and credo developed amongst planners and architects, that the more beautiful the city, the better the social capital in the city. Planners have also learned that beautiful cities have become more marketable, liveable and bankable.

My study of relevant literature, as well as my visual observations of typical world cities clearly indicate how technology in the past has resulted in beautifying cities, and how technology has branded cities, for instance the technological design of the Eiffel tower in Paris, France, and the London underground – to mention a few. Similarly, it has also become obvious to me that the more recent ICT and e-technologies have also had a major impact in terms of beautifying and branding cities.

When looking at how most world cities are functioning and how they are donned with ICT related gear and glitter, lights, screens, sensors, electronic sign boards, internet cafés and hot spots, etc., it has to be obvious that ICT has had a major impact on the branding and image of cities and the urban spaces in cities. In some cases these technologies (and e-furniture) have become so prevalent, that they have started to actually change and influence the particular architecture and design of buildings, interior architecture, design of public spaces and street furniture. In many cases these images have become so strong that they have resulted in international exposure and a global brand. The developments in Broadway, New York, and Las Vegas (USA), Singapore and Dubai are good examples of this. As presented in previous parts of our journey, the way in which cities have developed, and the way in which spaces have been affected by ICT and related technologies have created different experiences and many mixed emotions – positive and negative – for people.

However, closely related to architecture and the branding of cities and the role of technology in creating beauty and branding, is the way in which ICT during the past three decades has made cities more digital, electronic, informational, and "smarter" – so much so that reference is now made to the so-called "smart city" or the "smart city movement".

For most people the term ICT is strongly associated with smart technology and the so-called smart city. There still seems to be some confusion amongst scholars about what exactly the smart city entails. Watson (2015: 38), for example cites urbanization, environmental change, and ICT as a blend that smart cities endeavour to manage. Ryser (2014: 447) also traces the origins of smart cities to the famed 1992 Rio Earth Summit. However, Cocchia (2014: 26-27)

argues that the development of the internet post 2000, has largely influenced architecture and the character of the smart city.

According to Datta (2015: 3), smart cities are the wishful architectural and design approach to cities of the 21st century that try to address the aftermaths of urbanization patterns, such as contamination, pollution, and overcrowding, which demand better service provision. SALGA (2015: 9) adds that these large populations actually created the need for innovations, for example, development of systems that electronically distribute water and electricity. Mandarano *et al* (2010: 123) further state that cities, which accommodate high inflows of people and population growth will have to adapt and provide access to government services through ICT and smart initiatives and infrastructure. In short, they will have to become smart cities.

However, according to Gaffney & Robertson (2016: 2), the rise of smart cities was largely spurred by urbanization and the needs of people to access information in urban areas. Li, Lin & Geertman (2015: 2) also root the inceptions of smart cities in urbanization that brought about monstrous ecological contamination and a shortage of developable land for urban redevelopment. The reaction of the Chinese government was also to invest in innovation with the intention to address the difficulties arising from urbanization.

Various "smart city plans" were designed mostly by planners and architects from other countries, such as the USA. Examples of such recent smart city plans are: the Kigali Master Plan developed by OZ engineers from Denver, USA; Tatu City in Nairobi, Kenya, designed by Rendevour Rennaisense Group; Konza and Techno City in Nairobi, Kenya, designed by OZ modelers; Hope City in Accra, Ghana, developed by OBR designers from Italy; Le fleuve in Kinshasa, Congo, Eko Atlantic in Lagos by Darel Handash Shair and MZ engineers in the Middle East (see Watson, 2013: 4-8).

The City of Tshwane, South Africa, also embarked on strategies to become a computerized city that engages its population and promotes a green economy (City of Tshwane, 2012: 4). This city also developed initiatives to enhance integration, expand its economic competitive edge, bridge the digital divide (ibid: 9), advance agribusiness, and develop its social capital through online training (ibid: 29). In short, various efforts have been made in the City of Tshwane to become a smart city.

It has to be obvious from the discussion thus far, that smart cities have a number of advantages for society, the economy, and in terms of the liveability and beauty of cities. The smart city creates numerous opportunities for job creation, tourism and education, but more importantly smart cities are better able to compete in the demanding global nexus.

However, it should be noted that smart cities, and the way in which governments and developers are trying to create and invest in the smart city can have negative effects on other parts of the economy and communities. This is an aspect, which needs to be monitored and addressed carefully. For example, Mandarano, *et al* (2010: 125) defines the smart city as the production of a "double city" that both distributes resources equally and causes loss of work employment opportunities.

Datta (2015: 4 and 12) also refers to Dholera in India, which through its fibre optic links, cameras, sensors, non-mechanized transport, and low carbon emission, has been branded as an innovative city, information city, global city, eco-city, and smart city. I also want to refer you to Bunnell (2015: 45), who refers to Malaysia, which developed a number of smart activities such as the Cyber Jaya and the Putra Jaya.

Watson (2015: 36) argues that it is somewhat difficult to really brand the smart city, as there are too many new and confusing terms that are being used, such as "computerized city", and "eco-city". She further argues that some of the references are merely trying to associate or compete with, for instance, the typical "Dubai" picture which is internationally perceived as cutting edge, with its glass shopping centres, large airplane terminals, sky scrapers and high-tech developments. It is further argued, that the images of perfection depicted in these grand "smart plans" could perhaps persuade governments to divert financing from the key needs of the third world city, to a "Dubai picture" recognized as the latest design architecture, compliant with the technologies of the 21st century (ibid: 38). This again highlights the concern of the digital divide as discussed earlier, and this possible approach to ICT economic redistribution, can unintentionally continue to be discriminatory to the poor (Bunnell, 2015: 45, Datta, 2015: 4).

Li, Lin & Geertman (2015) refer to another situation where large private companies such as IBM sell or provide software solutions (under the pretext of smart city solutions) to cities in an attempt to remove urban problems such as slow service delivery in metropolitan cities. For example, when IBM launched smart cities in 2008, China invested 4 trillion RMB in

infrastructure development. Datta (2015: 3) however argues that smart cities are a type of "entrepreneurial urbanization" with business people creating models and images that are sold to growing nations as an answer for modernizing their urban space. Urbanization, consequently, has turned into a plan of action for the wealthier part of society and ultimately the poorer communities are being isolated and neglected in terms of service delivery.

SOMO (2015: 5) introduces yet another point to brand smart cities and contends that change lies in "globalization, neo-liberalisation and financialisation" patterns. Organizations in the advanced nations, in pursuit of reducing the expenses of manufacturing, have shifted the burden of hiring labour that contributes to branding, to poorer nations (ibid: 7) – hence leaving the third world nations with the obligation to meet the costs of paying wages (ibid: 18).

Smart cities are typically concerned with the environment, carbon emissions and environmental change, managing population densities, safety, sanitation and the general needs and priorities of people (Cocchia, 2015: 39). Monetarily, the smart city is also connected to employment creation and poverty alleviation. For politicians, the smart city presents an opportunity for winning votes (and not so much an opportunity to provide services to the people and specifically the poor) (ibid: 454) (bracketed part inserted by author). Lorenz (2015: 655) also argues that smart cities are about satisfying the needs of the wealthy, while Chen (2016: 1), argues that there is little thought about how smart cities are actually changing the lives of the poor living in the informal enclaves of urban space.

According to Li, Lin & Geertman (2015: 2), in China, in the year 2012, there were 193 endorsed smart city recommendations, 33 recorded smart city organizations, 229 other organizations directly involved with the management of the Internet of Things and the distribution of ICT and data. By 2013, China had 250 smart city developments (ibid: 8). While Li, Lin & Geertman (2015) focus much attention on the smart city movement, a gap in their discussions relate to the absence of reference to the millions of poor people in China.

It should be noted that the development of smart cities can have the potential to threaten communities and e.g. land ownership in certain parts of the city and city leaders should be careful not to force people to move to other places, so that space can be created for smart city activities, see also (Bunnell, 2015: 47).

Smart cities mostly portray the city urban spaces and structures, as perfect designs with high-rise blocks built out of steel and glass. Smart cities typically exhibit beautiful expressways with manicured green trees and non-motorised transport lanes such as cycle paths. The impression is often that these "perfect" smart cities do not have problems such as informal traders and informal settlements. This obviously is not the case. It is unfortunate that the real picture and reality of poverty, poor infrastructure, pollution, and the quest for proper infrastructure and services is not presented (Watson, 2015: 37).

While smart cities seem promising to resolve difficulties confronting urban spaces in BRICS countries, different scholars (Watson, 2015; Datta, 2015 and Bunnell, 2015) view these as dreams separated from the truth of the urban scene described by poverty and informal settlements. According to Watson (2015: 38), while smart cities and all that is attached to them present many opportunities, they cannot alleviate all urban problems and challenges. The reason for this is that, whilst planning attempts to be a bottom up process, government (often characterised by corrupt practices) operates from the top down, and this hampers the goals of becoming a real smart city. Undoubtedly, BRICS cities emerge at the top of web searches for countries to invest in. Watson (2013: 1, 2 and10) refers to African urbanization patterns and the rising middle class, which is attracting rich designers from all over the world, and the way in which African urban spaces are looking for new markets through radical property advancement (ibid: 13).

Let us look at the work of scholars such as Ponting (2013: 27-31), who examined "Cutting Edge Urbanism..." in Barcelona, New York, and Amsterdam. He demonstrated that ICT innovations and advancement had added to the development of the Amsterdam Smart City, new ICT innovations in Barcelona, with institutional support from New York Digital, and the Department of Internet Technology and Telecommunication Administration. Governments are now more transparent, straightforward, and available.

The ideas developing along with the smart city brand suggest that the old city can easily be erased. For instance, the Kigamboni-Tanzania City wrangle originates from the powerlessness to determine the ownership of land between designers and the local owners for over eight years (Citizen, 2016).

What is also emerging in smart cities is that urban planning is increasingly privatized (Datta, 2015: 13) and this creates a concern that social justice in urban communities will not be

achieved. Watson (2013: 11) also states that the smart city branding has downplayed the significance of individuals in urban space. It is furthermore evident that smart cities display perfect urban spaces with high-rise buildings, cutting edge air terminals, modern transport infrastructure, manicured yards, clean urban communities, urban spaces with cameras and sensors (ibid: 11). The impact of ICT on cities shows that it is critical to consider the appropriateness of a smart city before governments invest in them. In particular, the smart city ought to be weighed against the aftermath of the lives of individuals that have become more destitute, jobless youngsters, the proliferation of blue collar occupations as individuals battle to survive, and the disintegration of personal neighbourhoods, societies, and cultures. Jeffres (2010: 100) also states that ICT is about correspondence. Correspondence incorporates every one of the voices in urban space and increases the transparency of the decisions made in urban space.

In South Africa, major metros such as Johannesburg, Tshwane, Cape Town, Ethekwini and Ekurhuleni have attempted to show the distinction between a traditional city and a smart city. As indicated by SALGA (2015: 12) the City of Johannesburg has introduced smart meters, smart transportation, open web access focuses, and affordable broadband. Similarly, Tshwane has introduced free Wi-Fi in public spaces throughout the city, and Cape Town through Smart Cape has introduced smart PCs in public libraries notwithstanding the utilization of apps for security. It is somewhat ironic to note that so much attention is given to the development of ICT in urban areas, an in attempt to create the smart city, but so little attention is given and no investment is made in the impoverished and poor areas. A brief analysis of various spatial development frameworks in South Africa also revealed the overall neglect of planning of, and investment in, the rural areas.

This discussion and the discrepancy between rich and poor, and some examples of seemingly discriminatory development actions, bring to the fore an almost new construct or idea, namely the possibility of also creating “smart communities” or “smart rural areas”, or the idea to capacitate uneducated, poor and jobless people to become smarter and to enable them to build “smart communities”. Perhaps government and major private companies should consider to rather/also invest ICT in impoverished and rural areas.

Smart cities and smart technologies, can result in smarter communities, spaces and networks and in smarter cities in general. However, smart cities and ICT in smart cities, can also have a

major negative impact on communities, spaces and networks and can actually result in communities, spaces and opportunities (outside the smart city) becoming isolated or divorced from the real smart spaces. Again, it is the poor and destitute that will be affected most.

There seems to be an impression that the smart city principle is only visible in the big cities such as London. In addition, that it is associated with the wealthy and not for the poor and developing countries. However, as indicated in this section, smart cities and smart e-technologies are evenly applicable in poor areas and developing countries.On the contrary it has been specifically argued in this section that more could be done to apply the smart city principle in impoverished areas in an attempt to create smart rural areas.

Let us now pause for a moment and reflect on this part of the journey so far. We have now expored the various complexities of ICT and space, the aspects of time, speed and pulse, networks and network structures, the city beautiful movement and the smart city concept. You probably also noted the relationships between this spatial/structure/network part and the previous part on people as presented in Chapter 4.1. We will now navigate to another important landscape where we will observe the impact of ICT on the urban space economy, and then we will unpack and reflect on the overall experience of this part of the journey (Chapter 4.2).

4.2.5 Impact of ICT on urban space economy

As a starting point, and also to eliminate any confusion or expectations, I want to point out that, during this next stage of our exploration, we will mainly look at the impact of ICT on the urban space economy, and to some extent local economic development in urban space, and not at the larger focus on economic growth or macroeconomics, as it never was our intention to explore this as well. Having said this, I want, however, to encourage others in future to also explore the effect of ICT in the formal economy and the macro global economy.

Where an ICT infrastructure exists and a large number of people have access to capital and consequently a cell phone, the possibilities for GDP growth are enormous. To support this view, Misra (2014) and Policylink (2014) argue that the more people connect (via the net), to

the same urban opportunities, the higher the GDP of cities will become. Deliberate investments in ICT that have enhanced countries' GDPs are visible in the world's richest cities such as Tokyo, New York, Los Angeles, Seoul, London, Paris, Osaka, Chicago, Moscow and Shanghai.

Odendaal (2010) demonstrated that ICT is vital to the achievement of informal trade in urban spaces, and emphasises how streetscapes should be designed to accommodate stopgap furniture, and to enhance opportunities for emerging businesses. Odendaal (2010) also found that in Durban, South Africa, how ICT has encouraged the growth of electronic businesses (e-businesses) in urban spaces and how this has stimulated and spurred new relationships between government and individuals.

The installation of new ICT networks and improved access to ICT has created numerous new opportunities for business and e-businesses. Odendaal for instance, refers to private internet cafés, makeshift container or "spaza" shops, public buildings that provide internet service through libraries and schools in Durban (Odendaal 2010: 156). Such businesses are springing up all over, both in the urban and rural landscapes in South Africa.

Odendaal (2010: 176, 178) further demonstrated that ICT is increasingly utilized by informal traders for both social and financial purposes. In many areas, these informal stalls, with their particular structures and designs and colourful canopies, have begun to provide a new activity and branding in streetscapes. Private, semi-private and open spaces and walkways increasingly become the spaces and spots for these new businesses. According to Odendaal (ibid:181) these informal traders and e-businesses were largely activated, and is also largely maintained through ICT communication (cell phone communications, online networking, and email), which presented amongst others information on business opportunities and thoughts, connections with customers etc.

In short, it became obvious to me that ICT has had an impact and influence on the informal traders and the type of new e-businesses that are being created by informal traders. It also became obvious that ICT created numerous new opportunities for businesses in urban and rural spaces, specifically for some jobless and poor people, and that it had empowered informal traders.

As stated earlier on, Peet (1984: 564) argues that capitalism according to Marx's theory produces inequality and poverty in cities and that in order to eradicate poverty, the mechanisation of capitalism, which is based on ICT, should be altered. Merquior (1985: 110) also refers to the "non-economic theory" of power, which in this case states that power does not really drive the economy, but that it is rather the product of the relationship between forces and the economy.

Castells (2008, 2013: 295, 301) also contended that the economy is being driven by the Internet, and he hence refers to "an internet economy" or the informational economy. Within the context of the above, Castells (2007: 10, 2013) and Jassem (2010: 11), argue that the after effects and impacts of ICT and e-technologies, have actually adjusted the method of operation in urban space (and the urban space economy for that matter) (bracketed part inserted by author).

Based on my own explorations and observations, I want to conclude that the impact of ICT on the urban space economy can be associated with amongst others: the changing nature of businesses and the emergence of e-businesses, and how this has created new employment opportunities; the shift to an information-based economy and the so-called information revolution; the emergence of a workforce that depends on ICT innovation and speed; the appearance of new products based on the rapid emergence of new information and the sharing of urban challenges globally; and lastly, the observed speed and impact of the new production of information and services in urban space networks.

While virtual workspaces improve the lives of those participating in the formal economy, in many ways they are still out of reach for the informal sector in South African cities. The direct bearing is that unregulated informal markets and new e-businesses are compelled to forge a way to survive. This may, for instance, result in more informal businesses and even settlements locating nearer to wealthy suburbs so as to reap possible economic benefits from the rich.

UNHABITAT (2008/9), stated that ghettos (which are mainly associated with informal settlements), mostly in urban areas, have now begun to become destinations for mobs and vicious protests. In 2005, South Africa reported 881 protests in urban ghettos; no less than 50 had turned violent. In 2008, ghettos in Johannesburg became the sites of xenophobic attacks by South Africans against migrants from other African countries (UNHABITAT, 2008/9).

A noticeable economic impact so far is that urban communities (and economic opportunities) are changing faster than before the 21st century, because of the pace at which ICT develops as well as its impact on the economy (Rutherford, 2011: 22). This further suggests that urban planning will have to adopt a mindset that incorporates ICT into urban planning.

It now seems to me as if urban communities are becoming less concerned about physical urban spaces, and more concerned about virtual spaces, which have connected them, or can potentially connect them, to internet-based capital systems and the information economy. Spaces are coordinated and scattered at the same time, while individuals stay associated to these urban spaces. It has also become clear to me that a new e-economy based on the internet and influenced by ICT has emerged (see also Castells, 2000: 442; Castells, 2013: 295; Castells, 2010: 118; Mitchell, 2007: 145; Rutherford, 2011: 217; Mitchell, 2001, Gu, 2008: 250). In addition, urban communities have become the drivers and facilitators of global financial developments, which are linked to the global information economy (Huh, 2001: 103).

The convergence of new developments in ICT also increased the pace of "digital urbanization", which now presents new businesses opportunities and opportunities in relation to where people choose to live, work, play, and how they can contribute to the economy, through both physical and virtual spaces, as well as the blending of virtual and physical spaces (and networks).

The impact of ICT on urban space and urban space networks is further underscored by the way in which ICT networks and e-technologies permit capital flows between individuals and communities, between individuals and the state, between spaces in a particular urban region or city, between urban regions in a country, and between countries at a global scale.

There are various examples of how ICT and e-businesses have actually changed the lives of poor people. For instance, Chen (2016: 2) shares how artisans in Peru have used apps to build their client base and also how taxi Matatus in Kenya used apps to manage their routes and the demand for taxis in order to increase their transport income. In addition, cellular phones assisted traders to connect with customers to get buying orders (ibid: 12). Mandarano, Meenar & Steins (2010: 123) interpret this change as the rise of an "advanced social capital". According to research by the World Wide Worx Research Company in December 2012, also published in the Times Live report dated 10 May 2012 and Price Water House Coopers

commentary in May 2012, there has been a steady increase of internet usage and smart phones in South Africa, especially since the year 2000. More companies are increasingly relying on the internet, for instance for internet banking. This is in line with the emergence online and cell phone banking as the preferred mode of banking (Mitchell, 2005: 2). According to Forinet's investigations, in June 2014, 60% of the sample of South Africansthat was interviewed stated that homes connected to the internet would become a reality within the next 5 years. In other words, there was an increased belief in the potential of the internet.

This discussion so far, is starting to show that the influx of new ICT technologies have led to a faster pace of urbanisation, which is linked to increased economic strength. This revelation supported Castells's notion that economies have turned into information economies. In addition, capital is generated through information and the higher the number of people that are connected to information technologies, the higher the degree of empowerment linked to people's business and wealth base that connects them to new financial knowledge.

My observation is that the extent of economic growth and economic opportunities in the urban space networks largely depends on the way in which ICT and e-technologies have permitted and promoted the interaction between people and capital, and monetary exchange between people and government, people and businesses, businesses and businesses, simultaneously at a local, national and global scale.

The unfortunate paradox however, as has also been discussed in other sections, is that, while ICT and related e-economies in urban spaces bring wealth, at the same time there is a deteriorating quality of life for the urban poor. Approximately 40% of South Africans are living in poverty – with the poorest 15% in a desperate struggle to survive. It is a known fact that one of the causes of urban poverty is that peopleare not connected to global and local communities and e-economies. If the urban poor are not connected through e-connections they cannot tap into technology-based economic opportunities. However, it does not necessarily imply that if people connect to the urban space web, their lives will be better.

Now that we have reached the end of this part of our journey and yet another summit (Chapter 4.2), we can now unpack and look at our experiences, lessons learnt, concerns, questions etc.

4.2.6 Some questions to ponder and future images

The previous part of our journey mainly dealt with the impact of ICT on urban dynamics, urban space and urban space networks. As was the case with our first journey (Chapter 4.1), it is obvious that we are only starting to scratch the surface of the body of knowledge and that much research and further explorations are needed to fully unpack and explore these technologies, impacts, issues and challenges. In spite of all our endeavours and explorations, it is not possible at this stage to make scientific and credible deductions and propositions. This initial meta-analysis and exploration of current discourses on the subject matter, however also provided insight for me, to actually start framing some questions to ponder and imaginations about the challenges and opportunities, specifically for the future, and for future explorations.

One of the big problems for me and my story, is that ICT has developed so fast in recent years, and that it is still developing and expanding at an enormous pace – so much so that research on the subject matter cannot stay abreast.

To this end, it is obvious and somewhat frustrating and challenging to note that there are so many unanswered questions, concerns and frustrations. What makes this more frustrating to me, is the complex nature of the technology, the speed at which it develops and unfolds, and the uncertainty and unpredictability about what the impact of ICT on urban space and networks would be in the future.

While some of the questions presented in the following section could be somewhat “tongue in cheek”, others could be from a “devil’s advocate” point of view, testing thoughts that are deemed relevant or problematic. The fact of the matter is that these questions are relevant and could individually, or as a whole, spark a new interest and a possible structure and direction for further research and the road map for other journeys, not only for urban planners but also various other related professions.

If we now look at what we experienced and observed, and after having unpacked everything from the perspective of ICT, and the impact of ICT on urban dynamics, urban space and urban space networks, a number of questions can be asked:

How can virtual and physical spaces and networks be made more understandable, legible, affordable and accessible for everyone and specifically neglected communities in South Africa?

What can governments and city leaders do to provide equitable access to spaces and networks in their cities and rural areas, e.g. through providing free Wi-Fi, improved and faster networks and internet facilities?

How can ICT devices, and the use of cell phones and apps, (linked with e.g. tracking systems and Google earth), be exploited and applied to improve the planning and management of urban and rural spaces and networks, for instance improving safety and controlling traffic?

What can governments and related professions do to manage, control, measure and monitor the speed (and pulse) at which e-technologies and e-infrastructure are developing and impacting on urban space networks, so that urban and rural regions and infrastructure development can be adjusted to keep abreast with the pace of e-developments?

If ICT and related e-technologies are developing at such as fast pace, and if the movement of these technologies on urban space is so viral, then one would like to ask what could be done to ensure that all communities in all sectors are capacitated to keep up with the fast developing and rapid moving technologies.

If we are really concerned (and we should be), about the uncertainty and illusiveness of these invisible and somewhat frightening (ghostly and seemingly supernatural) virtual networks and spaces that have such a big impact on people, spaces and networks, then we need to ask, what can we as planners and development professions do to improve our understanding of the nature of these virtual spaces and networks, their impacts on space and people, as well as the powers?

How can we read, analyse, explore and study these invisible and illusive structures, networks and spaces and the impacts thereof on people and the future development in urban rural areas?

Do we really understand (within a people and space context), why it is imperative to effectively manage and control the dynamics, actions and movements of ICT and related technologies in the physical and virtual spaces and networks, and what can governments and related professions and role players do to control and manage this?

There sometimes seems to be conflict and friction between the virtual spaces and physical spaces, as well as the virtual and physical networks. It has become obvious that these

networks and spaces are becoming ever more integrated, and starting to function as one. What can be done to ensure that these networks and spaces function as one, so as to benefit all communities?

How can e-technologies and structures be used to beautify and improve the image and branding of urban spaces and urban space networks and cityscapes in general?

How can ICT and related e-technologies be used and exploited to brand and market cities and to attract visitors, investors and tourists?

What can related development professions do to make cities smarter and to create the ultimate smart city?

How can smart cities be structured and managed to ensure that all citizens can benefit from a smart city and that no communities will be disadvantaged through the creation and development of a smart city? In other words, that smart cities are not developed at the cost of the poor, as is the perception amongst some people.

How can urban planners exploit the opportunities of ICT and e-economies in the planning and design of urban spaces?

How can ICT and e-technologies be exploited to stimulate quality and viable e-businesses in the informal sector, both in urban and rural areas, and amongst the poor?

Imagine…a future where South African cities have adapted to the fast changing e-technologies, e-powers and changing networks, where cities have become fully transparent and accountable in terms of service delivery and specifically e-services to communities. A future where South African cities have become more resilient and flexible in terms of adapting to change and also “faster” in the way they move and adapt to ever changing technologies, innovations and needs of people.

What can planners, urban designers and related development professions do to effectively shape, structure, and design urban space networks and spaces, to effectively provide for and accommodate ICT networks, infrastructure and facilities, and also to make it more convenient, accessible and affordable to the broader public?

Imagine…South African cities, where innovations and applications in/of ICT have resulted in liberating the cities and people, resulting in quality cities that are associated with equality and e-quality, and the advancement of the social capital of urban and rural communities.

Imagine…a counter-complex future for South African urban spaces, where the utilization of an intelligent computerized model/app/programme, is unconstrained by the physical and virtual space that works at milli-seconds. The opportunities of such devices are that these devices can incorporate virtual space and physical urban spaces. Furthermore, through innovation and e-powers such devices can develop and shape urban and virtual spaces, build and strengthen associations and network at rapid velocities. They can also change urban spaces and networks by contracting, stretching, integrating and disintegrating the networks and systems simultaneously (for ease of explanation this idea can be compared with typical robot technology or similar devices).

Imagine a future where ICT and all new e-technologies are comfortably integrated with the urban space networks and urban spaces in all parts of the country and its urban and rural regions, completely familiar, friendly, accessible and affordable to all communities.

However, are we as planners and development professions really doing enough to actually understand the complexity and impact of ICT on urban spaces and networks, as well as the possible impacts this may have in the future?

Imagine…if the "smart city movement" as discussed in this section, could be expanded and extended to the areas outside the defined urban conurbation, towards the peripheral areas, neglected areas, impoverished areas and rural South Africa. Perhaps, notions of "smart communities" and the "smart rural" can be developed for South Africa.

Let us move on…from ICT and its impact on people, spaces and networks, to the impact of ICT on urban planning and planners.

4.3 Dialogues on ICT …and the impact thereof on urban planning and planners

4.3.1 Urban planning trends, discourses and tools

With technologies in ICT changing through innovation, simultaneous changes in urban space have a direct bearing on urban planning and the role of planners.

As discussed in previous sections of this chapter, ICT has resulted in new dynamics in urban space and a new role for cities in the global economy and this, according to Castells (1998), has frequently presented many new challenges to urban planning. Hiluten (2014: 1) and Rutherford (2011: 22) also refer to the impact of ICT, and the fast pace at which ICT develops and transforms, compared to the previous millennium. The implication of this for urban planning is that the future of cities cannot be predicted so easily anymore, and should therefore be envisioned and planned with an urban planning approach anchored in ICT (Shin *et al*, 2012: 34).

The meaning of the big cities, for people living in them has also changed. Migrants come to the city in search of a better quality of life, only to find that it is increasingly difficult to connect to the urban space systems. This leads to frustration, with urban protests becoming more rampant and violent. The meaning of time and space in the big cities is also changing, thereby creating new urban challenges for the urban planning profession. Space is increasingly being (re)defined as the intertwined physical and virtual spaces, and within new local and global landscapes, with almost no boundaries. This expanded scope makes it difficult to understand, manage and plan for these spaces.

If we look at how the characteristics and the meaning of space have changed, it also has to be obvious that this will require a new look at how we analyse, plan and design spaces. The freedom of mobility, connections and processes has inevitably changed the form and function of the urban space structures (Brindle, 1995: 50). Physical presence is no longer required for activities to take place in a particular space or place. Physical presence in a place also means simultaneous multiple presences in various other places. A person seated at home can through a cell phone be transferring funds in a bank and having a conversation with a person in New York at the same time (Huang, 2012: 1).

Mokhtarian (1997: 61) also argues that innovation and advancements in ICT can result that certain spaces in cities eventually actually "disappearing". Indicators in support of this argument include the introduction of internet shopping; the ability to diagnose and treat disease through "virtual medical practitioners"; medical examinations that are carried out remotely and where patients are monitored and even treated from a distance through video and robotic instruments; and the decline of community-based entertainment in favour of individualistic home-based entertainment (television, computers).

Chant & Goodman (1999: 248, 255), , argue within the context of changing urban space dynamics and e-connections that small-scale businesses could all move to the suburbs and the periphery where properties and rentals are seemingly cheaper, as there will always be easy connectivity to the centre or any parts of the city. The other side of the argument is that, with technological advancements through innovation, urban spaces may in fact become concentrated, because people will come to places with higher concentrations of activities and networks to engage with face-to-face interaction. Planners need to understand these dynamics, specifically in the process of developing longer-term spatial plans.

The invention of the internet and the cyber world in the new millennium certainly has triggered debates as to whether and how virtual space structures are replacing physical urban spaces and the need for physical connectivity. The view expressed by Devriendt (2008: 6-14) is that e-activities do not really replace traditional activities in physical space. The 1990s had simply seen the rise of new digital, cyber and virtual urban spaces. As I pointed out in the previous sections on structure and networks, these virtual spaces are associated with the invisible urban spaces created by the internet and ICT, or the content and structure of the so-called digital world as referred to by Devriendt (2008: 15). Devriendt (2008: 18) further argues that these virtual spaces can be analysed through internet based algorithms and the connections between the different elements in the big cities. The cyber world thrives on the broad bandwiththat is available in urban space and the radioactive waves that support the entire urban space web (Devriendt 2008: 18). Unlike the past, where spaces were largely shaped by planners who mostly drew on information relating to e.g. the needs of communities or the economy, such urban spaces are now being shaped by waves, signals and electronic motions.

You will remember, when we explored the previous part of our journey, where we unpacked the e-dynamics and functions of urban spaces and urban space networks (Chapter 4.2.3), we already started to touch on the role of planning. The way in which the function of urban spaces has changed is highlighted by Foroozan & Foroozan (2014: 176 -178), who refer to the new "e-life" in urban space which is associated with the electronic nature of how people live, work and play. It was surprising for me to note how many scholars have begun to refer to the changing dynamics and functions in urban space, which also inherently implies a new focus on urban planning. In this regard I refer you to Ioannides *et al* (2008), Maeng (2008: 7), Hall (1999), Kotkin (2000), Kotkin and Devol (2001) and Foroozan & Foroozan (2014: 176-78). Various prominent scholars agree that these new e-dynamics and modifications in space call for a new planning utopia that can explain this new spatial logic. In this instance, I would like to refer you to the work of Castells (2000: 442), Castells (2013: 295); Castells (2010: 118), Mitchell (2007: 145); Dodye *et al* (2011: 93), Rutherford (2011: 217), Mitchell (2001) and Gu (2008: 250).

Because of ICT, cities have become information centres and "information highways" in the larger urban and virtual space and networks (Jassem, 2010: 1, Tranos *et al*, 2011: 36; Castells, 2013: 296). In addition, cities have increasingly become the places where the "globalisation of capital, localisation of markets" are concentrated. Cities are becoming less about physical spaces and more about fluid spaces with a unique definition of time and distance. While cities have become engines of global economic growth, the intensity of economic competition has also increased through ICT (Nijkamp *et al*, 2013: 67-70; Foucault *et al*, 2008: 276). It is important for both economists and urban planners to analyse, understand and predict economic trends and opportunities resulting from the new informational economy in cities. In recent years, ICT also affected the ability for cities to adapt to new e-technologies and related challenges as well as the processes of industrialisation and urbanisation (Mitchell, 2002: 39).

It further became obvious to me that ICT has resulted in increased numbers of people moving into urban space in search of better social and economic opportunities. The increase in people further increases opportunities. This then attracts more people, which in its turn further increases migration, leading to a further increase in numbers. ICT and its fast communication and related opportunities advance this process. The implications for urban planning are that the high numbers of people entering cities have pushed cities into a spatial transformation.

Spaces have shifted from mono-functional spaces to multi-functional spaces that incorporate virtual spaces and the virtual lifestyle.

The innovations of ICT and e-technologies also influence and shape the overall city structure and the extent of sprawl. Some scholars argue that cities will inevitably experience increased sprawl because networks thrive with distance (and the speed of technology). For example in South African cities, there has been an increase in the number of urban nodes developing outside the urban edge.

Because of ICT, people living in cities have more freedom to locate anywhere in the city (or even the world). This freedom makes the dispersal of the urban structure of cities an opportunity to improve the quality of life (Brinddle, 1995: 50; Huh, 2001: 101).

ICT, and the way in which people and spaces have responded to the impact and powers of the new e-technologies and e-powers, has also resulted in new opportunities, new typologies in urban space and a new urban rhythm and pulse, which is much faster and stronger.

The response from planners to the impacts of ICT, has also been illustrated in the way in which some cities in the world have changed the focus of urban plans and master plans. Some examples are: the smart plans of Amsterdam, the New York City24/7 Programme, and the plans of Barcelona in Spain, which launched the Internet of Things (IoT) and Internet of everything (IoE) to represent how the internet and "things" in urban space could improve urban planning, see Chambers & Elfrink (2014).

I also like to refer you to the "Smart London Plan (2013)", the main intention of which was to improve the quality of life of its citizens. This plan demonstrates amongst other things, how ICT can have an impact on urban planning. For example, the Smart London Plan (2013) applies 3D visualisations of London's infrastructure to show how it has been used, accessed and maintained (City of London, 2013 9, 10 and 25). Through e-connectivity, the city is able to improve movement in the city and to reduce congestion and accidents between automobiles, and/or cyclists (ibid: 33). Communication through data accessibility and availability also makes it possible in London to guide the future needs of infrastructure growth. The London Smart City Plan (ibid: 10) also applies various other e-tools and smart metering and monitoring systems, to support the management of the urban spaces. In the City of London virtual "urban platforms" were created to provide opportunities for people to

contribute to the formulation of policy and rating of public service performance through various models and the use of apps (City of London, 2013: 10 and 25). The Smart London Plan also empowers people through what is referred to in the Smart London Plan as I-knowledge, which incidentally has been created and supported through on-line training programmes (City of London, 2013).

Attesting to the possibilities held by apps is the example of New York, where apps have been explored as navigation software used by the majority of urban residents. Apps have transformed the culture of how people find their way around the city. It is increasingly common that people intending to move around the city consult an app first. The positioning of apps on smart phones and the affordability of smartphones is crucial to life in the network space. For example, the smart phone creates alternative modes of transport and increased virtual mobility. Therefore, smart phones and the internet are becoming important survival infrastructure needed to live in cities (see also Goldwin, 2014). Fairweather (2014) also suggests that lines and points are connected through wearable gear, smart phones, smart homes with communication between appliances, services and people, smart services such as e-tolling, smart health, smart electricity metering, robots, and services that are all app driven.

I previously referred to the two PhD studies of Talvitie in 2003 on Finland and Meshur in 2013 on Turkey, who investigated the impact of ICT on urban planning. The following table presents responses on a selected list of relevant questions (selected by the author for the purpose and focus of this study). It should be noted that both scholars, although they did studies in different countries, have used the same questionnaire (also in an attempt to compare responses). It should also be noted that only the questions with a "yes-totally agree" response were listed for this study as these responses are considered to represent the strongest views of the planners that participated in the research.

Table 2: Table showing a comparison between research in Finland and Turkey on the impact of ICT on urban planning

The opinions of Turkish planners and Finnish planners on the impact of ICT on urban planning (Talvitie 2003, and Meshur 2013)	Turkish planners %	Finnish planners %
The urban sprawl of city regions will increase	18.3	6
Structural changes are slow and they can be adapted to the existing urban structures	12.9	9

The opinions of Turkish planners and Finnish planners on the impact of ICT on urban planning (Talvitie 2003, and Meshur 2013)	Turkish planners %	Finnish planners %
Old urban structures and traditions will soften the pressure for change	9.7	12
The significance of cities and centres as the central spaces of life and activities will remain	20.4	49
The application of ICT and related technologies will change slowly but steadily in existing community structures	25.8	7
The importance of distance decreases when measured in time	43	5
Location factors of different activities will change	37.6	3
As a result of ICT, organizations will operate differently and this will change the ways in which communities will work	23.7	9
The significance of the role of ICTs as a location factor is not yet recognized	20.4	8
The application of ICTs has no spatial consequences	5.4	1
Auxiliary functions of head offices will be relocated to cheaper premises	29	15
ICT will result in “Increased freedom in work and leisure”	29	18
As a result of ICT and new technologies, “Navigation services will save time and pains”	33.3	18
Locations of the key decision makers will remain in big cities	32.3	55
Freedom of location will emphasize the significance of the features of a place	20.4	25
As a result of ICT and new technologies, more central government offices will relocate to other areas e.g. the suburbs	11.8	3

In essence, in the case of Turkey, the responses to the questionnaires suggest that there would be a change in the profile of activities in urban space, with “increasing competition”. This incidentally aligns with the view of Castells, who argues that advancements in technology ignite competition. However, the table above also suggests that the Central Business District activities of trade will remain in the urban core. The composition of urban cores is therefore

expected to remain modern, reflective of high technologies and globally competitive. In the case of Turkey, it is believed that the "technology city" will assist in providing a stable number of work opportunities, which could see stability in the flow of people moving in the city's urban space. The findings further suggest that we can expect more people to move out of centres to move to cheaper peripheral areas, or to work from home.

In line with the above, various authors have also commented on the way in which these new spaces have created freedom, and how freedom commences when individuals through the internet are free to create their unseen urban space through personalised websites, with no fixed boundaries or addresses. They argue that freedom is viral and gives instant publicity. For example, freedom of mobility and connections changed the form and function of urban spaces. People now have the freedom to connect everywhere with anybody and with a flood of information and knowledge (Castells, 2011, 2013: 297; Castells, 2013: 295; Mitchell, 2007: 145; Mitchell, 1996: 3, 4; Mitchell, 2007: 144; Brindle, 1995: 50; Gu, 2008: 250). The consequence and relevance of the above for urban planning in my opinion, relate to the fact that people are in large volumes leaving trails of data along all the transmission lines with which they have connected.

The results of both these studies indicated that changes in ICT have been rapid over the last 20 years. The studies also showed how a new "information society" dependent on ICT for work, residence, and movement has emerged and emphasised how ICT has directed urban growth, and the importance of this for research in urban planning. Talvitie (2004) argues that the "information society" is the central force for spatial change. This also emphasises the importance of incorporating the changes that ICT had brought about in the urban planning practice. The studies have shown visible changes in the way in which society had advanced, how new software products had penetrated the market, and how the work place culture had changed. They also refer to a fresh perception of space and time, as well as the rapid increase in the quantity of information in circulation in urban space. In addition, the studies also mention how automation of machines had infiltrated the type of work that people in cities is doing, as well as the location of work places, with specific reference to e.g. "teleworking and e-working", which created a fragmented urban structure. The two PhD studies also argued that ICT should be incorporated as a vital element of urban planning and that ICT infrastructure should (like any other infrastructure) be considered in the development of spatial frameworks and long-term plans for cities.

Both Turkey and Finland agree that the location of key decision makers would remain in big cities. It is therefore expected that the urban spaces in the central business districts in the two countries will remain modern and globally competitive with evidence of the use of technologies to direct human movement and activity. Both Turkey and Finland believe that work will increase "regardless of location" and there is an 'increased freedom in work and leisure". However, in Finland there is a stronger belief that there will be an increased freedom in the location of homes, as this question scored 70% in Finland and 57% in Turkey.

The changes in character and function of urban spaces are also largely illustrated by the emergence of "telecommuting, teleshopping, tele-learning, telemedicine, and e-governance" which have become more visible in space (Meshur, 2013). Ozdemir (2014: 8) also argues that the computer was the engineering force behind the changes in urban spaces and urban planning in Turkey. He refers to the emergence of electronic banks, telecities, digital spaces, and the aerotropolis. In other words, the internet has played a significant role in shaping activities in and the character of urban spaces and urban space networks.

Meshur (2013: 474-478) in another paper, "Planners' Attitudes toward the Spatial Impacts of Information and ICT" suggests that ICT introduced new forces and powers of "centralisation and decentralisation" into the city space, which often are in conflict with each other. He attempted to reclassify cities into a "technological city, ecotech city, and a smart city". In support of the above, I would like to refer to another scholar, Audirac (2005: 123), who also researched the impact of ICT on urban form and shows that there is a set of forces working against each other in urban space, which he compares with the typical "centrifugal and centripetal forces". He argues that these forces will not really damage the city, but will instead create a fresh sprawling "polycentric" pattern. It is anticipated that this situation can escalate in the next 100 years, as more people will be working from their homes. There is also the expectation that companies and institutions will increasingly locate "anywhere", since the informational city will become borderless and timeless.

So far, this part of the journey focused on the impact of ICT on urban space, cities and urban planning. In the next part of our journey, I will attempt to explore how ICT has influenced new e-tools for urban planners and city leaders.

As a result of ICT, new e-tools have emerged that can assist planners with analysing urban space, the conceptualisation of space and the actual planning and management of urban

spaces. Examples of these are Google earth, GIS mapping and various other digitized programmable models that can screen urban development and advancements of urban spaces and places.

With developments in ICT, urban planning data increased and became easier, cheaper and faster to access. Similarly, it has become so much easier to record data, to analyse data in various ways, to share and store data through various e-models and systems as well as through sophisticated hardware and software. These new tools, software and opportunities can actually facilitate and improve the drafting of spatial plans, urban policies, zoning maps, and e.g. land-use controls. It should also be noted that the emerging e-technologies also resulted in the development of internet driven software. Plans and maps are now live, more interactive and easily accessible from the internet. Smith (2014) presents an example of such live maps and refers to the "Interactive Maps" and the LuminoCity3D in the USA, which is an interactive site that investigates connections between "urban morphology and financial cooperations". These sophisticated new e-tools can also be applied by planners and city leaders and even communities, to accurately measure and monitor the actual development performance of urban and rural regions, e.g. how the city performs in terms of spatial development, housing delivery, or sustainable development, etc.

Institutions such as the Centre for Scientific and Industrial Research (CSIR, 2014) designed an intuitive spatial guide called the Geographic Analysis Platform (GAP) as an attempt to raise the profile of urban planning. The CSIR has also set up an Integrated Planning and Development Modelling project that has an Urban Simulation Component: MATSim and UrbanSim, which have different planning and design abilities. UrbanSim produces land use transportation models and specialist based urban models, and Multi-Agent Transport Simulation (MATsim) aimed at the simulation of activities and developments in urban space (Wray, Musango, Damon & Cheruiyot, 2013: 25, 38, 39, 74, 76; Krizek & Waddell, 2002). Waldeck (2013) utilized urban simulation to develop designs from 2011 to 2030 for eThekwini, Nelson Mandela Bay Metropolitan Municipality; and the City of Johannesburg. Waldeck (2012) also made a presentation of how the Senozon Company had utilized MATSim to simulate and screen travel speeds in the Gauteng region. The Gauteng City-Region Observatory (GCRO) has similarly built an interactive GIS site.

ICT and the related smart technologies and e-tools have become increasingly important in the management of urban regions, e.g. the management of traffic. There are several examples that illustrate the impact of ICT on the management of urban space and urban space networks, and the data in these spaces. Berlin has a crowdsourcing 3D model where people can insert details regarding development on a map (Felix, 2015). Barcelona also features a bismuth solution that informs the location of transit systems (Data Smart City Solutions, 2016). In Chicago, MAPScorps has been used to explore how different sets of information in the city impact on each other (MAPScorps, 2016) in an attempt to improve the management of systems in the city. Rio de Janeiro also has a "centre of operations" that captures knowledge from local authorities, media, maps, and smartphones, and this information is ultimately analysed in a manner that can be used to inform urban policy (BetterWorldSolutions, 2016). New York also has a huge data assortment centralized system that allows anyone access to large volumes of data (NYC Mayors Office of Technology and Innovation, 2016). In Santander in Spain, 25000 sensors have been installed at intervals in the urban grid in an attempt to generate data that has directed traffic, parking, lighting and water distribution (SmartSantander n.d). Nissenbaum and Varnelis (2012: 18-19) refer to similar ways of capturing and monitoring information in urban spaces through e.g. the internet of everything, radio frequency identification chips, global positioning systems, foot paths sensing people's movements, EtherCAT and crowd sourcing.

Batty, Morphet, Masucci & Stanilov (2012) also state that the speed of information is a factor for evaluating urban planning. However, Dodge (2005) highlights the risk that high volumes of data generated at high speed can culminate in a loss of meaning due to the huge amounts of information received.

A variety of new software helps urban planners to interpret spatial data such as GMap creator Maptube (Crooks and Smith, 2008; Batty, Crooks, Hudson-Smith & Milton, 2008). Batty (2007) also states that digitised information can be used to manipulate physical and virtual networks in order to discover new patterns in urban planning.

Urban planners have in the past devised technological means of making sense of the information contained in urban spaces. Urban planners have also been developing software and models that analyse and aggregate the information flowing through urban spaces. It is obvious that such information generated by urban space is important in planning processes to

inform urban planning decisions. While there is an emergence of new models and methods making use of ICT that benefit urban planning, my concern is that planners are not doing enough to utilise ICT to develop appropriate tools for urban planners and to keep abreast of emerging technologies.

In sum, there is no doubt in my mind that technology has always influenced planning processes, data collection and analysis, and the urban planning processes in general. It also has to be obvious from this exploration that ICT had a major impact on urban planning (and all that is attached to it), and that it is expected that the ever expanding ICT will continue to impact on planning in the near future, even at a faster and stronger pace.

There now seems to be different views as to whether urban spaces have remained traditional, or whether urban spaces are transforming, because of the emergence of e-technologies. For me there seems to be confusion about how these new hybrid spaces and networks function, and this makes it difficult for planners to analyse these spaces, to develop appropriate land use management guidelines, and to make plans for the future.

One thing is certain, however: ICT resulted in fresh forms of power in urban spaces and many innovations in space. This incidentally has created many opportunities for planners and other development professions. ICT has changed behaviours, perceptions and emotions in urban space. ICT has caused urban space activity to become unpredictable, which makes long term planning more challenging. These new discourses and (sometimes) conflicting viewpoints have further created confusion and frustration about exactly how to analyse, manage and plan and design these spaces.

It is my opinion that ICT has certainly created new opportunities for futuristic urban planning. There are different views regarding whether location continues to matter in cities. This confusion is further complicated when we look at the possible ways in which cities can change in the near future, as well as the changes in urban dynamics, social networks, movement networks, urban space economies etc.

When the new emphasis on people and participatory planning, started gaining momentum in the latter half of the 1900s, the prominent UK scholar Patsy Healey referred to the “communicative turn in planning” (Coetzee, 2005). Later, towards the end of the millennium, with the emergence of concepts such as new-liberalism and the developmental state, various

scholars referred to the "developmental turn in planning" (Coetzee, 2012). If we now look at the recent advancements in ICT and the impacts thereof on people and space (post millennium), and the emerging informational society and informational cities, I would perhaps like to refer to the "informational turn in urban planning".

It has become obvious to me, when looking at the changing nature of urban space that urban planners will have to explore and find new ways to make sense of the information contained in the DNA of urban space. Amongst other things, this will imply that planners will increasingly develop new tools, models and software that can analyse and aggregate the new challenges and dynamics presented by both the physical and virtual urban spaces. One thing is certain however, and that is that the speed at which new tools and software are being developed, will have to keep up with the pace at which ICT is developing all over the world. The example of the rapid development and new applications of GPS systems and Google earth, for instance, provide proof of how (and how fast) urban planners have had to adapt to new technologies.

The rapid development of ICT and the impact thereof on urban space also have some implications for planners and the way in which they conceptualise and plan spaces, networks and regions. Firstly, the speed of formation of physical spaces and virtual spaces in cities demands a fresh approach to urban planning and the role of planning. Secondly, the plight of the people interacting in these new hybrid urban spaces (which are formed by the integration of physical urban space and virtual urban space under the influence of innovations in ICT), cannot be ignored by planners. Metropolitan cities under the ICT innovation regime are faced with mutating impacts of ICT innovations that have turned out to be (almost) uncontrollable, specifically if we look at the speed in which "things" move in space and the impacts of instant connectivity. Urban spaces face considerable pressures from ICT to produce and absorb data, and urban planners need to understand this. Thirdly, urban planners now have the opportunity to understand the effects of innovations in ICT on the people living in urban spaces. For example, ICT divides the population into two groups, namely the connected and disconnected. For the disconnected urban citizens, there is still an over-reliance on slow and costly face-to-face communication, with networks in poorer urban spaces more often than not being poor or non-existent. Furthermore, it has become clear that muchmystery still surrounds how urban spaces work in dual mode, i.e. the visible versus the invisible networks and the consequent hybrid of physical and virtual urban space networks, and the interaction

between the two networks. How this will affect urban planning and the way in which we plan in future, is somewhat of a mystery. However it is something that we as planners cannot ignore.

It is my opinion that the importance of the relationship between urban planners and ICT cannot be underestimated. The impact of ICT on people and spaces also affects the role and very nature of urban planning and development professions in general.

We have now again reached the point in this part of our journey, where we have to reflect and look back, and try to make sense of these recent explorations and observations. This brings us to more questions and images to ponder.

4.3.2 Some questions and images to ponder

The following questions and images to ponder relate to the impact of ICT on urban planners and urban planning, and the expected new role and focus of urban planning, within the context of the new urban and virtual networks and spaces.

What can planners do to create live and interactive spatial development frameworks that are able to interact with institutions, planners, development professions and communities through virtual networks and e-technologies?.

What can planners do to improve current software, apps, e-tools, and to develop new ones to support planning processes, data capturing and analysis, site analysis processes, spatial mapping and analysis etc.?

How can ICT and e-tools and technologies be exploited by urban planners and city leaders to effectively measure and monitor the actual development performance of cities, through e.g. satellite mapping and imaging, Google earth monitoring and spatial mapping, electronic data capturing and analyses of economic trends and performance, similar to some computerised dash boards and typical city labs?.

How can ICT and e-tools be exploited by urban planners and city leaders to effectively measure and monitor the daily operations in and management of cities such as traffic, pedestrian movements, safety, littering, influx of people and tourists, zoning etc.?

How can ICT and e-tools be exploited by urban planners and city leaders to enhance, streamline and fast track planning processes and land use management processes e.g. zoning processes?

How can e-planning portals be established in cities and provinces in South Africa, to become a one-stop-shop/centre/lab or data base, for planning information and data, and even a library/portal where publications, experiences and stories related to urban planning can be accessed and shared?

How can urban planners exploit the socio-economic opportunities and benefits presented by the new global and informational city, specifically in planning, and community building and city development?

How can governments in South Africa (at all levels) use ICT informed planning and e-planning tools to improve inter-governmental planning and relations?

How can ICT and e-tools be used to support and create new training programmes for planners, e.g. the application of the typical Sim City (city modelling software)?

How can ICT and e-tools be used to support and facilitate community participation processes in urban and rural planning processes?

Imagine…if urban planning departments, and all urban planning policies, spatial plans, land use management processes can be transformed into a virtual planning space, which is "alive" and accessible to all, and an interactive space which could also be monitored by all professionals, institutions, developers and communities.

We now move on from impacts to powers.

4.4 The emerging e-powers associated with ICT and the constructs in 4.1, 4.2, and 4.3 above

4.4.1 From ICT e-impacts to e-powers

In the previous part of our journey, we mainly explored the various e-impacts of ICT on e.g. people, people's spaces, urban spaces, urban space dynamics, the urban space economy and planning. We will now move on to another space, where we will explore the different e-

powers in this complex network, again within the context of the different landscapes of people, space and planning as was presented in the previous part of the journey.

I would like to point out, however, that it never was the intention at the start of my journey to actually explore the concepts of power as it relates to ICT, or to unravel the theories on power. This could easily have been an exploration or even a PhD study on its own. However, as I progressed with my odyssey, navigating through the different landscapes and spaces, I observed the various positive and negative impacts of ICT on people, space and planning. I started realising that (1) these impacts are very much associated with powers, and (2) that there were a number of new e-powers associated with ICT. Although powers strongly relate to impacts as discussed in the foregoing parts, it has become obvious to me that ICT and all that is attached to it, has become extremely powerful, and that it spawned a number of e-powers.

Before we continue, I would like to clarify the distinction and relationship between impacts and powers.

The Oxford dictionary defines the term impact as *"the action of one object coming forcibly into contact with another".* This refers to e.g. the impact of technology on the economy (as an example). Such impacts can be positive, negative, weak or strong. If such impacts become strong, significant and lasting, and so strong and powerful that they actually start influencing something such as the economy, or start shifting or changing a particular situation in a powerful or radical way, such impacts tend to become powerful, or in simple terms "a power or powers".

According to the Oxford dictionary, the word power has various definitions, depending on which context it is viewed from, e.g. people, politics etc. Examples of definitions presented in the Oxford dictionary are: *"the ability to control people or things (in people); the ability or opportunity to do something; the strength or influence in a particular area of activity; the strength or energy contained in something; physical strength used in action; a physical strength that somebody possesses; and power can also relate to a good or evil spirit that controls the lives of others".*

In order to provide a (power) context for this part of the journey, and an understanding and a reference within which we can present our discussion on e-powers, I will also present some

scholarly viewpoints on the concept of power, as far as it pertains to people, space and planning, and more specifically the urban space network, which actually provides the grid or web for "everything".

In the previous parts, I presented illustrations of the so-called urban space networks, the virtual space networks, the social networks, and how these networks interface and overlap with each other. I also referred to the nodes and connections or intersections in the networks and the special places (powers) that are being created at these nodes or knots in the web. It also became obvious to me that ICT and the impacts thereof revealed a strong relationship between the networks and the powers active in these networks.

Although the study of power and experiences of power dates back to years B.C., it is probably appropriate to mention the influential work of Machiavelli on power, *"The Prince"*, written in the 1500s. The first real contribution on power as far as it pertains to power relations and networks, in my opinion were the works of Foucault (see Foucault, 1969, 1975, &1994). Flyvbjerg (1998 a and b, and 2001), Watson (2001), Allmendinger (2001), Hillier (2002) and Lapintie (2002), also presented viewpoints on the relationship between power and urban space networks. A more recent PhD study by Coetzee (2005), as well as a later publication by Coetzee and Oranje (2010), on power relations, present a useful discussion and explanation on the various illusive powers and the power networks within the context of space and planning. Here, specific reference is made to the explanation of nodes and networks as well as the complex web of powers and power relations associated with such networks as presented by Coetzee (2005: 11-16). Healey (1997: 58) in Coetzee (2005: 11-16), also refers to this complex web and how social relations or the social web intersections or nodes in the web can become the common spaces of the institutions and associations. See also related references to power and social webs by Habermas, Wartenburg, Foucault, Kogler, and Giddens in Coetzee (2005: 11-16). Coetzee (2005: 11-16), argues that the social web and relations in the web are not only associated with power, but it is responsible for "creating" power.

It was interesting for me to note that so many scholars have located the aspect of power and power relations in a web-type structure. Within the context of the works of these scholars, I would like to draw some parallels to my study and the context of ICT, as well as the networks and powers associated with ICT.

Foucault, who incidentally also drew on the theories of Nietzsche, also links power with the flow of knowledge, communication and information. For more information on this I would like to refer you to Allmendinger (2001: 26), Forester (1982) and Hillier (2002: 49) in Coetzee (2005). Coetzee (2005: 11-16), drawing on the work of Foucault, also presents some discussion on the dynamics of power, stating that power is everywhere and that it comes from everywhere; how power flows between nodes, concentrates at nodes, flows from the centre to the periphery, how it circulates through individuals, how power is linked with the flow of knowledge and information; how power is deeply rooted in the social nexus; how power becomes embodied with local discourses and institutions; how power affects behaviour and communication; how communication affects power; and how the power web overlaps and interacts with the social web. It is obvious from Foucault and Coetzee, that there has to be a strong relationship between information, communication, technology, the way in which information is distributed, transferred, captured and concentrated, and power.

Foucault (1994) also stated that, as a result of the dispersed nature of power, and the different types of power relations in different parts and at different levels of the so-called power web, various different powers can be distinguished, namely good powers, bad powers, dominatory types of infra power ("sous-pouvoir") such as juridical, economic and political power and panopticism, people powers, social powers, the power of communication, neighbourhood powers, government powers, the powers of instruments, professional powers, powers associated with resistance and opposition to power; powers associated with anti-authority struggles; opposition of power over women; and administration over people, powers of exploitation etc.

If I now reflect on our previous discussions on ICT and the speed in which information is being distributed in the web or cyber space, as well as the impact and power of the concentrations (so much information and power in one small space at the intersections), the relevance of power (within the context of the cyber web) becomes clear. A good example of this is the power of your desktop computer, and this is only one node in a large network of many nodes. If we look at the relationship between the power web and social web within the context of the flows of information, then I would like to argue at this stage, that these social and power webs then also have to overlap with the virtual space webs that structure and dominate the powers of ICT.

The study of Coetzee (2005) in some ways helps us to understand how power works, how it moves around in the web, how important it is to understand the dynamics of power and power relations in order to manage power relations, to exploit good powers and to eliminate bad powers. It helps us to understand different types of powers and how these work on/in various components of society.

Coetzee (2005: 16-19) also refers to numerous scholars who in recent years have studied power within the context of urban planning and politics, such as Forester (1982), Hoch (1984), McCloughlin (1992), McClendon and Quay (1992), Brooks (1996: 118-131), Marris (1998: 16), Flyvbjerg (1996, 1998 a and b, 2001), Allmendinger (2001), Lapintie (2002), Watson (2001), Hillier (2002) and Homann (2005), and the need for planners to improve their understanding of power and power relations in the complex urban nexus and power and social webs (and now recently also the virtual webs) (bracketed part inserted by author).

According to the "social power theory" also rooted in Marx, power created a class system in society and drove the economy. However, according to the "non-economic theory" of power, power did not drive the economy but was the product of the relationship between forces and the economy. However, according to the "power as war" theory, power created inequality and exacerbated already existing urban space conflicts (Merquior, 1985: 110).

This "power journey" so far not only highlighted the different opinions on the relationship between power, rationality and communication, but it also highlighted the need to better understand power relations and the dynamics of power in the complex and volatile planning environment – also within the context of the virtual cyber space networks.

Although ICT is a term mainly associated with modern day post-millennium information technology, such as computers, cell phones etc., some electronic or information powers were also visible and present during the first technologies, namely the ox wagon that transported information, the early trams (1800s), the automobile (late 1800s), telegraph (1877), phone, fax, TV and early versions of the computer. However, they cannot compare to modern day technology and the current cyber space with its previously unimaginably complex, fast and viral virtual networks and impacts. What makes the power so strong and these networks and spaces so powerful, is the cumulative effect of all the various e-powers.

In this part of our journey, I would like to direct you to four new landscapes, which in my opinion have not been explored in much detail by others, at least not in the global south, namely:

(1) The e-power(s) on, or/and associated with people and people's spaces;

(2) The e-power(s) on, or/and associated with urban space dynamics, urban spaces and urban space networks;

(3) The e-power(s) on, or/and associated with the urban space economy; and

(4) The e-power(s) on, or/and associated with urban planning and planners.

4.4.2 The e-power on people and people's spaces

Before we embark on this part of the journey, we should perhaps ask how people are affected through the power of ICT and so-called e-powers.

In some of the previous landscapes, we observed how ICT has impacted on people, their conduct, behaviour and emotions in various ways. Due to the speed, magnitude and almost lasting impacts of ICT these influences and impacts became so powerful that they actually started forming a power that is now manipulating and controlling people and their lives on a daily basis. If we consider how ICT and related activities and gadgets are now manipulating our lives on an hourly basis 24/7, as well as how dependant on and addicted to computers, smart phones, Google earth, GPS, Social Networking Sites, etc. we have become, it has to be obvious that the e-powers on people have become exceptional powerful.

Thanks to ICT, individuals living in urban communities now have more information, knowledge and freedom. The more people are connected and the more people know, the more they can demand services and the more able they are to contribute to, participate in, and monitor government.

The e-power of ICT empowers people – it allows them to communicate in different ways, to access banks and accounts through their cell phones and computers, to find jobs on the internet, to do business, buy and sell motor cars on the internet, and most importantly to

access information and to learn from/via the internet. And all of this can be done from a phone or computer at relatively low cost, and if one could access a free Wi-Fi spot, such connections, information and opportunities are free.

The internet and software such as apps therefore elevated individuals to an easier and closer association with urban and virtual spaces, and communities all over the world. Urban communities, through the e-power of ICT, are continuously changing from a static community inside the borders of their physical locations, to "another space" where millions of people communicate in urban and virtual space with different societies, all impacting on each other's conduct through ICT. This presents another example of how e-power affects communities and communication, and on the other hand how powerful these virtual communication powers can be.

When talking of bad powers, it should be noted that e-powers can be extremely strong in the sense that they can totally manipulate and control (unintentionally) human behaviour and conduct, for instance in the way a person, while driving a motor car, can be tempted to use the internet, a smart phone etc., which irresponsible actions could lead to a fatal accident. I sometimes wonder if these powers are not capable of actually creating an addiction to the use of ICT.

Apart from the inherent power of/in ICT as discussed above, the computer, smart phones and worldwide web (www) also spawned new *communication powers* i.e. the power that people have to communicate, anywhere in space, any time, with anyone or any group or entity, anywhere in the world – at a relatively cheap rate. This power is strengthened through apps, images, video footage, music, internet information, etc that facilitate and promote communication and the sharing of information.

The role of ICT in the emergence of powers is clearly visible, if we look at how computers are being used to control urban space. ICT has the e-power to control businesses, economies, industries, institutions, people, the air space industry and satellites, and to empower people. It controls and powers the whole world economy. Imagine a global shut down or "power failure" and the impact of this on society. People will not be able to move and communicate and this will threaten the world and its economy.

When talking of e-powers and the way ICT empowers people, it is also important to look at how ICT affects government, politics and even democracy. As the power of e-government increased, the power of both citizens and politicians also increased because of new ICT powers and faster, more powerful forms of communication. Urban planning is an integral part of government, politics and people, and hence the need for planners to be familiar with the e-powers of government and politics.

In South Africa, e-governance actually only began in 1994. The change of government in 1994 saw an opportunity for the South African government to invest resources into the development of ICT with the intention of bringing South African cities back into to global arena and to make the country globally more competitive. E-administration systems, for example, web portals, libraries, digital labs, telecommunications service centres, multi-functional cyber centres, and portable digital offices were installed in various administrations throughout the country.

In South Africa (DOC, 2013) e-administration has three parts, namely e-organization; the connection of government to government (G2G), e-administration/society, which relates to the connection between government and individuals/subjects (G2C), and e-business which forges a link between business and the state (G2B).

ICT has played a major role to create new powers in/and for government and administration, and indirectly these governments are exercising different and new powers on people. E-governance (a term also used by the DOC, 2013) is about the degree to which the administration empowers business operations in urban communities through nurturing an ICT-accommodating environment, for example, through the development of free Wi-Fi hotspots or the unwinding of ICT strategies. E-governance (or electronic administration) further alludes to administration that makes use of PCs, phones and the internet. This e-administration opens up opportunities for government to connect with the urban poor. In this way, the urban poor can be better informed and educated on administrative procedures, job opportunities, access to schools, information etc. This e-power has made governments more powerful. In short, ICT and e-power influences government and the way it operates, an in turn government uses these e-powers to manipulate, capacitate and organise citizens positively and negatively.

The South African government's ambitions also included patching up the e-government portal to enhance public connectivity to government organizations. In the meantime, the Eastern Cape Province's Department of Cooperative Governance and Traditional Affairs (COGTA) and the United Nations Development Program (UNDP), are also implementing an e-administration model (UNDP, 2007). Aspects of e-administration are found in different locations. For example, the Western Cape has an e-governance strategy to advance community-based planning (WCG, 2012).

South Africa's e-participation index and global position dropped to 76 out of 193 in 2016, 83 out of 193 in 2012, from 64 out of 193 in 2010. However, innovations in ICT are reflected in various available services listed on government websites of South African cities (UN, 2016).

As a result of ICT and its related e-powers, our governments in some way have become more democratic (as it is easier for them to communicate with citizens and for citizens to vote through e-technology), governments have become more accountable, and city budgets and processes more transparent, also due to smarter and more sophisticated infrastructure and e-support systems. It is now evident that ICT resulted in typical e-powers and a type of e-governance, which has its own e-powers specifically relevant to people and their behaviour. The previous discussion mostly highlighted the good powers, and social powers, but there are also examples that show how powers influenced people in a bad way.

Pinzon (2013) amongst others has also researched "how online networking influences power connections around urban space" in Ecuador. He presents confirmation of how social networking through the internet had an immediate bearing on the connections, powers and authority noticeable between individuals and communities in urban spaces. He further illustrated how the e-powers of the internet spurred activists to assemble in digital spaces and draw in universal backing, in an attempt to challenge local decisions and oppression (ibid: 16). Facebook, Twitter, Messenger and SMSs assisted with e.g. the democratization of urban space through helping individuals to gather (ibid: 21), for example, under the auspices of the campaign referred to as "Un Cambio Por La Vide: UCPV-a change forever".

In Russia, political and activist groups used community applications, such as "RosYama", "RosZKH", "Zalivaet.spb" and "Krasiviy Peterburg" to negotiate better places and better service delivery and better participation in government affairs (Ermoshina, 2014: 1). Mexico City also has the #YoSoy132 programme, which through online networking also negotiates

for majority rule government and better administration of power (Favela, 2016; 222). Another case is China with its citizen journalism and digital activism, which uses the counter PX plant (app) to negotiate improved service delivery. In Malaysia a similar programme, called the Hindraf, is as used to negotiate with government.

The Czech Republic has also developed a Czech online activist group that holds the administration accountable to its promises through planned protests. It is also increasingly noted that power struggles became more visible when governments block internet access to selected social media sites. The Czech Republic found that digital activism is well organized and that it exploits the speed with which ICT transfers data to urban space (Macková & Macek, 2014: 1). There is an increase in online political cooperation, discretionary support, and the degree to which individuals search for news and data. In the Czech Republic there is a critical positive relationship between the level of engagement of people on Facebook and their political interest (Stětka & Mazák, 2014: 1). Several other nations have also had policy challenges in urban communities, for example, Uganda in May 2016 (Kuo, 2016), Zimbabwe in July 2016 (TMG, 2016), and Egypt, which blocked internet access (Abutaleb & Menn, 2016).

Talbot (2016: 1) also states that the use of the internet by activist urban societies has created a space for sharing, planning, and engaging that is hard to “assault or close down”. Assertive urban societies give credit to the electronic administration that fortifies the relationship between individuals and government (Ramana, 2016: 75). For instance in Taipei, the TapeiCyberCity, UI-Taipei, and WiFlyTaipei, bring the administration to individual citizens all day, every day through remote systems and e-administrations (Huang, 2012: 47), and the various e-powers.

Castells (2014) contends that ICT is about the African uprising in the 21st century. For example, Tunisia's December 2010 upheaval was ignited by universal media mechanically determined to expand the activist scope from Tunisia to Egypt, Algeria, Yemen, Libya, Jordan, Bahrain, Iraq, Mauritania, Pakistan and the Ivory Coast (African Revolution, 2011).

The mix of new advancements of the cell phone and the internet empowered the viral spread of activists both in the neighbourhood and worldwide. The Hong Kong 2014 Umbrella Revolution is another valid example where viral circulation of activist messages played a role

in the social development of Hong Kong and forced discussions towards democracy to start locally (Doane, 2014).

ICT also made it possible for court cases to be broadcast globally, for example, regular citizens versus the state, the rich versus poor people, and included versus excluded urban communities (Castells, 2013: 298; Castells, 2011; Castells, 2012; Castells, 2000: 16; Castells, 2001: 127; Castells, 2012: 5).

Castells states that power moulded urban space as a "social rebellion" (Katznelson, 1993: 134-135). Castells (2011, 2013: 295 and 297), Mitchell (2007: 144 and 145), Mitchell (1996: 3-4), and Gu (2008: 250) contend that democracy begins when people are empowered through the internet to influence decisions that shape the city.

Rotman (2013: 28, and 2015: 33), however, contends that ICT could be the reason for the expanded disparity in communities and urban areas. Castells refers to this emerging space as the "fourth world", which is made up of prohibited, detached, non-proficient and un-financed individuals living in spaces of exclusion (Sheerwood, 2016: 16). These perspectives suggest that it remains difficult to achieve a real democratic space.

The e-powers of ICT were also exploited already in the 1970s by the South African Defence Force, that used various ICT gadgets and PCs to analyse war zone information, guide weapons, transport gear, and send strategic notifications. Computors, in conjunction with the Air Force's radar, linked with satellite interchanges, were also used at the Silvermine maritime database to screen maritime developments around the sea bank of South Africa (Chokshi *et al*, 1995).

It is interesting to note that ICT and its political e-powers, were already exploited in the1970s in South Africa to empower governments and politicians in the struggles, and to ensure managerial control through correspondence, and the maintenance, stockpiling and distribution of data. For instance, computers in the 1970s (although somewhat old fashioned compared to the technology of today), were used to capture and organise population registers (of different racial groups, and the passbook for blacks, which allowed them to enter the city spaces), to screen individuals getting to the city by checking their criminal records, to record photocopies and transmission of fingerprints, and to manage the movement and management of black workers between work and homes (Chokshi *et al*, 1995).

It is even more evident that ICT also strengthened and enhanced political powers in cities and urban spaces. “Operation Vula”, a faction of the African National Congress (ANC) also started using computers in the 1980s, to disseminate information about the struggle. Data of the general population and the political affairs in South Africa was circulated worldwide in a split second (Garrett & Edwards, 2007).

The development of ICT in many ways also spurred digital activism. In South Africa's digital activism the images # and the “must fall” developments in urban spaces became the new communication lingos. In this way, the # and “must fall” turned into a way of life. Campaign slogans started with # and appeared to end with “must fall”. An appropriate illustration is the #RhodesMustFall and the #FeesMustFall campaigns in 2015 - 2016. These innovations and new initiatives are also largely associated with and supportive of the new e-politics and e-powers on politics and government.

Political power in recent years developed with considerably more advancements in ICT – ultimately resulting in a type of e-politics. Digital urban and virtual spaces were created, through online discussions, for example, the #askMmusi initiative, established by the Democratic Alliance political party on 13 May 2015, and the #AskRamokgopa initiative, established by the Mayor of the City of Tshwane on September 4, 2015. This initiative made it possible for citizens to communicate with government and the Mayor through Twitter, Facebook, and videos, using the Tshwane Wi-Fi TV (see also the 2015 Tshwane State of the City Address).

Social gatherings also became more advanced and part of the virtual networks. In South Africa, the Digimbizo's (a term derived from two words: digital and imbizo) were formed. An imbizo is a Zulu word meaning group gathering. With the Wi-Fi advancement, the imbizo’s became so part of the virtual networks, that a new term was coined, namely “Digimbizo”.

During my explorations, I observed how ICT innovation has also decreased the power (and opportunities) of some individuals and communities, mainly in cases where some people were detached from ICT or isolated. In this instance I would like to refer to the case where people have lost their cell phone or computer, and how powerless they become, so much so that it is not possible for them to work or to communicate.

So far, it has become clear to me that already during the apartheid era ICT started creating a new kind of political power and governance, which can be regarded as the advent of so-called e-governance and e-politics, which are now becoming more prevalent and powerful through the rapid advancement of ICT. Through the easy contact and connections between ICT and people, communities became more empowered, and this created many new opportunities for communities, to challenge government and politicians, interact, to communicate, to monitor and manage government and politics. This has made democracy and democratic processes stronger and more powerful, but in some ways it has limited the powers of government and politicians, as government and political actions are now so easy to access and monitor. It has become increasingly easy for people to get their voices heard and to attract the necessary attention. In essence, the ICT powers have resulted in a more bottom up and people oriented administration, which in so many ways supports the vision of the new South Africa.

Let us now look at how e-powers have impacted on urban space and urban space networks.

4.4.3 The e-power on urban space and urban space networks

If we look at the pace in which ICT develops, and the impacts of ICT on urban space networks, it is reasonable to expect major changes to urban space networks in the future and a new type of automated and digital urban space. Such spaces will be characterized by e.g. self-driving cars, computerised traffic systems, robots, Wi-Fi spots and various other e-technologies (which I have not yet heard about, and "things" I cannot even imagine).

Furthermore, there has been a shift from the 1900s, from the mechanical space driven by the automobile and machines, to an urban space driven by data. This relationship helps the urban planners to comprehend self-planned urban spaces, the capability of the virtual urban spaces, and what the combination of physical urban space and virtual urban space means for the experience of the city. The models of urban space have likewise changed. Urban space has turned out to be digitally transparent through digitized imaginative expressions, intelligent amusement, news, and information. Therefore, new space types have emerged. This new type of urban space introduces another role of urban space, which is to gather, handle and disperse data past the constraints of time and barriers. It became obvious to me, that urban spaces have

become a double-edged sword. They advance superior personal satisfaction for a few people, however in the meantime they compounded the suffering of others, particularly poor people.

Given that a large number of the urban South African populace is unemployed and hence has no wage, paid access to the internet is not rational. The poor frequently live in unindustrialized areas that do not have the supporting infrastructure (for example, broadband links) that are vital for ICT to be accessible. ICT, therefore, conveys satisfaction through urban space through ICT programming, for SNS and for social purposes. ICT has made spaces socially more powerful.

Through various activities, people simultaneouslylive in dual or different urban spaces. As it were, individuals are dynamic members in different time zoned urban spaces. For me there is a gap in the knowledge in the sense that there are relatively few discussions that display how urban space should be planned and designed for various capacities, while exploiting the capability of advancements in ICT for South African cities. My observation is that although a few discussions were traced in the global north, there seems to very few scholars in the global south that have explored these phenomena.

It was interesting for me to note the speed at which individuals had to adjust to ways in which urban spaces were affected by ICT. For instance, there has been movement from individual neighbourhood urban spaces to aggregate worldwide urban spaces with instances of more than one million individuals associating with any given space at any one time through new ICT advancements.

On numerous reviews of this journey, I noted that underneath the discourse of urban planning, including urban structure, urban space, urban dynamics, urban space networks, there was another discourse and an expression of yet another type of power, which is associated with the power of urban spaces and urban space networks, hereafter referred to as “urban power”. There is no doubt in my mind that ICT and e-technologies exert a number of e-powers on urban spaces and urban space networks. ICT, and the way in which people exhibit e-power made these spaces and networks more powerful. Urban power, in the context of this study can be described as the power or the force possessed by individuals living in the urban space, in the light of the adaptations to the structure and space of the city that result from advancements in ICT.

What is more, urban power can relate to the capacity of a city to reconfigure its structure. Urban areas can be independent or concentrated; urban communities can grow, concentrate, sprawl; or even become mechanized or digitalized; or they can disappear in the virtual networks. Reference in this case is also made to the reproduction of a city structure into a progression of twisted grids or a complete re-arrangement in the shape of lattices. Urban power allows individuals to be flexible to the dialogue of time cognisant with less resistance between individuals and activities in urban space.

Urban power is associated with connectivity between individuals in the virtual internet web. For instance, individuals strolling on roads seem separated from what is going on in the physical urban space, however completely associated with (and part of) the digital world's virtual urban space. The inverse is also valid, namely that the individual as a dynamic member of what is occurring in the physical urban space, is somewhat separated from what is going on in the virtual urban space network.

Urban power in South African urban areas can be utilized decidedly as a part of reinforcing basic leadership through information in an incontestable way. Information delivered by different connections in the city, or by investigators ought to be accepted and utilized as scenarios to urban planning.

Urban power also resulted in the creation of different spaces – physical spaces and virtual spaces. The hybrid urban spaces, which emerged along with advancements in ICT created new powers and opportunities for people.

Another form of urban power is the unverifiable peculiarity that, while ICT urban spaces bring wealth, for the urban poor dejection and unemployment remains. These new e-technologies will be characterizing a new type of digital space, and a new type of urbanism (in this script coined as “digital urbanism”). What is now emerging is that ICT and the various e-powers are actually changing the nature and dynamics of urban spaces and urban space networks. These spaces and networks were infected with e-powers and are characterised by e-technologies and this made these spaces more powerful. If we consider and agree with Foucault’s views (as discussed earlier on), on the dynamics of power and how power moves in space and in networks, how power culminates in the nodes in the web, how power emerges and disappears, how it becomes stronger and weaker, etc., then it has to be

obvious that these powers and power dynamics will change significantly as the characteristics of the networks change.

If this is the case, and if we look at the ways in which the new e-powers are changing urban space networks and how these networks will change in the near future, it is obvious that urban space networks will spawn a number of new urban powers or e-powers. What makes this more challenging, and almost frightening, is the fact that the urban space networks are further distorted by the virtual networks and the illusive powers in these networks.

If we look at the current e-powers and new e-technologies in space as discussed previously, one can expect a range of new urban powers such as: the power of new types of recreation in space, the power created by new movement systems (i.e. to link people and goods at a faster pace), the spiritual powers created by new urban experiences, the economic power of new ICT related economies, the powers created through a safer environment as a result of ICT and related e-technologies, the power of speech and communication as discussed earlier on. On a more negative note, is it also important to mention the possible bad powers that can be expected in future urban space networks such as the e-powers exploited by criminals in certain spaces.

Although it never was my focus to explore the detail content of these powers, my study rather aims to bring to the fore the need for further research and to sensitise planners and city leaders to the nature and possibilities. If we agree that ICT is changing urban space networks and that it will be creating new urban powers, it is obvious that planners and city leaders should comprehend such powers and possibilities, now and also in the unpredictable future. Planners in recent years have learned the hard way how power dominates and dictates planning, as also presented by Flyvbjerg, who stated that “power defines rationality and the more the power, the less the rationality”. This alerted planners to the challenges of dealing with power in planning. We now know that ICT has created many new powers. We do not know, but certainly can expect that ICT will result in more and other types of urban powers in the future.

A possible concern that comes to mind is that ICT is creating a new space, and new activities “in the cloud”. While we have good and bad powers on the ground or in the physical space, we might in future be witnessing possible bad powers and undesirable power networks in the

cloud. We are now moving away from apartheid in South Africa. The last thing we want to see, is another apartheid "in the cloud".

Just to reflect. If we argue that ICT is having an impact on urban space and urban space networks, and that new powers are being created in these spaces and networks, then it has to be expected that e-powers will have an effect on the planners and urban planning in general.

4.4.4 The e-power on urban planning and planners

In the previous section, I presented some illustrations of the impact of ICT on people, urban space and urban networks. It has become obvious that planners need to comprehend the impacts of advancements in ICT on people and space.

The various urban powers discussed above certainly emphasise the need for planners to explore the impacts on people, urban space, the urban space dynamics, changing urban space networks and the relationship between people and spaces, but more specifically how these spaces are being influenced and powered by ICT. This requires almost a new type of planning power (see also Foucault on professional power and the power of instruments).

It has become clear to me that ICT and the various e-powers in recent years had a major impact on people, space, and urban space networks. It has also become obvious that urban-dynamics and urban space networks have become more prominent and more complex as a result of the new emerging e-dynamics and e-powers associated with ICT. The study also indicated the strong relationship between people and urban space networks and how people are affected and empowered in these spaces and networks, because of ICT powers and innovations. There is no doubt in my mind that these urban space networks (in conjunction with the associated virtual networks) will expand and become even more complex in the near future because of the rapid innovations and advancements in ICT. If we agree with these statements, and if we agree that urban spaces and people are primarily concerned with planning, then it is obvious that ICT and its related e-powers will affect urban planning. In fact, due the scale and nature of ICT, its complexity and speed, it is expected that the impact on urban planning will be significant.

Urban planners have always used data in whichever form to analyse and draft spatial plans, to develop urban policies, zoning schemes etc. Urban planners have become the custodians of

urban space networks, and the dynamic master organizers of urban space. What is more, the town planner has a dependable information base of constant data that assists him/her with making informed decisions. In recent years the way in which data is collected and presented has changed significantly with the advent and advancement of ICT, digitized programmable models, and new e-planning tools such as GIS, satellite imaging, Google earth, and various other advanced computerised models and software.

It has furthermore become clear from previous discussions that ICT could/will in future affect and even determine the spatial structure of the city. People will increasingly work from their homes, do online shopping, engage in e-learning or distance learning, tele-conferences or Skype meetings and enjoy entertainment that will move from the sports grounds, movie houses and recreational areas, to the virtual space through the smart phone and computer. These innovations may have an impact on how future development will be planned, and this type of planning is expected to be vastly different from the planning we have been doing over the past 100 years or more.

The paradox remains that there is an expanded virtual correspondence in cities, although unreasonably expensive airtime and the cost of data make it difficult for all people to access it. For instance, South African urban communities have unequal levels of access to data between the urban poor and the urban rich. Planning and legislation should endeavour to resolve this gap through advancements in ICT and proper urban planning. Moreover, with ICT, activities in the virtual urban space cannot be contained to that space, but rather manifest through the physical urban spaces. What is more, there are numerous types of hybrid spaces because of the overlap between physical urban space and virtual space. For instance, while private sector analysts for example financial analysts, investors, and engineers, create models for monetary development, the specialists who work for the public service in urban planning should ensure transparency in the accountability of urban investments, and they should explore the possibilities of ICT and e-tools such as digital mapping and digitised community-based planning.

In urban planning, e-governance is about the strengthening of community-based participatory planning through ICT. This dialogue shows the power of ICT and how electronic community-based planning systems are being used mainly in the upgrading of informal settlements. Individuals have used ICT and e-powers to communicate and negotiate with

government, to mobilize their communities, to upgrade their settlements or infrastructure, to apply for government subsidies and to improve their security (SDI, 2012).

The opportunities that ICT presents for community-based planning in the upgrading of informal settlements, for example, make developments and actions more visible. With the emergence of new software and the emergence of smart cities as discussed in Chapter 4, organized communities are now better positioned to hold government accountable to the prioritization of investments.

When considering urban power as discussed previously, there is a need for an exhaustive clarification in urban planning science of the new typologies of urban space emerging at high speeds and on a large scale under ICT. It is therefore important that urban planning for South Africa's cities must take into account the capabilities of urban power. For me, it is critical to contemplate and ponder whether urban planning in South Africa has grasped these advancements to contribute to the improvement of urban space.

Urban planners throughout the world should do more research to discover new powers hidden in the data contained in the DNA of urban space. Through urban power, urban planners are progressively creating programmes and models that can break down and simulate the data produced in urban areas in both physical and virtual space. It is important that planning should exploit the capabilities of urban power.

The quest is therefore for an adjusted way to deal with this emerged urban power in order to review the efficiency of urban policies in South African cities. The opportunity has been presented to transform urban space so that the physical urban space is embraced along with virtual urban space thus resulting in a blend of physical and virtual urban space. Therefore, cities in South Africa pose a perplexing challenge to urban planners to manage urban space and power at the pace that they advance technologically through the capabilities of ICT.

4.4.5 Some questions to ponder and future images

It has become obvious to me, and hopefully to you, the reader, that planners need to comprehend the impacts and powers of ICT in relation to people and space, as well as the powers exerted by people and space. This brings to the fore a number of (power) questions:

How can ICT be exploited to empower people and communities in both urban and rural regions so that that they can benefit from the e-powers and opportunities presented by ICT?

How can ICT be exploited to empower poor and jobless people, specifically in rural areas so that that they can benefit from the e-powers and opportunities presented by ICT?

How can the negative and bad e-powers of ICT on people be managed, controlled and mitigated, and how can the good powers be enhanced to capacitate communities and to ensure their quality of life?

How can communities be capacitated and trained to understand power dynamics and the opportunities and threats of e-powers, for them to become more informed and resilient?

How can e-powers be used, to actually build, harness and strengthen communities and specifically fragmented communities?

How can e-powers be used to strengthen democracy in South Africa and to promote peaceful participation and negotiation?

How can e-powers be exploited to actually make urban spaces and urban space networks more safe and resilient?

How can e-powers be exploited to actually make urban spaces and urban regions more effective, liveable and sustainable?

How can e-powers be exploited to actually make urban space networks and movement systems more accessible, safe and effective?

What is the relevance of the emerging hybrid e-spaces and networks, emerging from the physical and virtual networks and how does this relate to the power networks in an urban region, and what is the relevance of this for urban planning and management?

How can ICT and related e-powers make urban planning more relevant and powerful?

How can e-powers be used to assist urban planning processes, community involvement in planning, and fair decision making processes in planning?

How important is it for planners to understand the impacts, powers, dynamics and opportunities presented by ICT?

How can we empower planners to deal with the challenges presented by ICT, e.g. the digital divide, and the opportunities presented by ICT and e-powers?

Can e-planning tools and innovations and e-powers actually promote and support a planning system that is able to bridge the divide between the rich and the poor?

Do these e-tools and instruments have the e-power to actually create sustainable communities, quality environments and urban growth where it is needed?

What are the powers associated with ICT (within the context of people, space and planning)?

How will these e-powers affect people, space and planning in the future?

4.5 The reality and future possibilities for South Africa and a metro region such as the City of Tshwane

In the previous parts of our journey, we explored the impacts and powers of ICT on people, space and planning. I now would like to re-direct us back to the South African landscape and perhaps we can also look at the City of Tshwane, in an attempt to observe whether and how these powers have manifested in these landscapes.

Throughout the various stages of our journey so far (Chapters 4.1, 4.2, 4.3 and 4.4), we noted there were different role-players evident. Urban planning and related professions in the built environment are such role players that have an important role to play.

It was interesting to note that during the history of Pretoria (prior to the 1990s), very few studies were done, and very limited information was recorded on the role of technology (and ICT), within the context of urban space planning. Essentially, in the 1800s no mention was made of the use of a phone or telegraph in planning. In addition, even though by 1930 Pretoria had grown significantly and communication technologies had started to pervade urban space, there was still no mention of consideration of these technologies in the planning

of Pretoria (Tshwane, 1972: 6-7). The only technology that was considered was transport technologies, which were acknowledged as the driver of urban structure expansion (Tshwane, 1972: 129).

However, in the goals of the revised 1993 Pretoria Structure Plan, it was acknowledged that the influence of telecommunications, radio and television would play an increasingly important role in the city of the future. The argument was that communication technologies had increased personal communication, and that the manner in which people commuted from residence to work would play a role in informing future planning (Tshwane, 1993: 15).

Essentially, the nature of ICT technology is such that innovation and the impact thereof on the lifestyle of people changes very fast. By implication, the indicators that inform urban planning such as migration trends, population profile, economic profile, and settlement patterns among others are also changing very fast, because of the influences of rapidly developing ICT. It has hence become increasingly important for urban planners and planning in general to embark on "an ICT informed type of planning", or a planning system that respects and understands the dynamics and impacts of ICT. Planners were always concerned with infrastructure and how this relates to urban space. It is not certain whether planners in South Africa have actually begun to realise that a new strong and virtual infrastructure "above the ground" and "in the cloud" has emerged, and that this infrastructure has major impacts on all aspects of people and space.

Notwithstanding the above, South Africa's approach to spatial planning at the national level shows appreciation of an ICT based spatial planning approach. I want to refer you to the National Development Plan 2030 (NDP) crafted in 2011 by the Office of the Presidency, which argues that the extent of prosperity of the economy is largely determined by the extent of ICT infrastructure investment. In addition, the NDP somewhat acknowledges the new informants to urban planning and planners as the shift from "infrastructure to *infostructure*". In this case, *infostructure* is the infrastructure based on data and information produced by ICT. I also noted that reference was made to the emergence of a new "e-literate culture" which has been adopted (South Africa: The Presidency, 2011: 170). The NDP (2011: 178) further argues that the constraints to the efficiency of *infostructure* are that the cost of installing *infostructure* services is very high.

In the same way, specific to Tshwane, according to planning strategies such as the Municipal Spatial Development Framework 2012 (Tshwane, 2012: 5-6), Tshwane has even created a Consolidated Infrastructure Fund to support new transport infrastructure that is linked to modern ICT technologies, for example the Bus Rapid Transport system and activity spines.

I also explored other planning documents and frameworks in search of investments that bridge ICT and other infrastructure, as highlighted in the National Development Plan. According to the 2013/14 Built Environment Performance Plan (BEPP) of Tshwane, it was mentioned that for the past five years (2007/2008 to 2012/2013), most of the Tshwane capital budget expenditure was invested in network development and upgrading of infrastructure. In addition, in a separate planning related framework, the Medium Term Revenue and Expenditure Framework 2013-2014 (MTREF), Tshwane has intentionally put in place the Movement System Programme, that invests in corridor developments. It was also noted that lines or paths that promote the use of motorised and non-motorised transport were prioritised for development, which includes extension, expansion, and maintenance. Another example is the "City Wide Densification programme" that ensures that Tshwane is geared towards the growth of urban nodes and the increase in the quality of infrastructure lines.

I also found that planning in Tshwane focuses on a 5 year planning cycle. This includes among others the Integrated Development Plan, Spatial Development Frameworks and the Tshwane 2055 plan. However, the speed of ICT suggests that in the future, the notion of such static documents could be phased out.

The impact of ICT on planning Tshwane was also visible on 5 February 2014 when the Tshwane Rapid Transit (TRT) Spatial Development Policy was developed with an emphasis on densification and intensification around the transport corridors and Tshwane Rapid Transit Stations. The intention is to improve connectivity, residential densification, suburban densification, transit/transport oriented developments, building orientation and infrastructure for non-motorised transport (pedestrians and bicycles).

I also noted however, that the Tshwane Integrated Development Plan contains extremely limited reference to ICT. The Tshwane Integrated Development Plan (IDP) 2011-2016 mentions ICT from the SMART city and Wi-Fi perspective, referring to projects such as the Wi-Fi33 project of Wi-Fi hot spots installed at a number of academic institutions. The IDP

2011-2016 demonstrates the adaptation of the financial sector to ICT (Tshwane, 2011: 108), but makes no reference to the effect ICT has had on spatial planning.

The City of Tshwane is divided into 8 planning regions and a Regional Spatial Development Framework (RSDF) was drafted for each region in an attempt to guide development. It is essential to note that these RSDFs make very little mention of ICT as a new infrastructure. These frameworks however make mention of various new developments related to ICT, such as the nodal developments, Tshwane Rapid Transport systems, and the development of new corridors in various parts of the city.

However, the Metropolitan Spatial Development Framework (MSDF) (2012), which is the foremost spatial planning document of Tshwane only highlights Information and Communication Technology (ICT) under the "blue IQ" initiatives in the Rosslyn Automotive Cluster (Industrial Estate), Innovation Hub (Research, Innovation and Technology) and Dinokeng Nature Reserve" (Tourism node) (Tshwane, 2012: 122). The framework makes very little reference to *infostructure.*

It has become obvious also in the City of Tshwane that there seems to be an emergence of parallel investments happening in Tshwane in ICT infrastructure and the transport sector. Both these investments support the Tshwane Smart City Plan.

In the City of Tshwane, there is an emergence of private companies and private urban planning practices that are developing live urban network analytical software. For example, the Morphology Institute through a partnership with the University of Pretoria analysed the networks of the Newlands, Silver Lakes, Brooklyn and Irene suburbs in the City of Tshwane. They used live models and the Space Syntax software to present findings (see also www.urbanmorphologyinstitute.org, Bourdic, 2014, Nel and Ferreira, 2014). Mapable is a planning consultancy based in Tshwane that also developed an interactive and live database and mapping system to assist governments, municipalities, development professions and planners with data capturing, data analysis, forecasting, spatial analysis and spatial planning (see also the Mapable website).

If we now look at how ICT has developed and specifically the new e-technologies and e-novations applicable to spatial mapping and spatial planning, it has to be obvious that planners will soon have to move away from the typical static SDFs that we have in South

Africa towards live, electronic SDFs that are able to work, communicate and interact "up to the second". The opportunities for such e-plans are endless if we think of e.g. how such plans could be updated (almost immediately), and regularly, as data changes and are fed into the system. The possibility further exist that communities, businesses and investors can make inputs to the plans, based on changing needs and priorities. The typical software used for the popular SimCity models could also be adapted to present the SDF in 3D motion, and to actually present graphical images and visualisations of spatial planning trends, proposals, changing spatial dynamics, movement systems etc. Such a new generation of e-plans or e-SDFs could also be informed intelligently by the virtual infrastructures and the relevant dynamics in the virtual spaces and virtual networks, and in this way also indicate the relationship between the virtual and physical spaces and networks – an aspect which cannot be effectively illustrated through traditional plans. Lastly, these plans, which could also be located "in the cloud" can so easily be linked with other data bases, other e-plans (to ensure integration and alignment of plans), and even the different sectors in the various spheres of government in an attempt to enhance inter-governmental planning – a system, which is really not performing well in South Africa.

We can begin to imagine that the MSDF presents an opportunity for an ICT-spatial map that shows where and how the invisible and visible networks of the City are shaping the urban structure. If such a plan were in place, the Tshwane urban policies that contribute to social cohesion and overcoming the fragmented and sprawled spatial patterns of the past could follow suit.

An ICT oriented spatial plan or e-plan could also enable Tshwane to predict its global and local economic position and pace of growth. In so doing, the City's resources could be channelled in a more appropriate and decisive manner.

The City of Tshwane really has an opportunity to re-invent its planning and to adjust to the speed of new emerging technologies. This could firmly establish the city, and enhance the status of the city in the global, African and national, virtual and physical networks. This would literally "put Tshwane on the map".

Imagine the possibility of an e-quality City of Tshwane culture where everyone has access to a smart phone and unlimited bandwidth and free internet. Imagine the possibilities that could

be unlocked such as e-learning for all, e-employment, e-health, e-businesses, and government accountability to its citizens and e-governance.

Immense possibilities are therefore presented for the strategic documents of the City of Tshwane such as the IDP and the MSDF to address in a massive digitised way how e-services can be brought closer to people.

In the previous chapters (4.1-4.4), different scholars highlighted the link between power and ICT. We will now look at the reality of the City of Tshwane in terms of how e-powers have emerged. The context of section 4.4 above that presents how e-powers are divided into the e-power on people and people's places and the e-power on urban space and urban space networks, is essential as a backdrop to this section.

E-powers in the City of Tshwane started already in the 1800s when certain forces/powers started emerging and increasing in the urban network spaces as the years went on during the 1800s and 1900s, with a climax in 1994, with the introduction of the new government, and later in 2000 with the rapid expansion of the ICT sector. It was somewhat difficult to package this force as an ICT power, or as a political power, or as a hybrid power emanating from the presence of a political agenda and advancements in ICT and transport technologies. It became clear to me, however, that by the mid 1900s, the network space had become the site of many emotional experiences based on the need to control access to urban space of different races. Therefore, there were visible signs of power and domination presented through the evidence of location of residences and activities such as civil actions and protests.

In line with the above, Chokshi *et al* (1995), argued that by the 1970s, life in South Africa was dependent among others on computers and the telephone. Not only were these used as communication technologies but also to design and monitor space. These instruments had so much power that administrative control through communication, data maintenance, information storage and dissemination of information was activated.

It was through the computer that political power was exercised in a new way to ensure that there was access control in the network spaces dictating racial movement and e-quality (see chapter 4) and access to the different city spaces. To support this position, Hoveyda, Garcia & Zuch (2012) stated that between the 1940s and 1995 only white areas were prioritised for

the installation of ICT infrastructure. This means that computer instruments had definite power to informing where investment should take place.

In the twentieth century, South African cities had two emotional characteristics. Firstly, the intention of network space was to increase white oppression of blacks. The unintended emotional consequence was that the oppression of blacks increased the power on people and the power of people in urban space (see Chapter 4).

In South African cities (during the apartheid era) white security personnel moved with ammunition to contain the black population in particular spaces. Chokshi *et al.* (1995) also argue that the movement of black labourers was monitored by advanced photography stored by computers so that movement of black people could be regulated and controlled. This saw a growth in the power of people as resistance grew to containment to secluded spaces away from the city. It was interesting for me to see how the dynamics of different e-powers, political powers, powers on people and powers of people could result in an emotionally confusing unpredictable urban space in South African cities.

Networks, therefore, not only served as lines of political power aggression, because blacks were being forcefully removed, in addition to white political powers placing points of control along the network (power) lines. Networks became the spaces where power struggles took place. What is now needed is to clarify succinctly the extent of the influence of ICT on the political power in urban space.

Computers designed and maintained the "automated population register", the passbook system for blacks, in the 1970s. Computer hardware and software were used for the access to all personal information including financial status and criminal records. Specifically, the "IBM hardware system" maintained the non-black register, while the "British made ICL hardware" maintained the black automated population register. Photocopies and transmission of fingerprints for identification were enabled by the computer system's software and hardware. X-ray machines were also used to check personal possessions, and passbook fingerprinting equipment, and communications logging recorders were all available to the South African police. Electronic sensing equipment, infra-red alarm systems, and photo identification systems were available in the 1980s to assist the police to design black townships with the goal of allowing maximum police access and control in cases of revolt (Chokshi *et al*, 1995).

In the meantime, while emotions were high in the network spaces of Pretoria, there was a simultaneous branding of Pretoria as the administrative capital of apartheid. In the case of Pretoria, it was found that security systems that scanned the human body as well as personal information were tightened by the security control. Moreover, enclosed dormitory network landscapes were designed for black areas with computerised software for surveillance at entry and exit points to control connectivity (Chokshi *et al*, 1995).

The South African Defence Force had six major computing centres. These computers were used to analyse battlefield data, guide weapons, transport equipment, and send notices to draftees. Computers were used at the Silvermine naval database to monitor naval movements around the coast of South Africa, in the Air Force's early-warning radar system, and in satellite communications. the majority, if not all, of the components of these systems were of foreign origin (Chokshi *et al*, 1995).

In the 1980s (at the heat of the apartheid movement and the eve of the transformation of the country), an increase in the emotions was experienced in network spaces all over South African cities. According to evidence provided by Garrett & Edwards (2007), a major contributor to the network space emotions was the "*Operation Vula*" initiative by the African National Congress (ANC). The day "*Operation Vula*" gained access to ICT through computers, according to Garrett & Edwards (2007), news of the political unrest immediately spread to the rest of the world (in a powerful way).

According to the UNHABITAT report, "in 2005, South Africa reported 881 protests in urban slums, at least 50 of which turned violent[7]. In 2008, slums in Johannesburg became the sites of more violence (xenophobia) as unemployed South Africans vented their anger at immigrants from other African countries"[8]. I also observed that riots by people in South Africa and Tshwane were associated with both the physical mode and intelligent mode (I-mode). In South Africa, urban communities often resort to burning tyres, people, cars and even dumping human waste in public areas. In the same space, many people will be using twitter and other social media sites for communication between various groups.

[7] Read more on this piece at Wines, M. (2005, 25 December). Shantytown dwellers in South Africa protest sluggish pace of change. The New York Times.

[8] Read more on this at State of the world cities 2008/9 harmonious cities UNHABITAT report page 57

What has emerged from the journey so far, is that South African cities were saturated with the combined abilities of the power of people (see chapter 4), and the power of instruments – computer hardware and software, as well as the telephone. For example, Garrett & Edwards (2007) further explain that the computer improved the accuracy of records of meetings convened during the apartheid regime for all parties. The e-powers not only strengthened emotions, but it also empowered people to participate in the struggle. It further also empowered many people in many other countries, informing them about the struggle, and ultimately resulted in a global empathy from all over the world for the South African community.

If we look at the previous journey as a whole (the impacts and powers) (Chapter 4 as a whole), it became evident to me that the grid that organised space in the City of Tshwane not only existed as a physical and virtual network, but also as a power web (as referred to by Foucault, see Chapter 4.4). It can therefore be assumed that ICT is associated with the (hard and visible) power of instruments (see also Foucault, Chapter 4.4.) i.e. computers, smart phones, satellites, and the (soft and invisible) e-powers created by these instruments (see Chapter 4.4).

It should however also be noted that these e-powers can be vulnerable and that a “power failure” can easily be created if the networks become overloaded with data and e.g. the physical fibre cables cannot absorb the pressure of data transfer.

Today, the South African government, as well as most of the larger municipalities, are well grounded in the use of ICT for communication to its citizens. More officials and politicians have resorted to social media platforms to communicate with people.

CHAPTER 5:
SYNTHESIS AND CONTRIBUTION

5.1 Introduction

We have come a long way with this journey and exploration. We have travelled through many new and complex landscapes and covered many rough terrains. We have now reached our destiny, the top of the summit, the highest peak. It is from this position (from the top), having experienced this journey, that we are hopefully now able to look down, look back and reflect on where we started, what we set out to achieve, and what we have experienced, explored, observed and learnt, and what we have achieved. We have experienced and explored various new objects and constructs. Certainly, this journey expanded our scope and thinking, but it also raised many new questions, and perhaps more questions than answers. This is how nature works, I suppose. The challenge for me is to make sense of it all, to synthesise and comprehend this vast number of inputs and stimuli and incitements.

In this last concluding part of my story, I will aim to: (1) "bring everything together"; (2) provide a synopsis and snap shot of the journey as it unfolded through Chapters 1 – 4; (3) present a summary of the main findings of this exploration; (4) present the "answers" to the main research questions as presented in Chapter 2; and (5) lastly, but most importantly, to present a discussion on the contribution that this study and exploration has made to the field of knowledge, specifically within the ambit of urban planning and development, and the role of people in the new emerging and hybrid physical/virtual spaces.

5.2 Reflecting back on the four journeys (Chapters 1 – 4)

In the first journey (Chapter 1), I presented the thrusts that inspired and informed this exploration. I highlighted the power of technology (in general) and how this has influenced and shaped the organisation of the network spaces of cities during the past decades. I also introduced how fast the new e-technologies have emerged, developed and expanded and how powerful ICT has become during the last three decades.

In the second journey (Chapter 2), I briefly unpacked the research problem, the aims of the study and the road map for our journey. Just to refresh, the main problem relates to the fact that ICT has developed and expanded at such a fast pace and it became so complicated that it became difficult for society to keep up. To make it worse, and because of this rapid development and expansion of the new technologies, ICT has started influencing people and space, in a way that could not have been imagined. This problem is exacerbated, by the uncertainty of how ICT will further expand in the future and how this expansion will influence people, people's spaces, urban dynamics, urban space and networks, and urban planning and planners. This problem hence framed the following research question that framed and guided this journey, exploration and study: *"What are the current discourses and dialogues on the construct of Information Communication Technologies as far as they pertain to impact, power and relevance thereof for people, space and planning?"*

Sub-question 1:

What is the impact of ICT on people and people's spaces, with specific reference to communication, new and confusing lingo and terminology, human conduct and culture, and emotion?

Sub-question 2:

What is the impact of ICT on urban dynamics, urban space and networks, with specific reference to complexity, time, networks and structure, the city beautiful and smart city movements, and the urban space economy?

Sub-question 3:

What is the impact of ICT on urban planning and planners, with specific reference to urban planning trends, discourses and tools?

Sub-question 4:

What are the e-powers associated with ICT, and how do these powers empower and affect people, urban space and networks and urban planning?

Sub-question 5:

How do the impacts and powers of ICT (within the context of people, space, planning and power) manifest in the South African landscape and the City of Tshwane?

The third part of our journey (Chapter 3) continued with a discussion on the research methods used to unravel this problem, and to answer the question and sub-questions. The primary method that informed this study is the meta-research method. In summary, meta-research is research on/about research. After weighing several options of other research methods such as the case study method, and the development of a hypothesis, and even the exploration of mathematical models, I found that in view of the particular complexity and nature of this study, the meta-research method was most suitable. This method was supported by the conceptual research method, which enabled me to use my imagination without any empirical evidence because most of this study involved an interaction with virtual space, emotions and memories which are invisible and intangible. In addition, the support from the conceptual research method also enabled the use of theories in a way that made it possible for me to provide some explanation for some of the dialogues and trends observed with relation to the impacts of ICT.

The fourth journey (Chapter 4) comprised the largest part of the overall exploration and study. During this journey, I explored and presented the dialogues between scholars on topics related to ICT and the emerging e-technologies, with specific reference to possible effects and/or impacts of ICT on people, people's spaces, urban spaces, networks, urban planners and urban planning in general. I frequently referred to global and local examples, experiences and case studies. This journey subsequently contained five main stages (based on the study themes), and each phase was divided into different sections. Just to refresh, I like to refer you to the diagram that guided our journey. (Table 3) borrowed from Chapter 4.

Table 3: Table indicating the various main themes and sub-themes that frame the study

MAIN THEMES	SUB- THEMES
4.1 Impact of ICT on people and people's spaces	4.1.1 Communication, new and confusing language and terminology
	4.1.2 Human conduct and culture
	4.1.3 Emotion, privacy and personal safety
	4.1.4 Some questions to ponder and images for the future
4.2 Impact of ICT on	4.2.1 Complexity of e-interactions in the urban space networks

MAIN THEMES	SUB- THEMES
urban dynamics, urban space and urban space networks	4.2.2 Time, speed and pulse of e-activities in urban space networks
	4.2.3 Networks and structure
	4.2.4 City beautiful and smart city movement
	4.2.5 Urban space economy
	4.2.6 Some questions to ponder and images for the future
4.3 Impact of ICT on urban planning and planners	4.3.1 Urban planning trends, discourses and tools
	4.3.2 Some questions to ponder and images for the future
4.4 The emerging e-powers associated with ICT, and the constructs in 5.1, 4.2 and 4.3 above	4.4.1 From ICT e-impacts to e-powers
	4.4.2 The e-power on people and people's spaces
	4.4.3 The e-power on urban space and urban space networks
	4.4.4 The e-power on urban planning and planners
	4.4.5 Some questions to ponder and images for the future
4.5 The reality and future possibilities for South Africa and a metro region such as the City of Tshwane	

(Table compiled by author)

The following part of my story now presents the main experiences, lessons and findings:

The impact of ICT on people and people's spaces (see Chapter 4.1)

It became clear to me that there has been an emergence of new and confusing language and terminology in the way people communicate amongst each other and in people's spaces (4.1.1). Language is increasingly coded and tagged, making it both opportunistic and confusing for people, specifically in South African cities. In this case, ICT exhibits a double-edged sword. While new language has confused people, at the same time, it presents an opportunity for better communication between citizens and between people and government.

It became obvious that new opportunities were created for investment in intellectual capital as people begin to communicate faster and more effectively through ICT. I also discovered that there is a strong link between digital activism, the power of the masses and access to ICT. Said differently, there is an e-power in communication that is empowering to communicate and act in different ways. For example, people can speak up and link up faster and more discreetly through the e-power of communication. The new e-way of communicating also create various new opportunities for urban planners, governments and businesses.

Based on my explorations, it also became clear that ICT and the emerging e-technologies had a major impact on human conduct, and human culture (see 4.1.2). People communicate faster and culture is increasingly electronic and information driven. I also found that there are increasing shifts to an e-lifestyle, in an emerging new life world. This further implies that a new e-culture which produces and provides e-services electronically and through the internet (www). I also experienced how it has now become the norm that the experience of urban space and urban space networks is shared electronically through ICT and the www. Therefore, ICT has become somewhat addictive, and became a new basic need for many people in South African urban regions. Essentially, the future is therefore premised on the ability of people and the South African government to leverage the opportunities that ICT brings, such as social cohesion, safer spaces, and entrepreneurship through targeted marketing opportunities, new types of job creation and transparency in urban space.

In Chapter 4.1.3 I referred to the emotions of people and people's spaces. Once again, the double-edged nature of ICT became evident. For instance, I found that, while the concern for safer cities remains an issue, also within the context of cybercrimes, the confidence in ICT technologies for keeping spaces safe has also increased. Essentially, the effect on emotions emanating from the potential e-power of these so-called little machines and gadgets cannot be underestimated.

The impact of ICT on urban dynamics, urban space and networks (see Chapter 4.2)

In Chapter 4.2.1, I found that the double-edged nature of ICT made urban dynamics, urban space and networks extremely complex. ICT on the one hand has potential to be the solution to South African urban and rural regions, but on the other hand, it can also cause the destruction of the South African urban and rural regions. Physical urban spaces are now

being integrated with virtual spaces, and physical networks integrated with virtual networks. Urban regions and cities in South Africa are now associated with both the segregated sustainable city and a fragmented unsustainable city, with many areas cut off from access to ICT and the related opportunities. However, the complexity is that, in spite of the high investments in ICT, the current structure of South African cities cannot yet be attributed to ICT, but rather to transport technologies and the market.

Chapter 4.2.2 illustrated the impact of ICT on urban dynamics, within the context of time, speed and pulse. ICT also displayed its double-edged sword nature in the sense that activities in urban space could happen faster and in an integrated way in cyber space and virtual networks. However, by the same token, I noted that there were many people who could not cope with the pulse and different time zones of virtual space found in cities. In addition, tension increasingly built up between the speed at which physical infrastructure developed, and the speed at which virtual infrastructure developed. Consequently, the digital divide in South African cities is prominent. Essentially, infrastructure development in urban space networks must move at a faster pace in order to keep abreast with the pace of ICT developments in both virtual and physical spaces. The success of South African cities (as argued in this study) will largely depend on the extent to which urban planning connects the poor to ICT , without the limitations of the various time zones and time challenges resulting from ICT and related e-technologies.

In Chapter 4.2.3, I illustrated how ICT impacted upon and penetrated urban space networks and the physical structure of the city. Essentially, ICT has contributed to the formation of both physical and virtual networks. ICT has penetrated the way people, machines, technology and information and data merge, move and circulate in these networks and how it has changed the role and function of South African cities. Networks and structures exist in the form of a base structure and a super structure connected by virtual networks. However, it became clear to me that new opportunities were being presented for urban planning and planning to read, study and manage these invisible and illusive structures, networks and spaces towards the development of South African urban (and rural) regions. For me it is somewhat scary to imagine the possibility that the power of ICT can actually surpass human intelligence and indeed take over the form and function of networks and structures.

Chapter 4.2.4 illustrates how ICT has affected and influenced the overall look, image, architecture and brand of cities through various e-technologies, e-structures and gadgets. In this part of the story, I contextualised the city beautiful and smart city movements and the relationship between these movements and the emerging informational city. It is evident that, globally, beautifying and branding cities have become the "modern style" of urban planning and architecture, emanating from high-tech e-technologies, and ICT in general. I also found that smart cities and ICT in smart cities, can simultaneously have positive and negative impacts on cities and people in smart cities. Specific reference is made to the way in which smart cities and the prioritised investment in the smart cities can actually lead to the neglect and isolation of the impoverished communities and the ugly areas ("ugly" here denoting the opposite of smart).

In Chapter 4.2.5, I illustrated how ICT and e-technologies have penetrated and enhanced the urban space economy and to a large extent the structure and pace of local economic development and informal trade. I provided examples of how certain businesses have benefited from e-technologies and the informational economy, the potential of the new economy. I also indicated how new e-businesses have emerged and expanded through apps, computers and smart phones, and in the informal sector. It became obvious to me that ICT networks and e-technologies have increased capital flows between individuals and communities, between individuals and the state, between spaces in a particular urban region or city, between urban regions in a country, and between countries at a global scale. ICT and all that is attached to it, is fast becoming a new thrust or anchor in the urban space economy. In sum, the pace of growth in urban space economies is rooted in the degree to which ICT and related e-technologies are presented, and accessed by people and governments, as well as the flow of capital in urban and global networks.

The impact of ICT on urban planning and planners (see Chapter 4.3)

For me, after having navigated through the various readings and experiences, it became obvious that ICT has had a major impact on urban planning and planners, urban planning trends, planning discourses and planning tools. The previous sections illustrated how ICT has impacted on people, space, urban space networks, urban space dynamics, and the urban space economies, and the way in which cities are structured. If I look at these impacts (as a whole),

it is obvious that this has to become a concern for planners and that it will have an impact on urban planning, now and more so in the near future. Cities have become both "introverted and extroverted" and planners need to take note of this. The new informational city or e-city or smart city, has certainly challenged urban planners to look afresh at the way in which cities are planned, developed and managed. Urban planning and urban planners will have to adapt to the new urban and community opportunities presented by ICT and related e-technologies, and for instance the emerging e-affecting planning such as "teleworking, e-working, telecommuting, teleshopping, tele-learning, telemedicine, and e-governance". Another challenge for urban planning and planners is to embrace the dual mode functionality of cities that exists through overlapping physical and virtual spaces. Cities are increasingly becoming information centres, integrated with e-technologies and e-powers. It is inevitable that urban planners (and IT specialists and engineers), will have to develop new and more appropriate planning tools, e-tools, and various e-models in order to ensure effective planning, monitoring, evaluation, communication and marketing-and a planning system that aligns with the new e-challenges.

The emerging e-powers associated with ICT (see Chapter 4.4)

In Chapter 4.4 (the part on e-powers) we briefly looked at the emergence of new power concepts such as the e-power on people and people's spaces, and also the way in which ICT has (em)powered people, spaces, planning, communities, governments, politicians, economies etc. – in other words how these entities have become more powerful as a result of ICT. Although impacts and powers are closely related, I presented how powers have resulted from impacts and what the new e-powers are, that were created by ICT.

It has become obvious to me, that ICT (and all that is attached to it), has become extremely powerful and has changed the lives of many people and communities. It has also restructured urban spaces, networks, institutions and governments. It actually changed the meaning of infrastructure and infostructure, and ultimately also the overall look, feel and structure of cities.

The speed at which information is distributed in networks and the impact and power of the concentrations is alarming. It is extremely critical that power relations within the context of the urban space networks (see Foucault's power web) and the virtual networks be understood in an attempt to manage power relations, to exploit good powers and to eliminate and

mitigate bad powers. These networks also function in relation with the social networks (see also social webs, Habermas, Healey and others).

One particular aspect I would like to highlight in this summary chapter, relates to how e-powers are transmitted through the power of instruments such as smart phones, computers and the internet, and the powerful nature of such instruments. All aspects of life such as communication, health, businesses, transport, sanitation, water, electricity, governance, among others are in one way or another linked to the e-power of instruments on people. In South Africa the various e-powers can automatically reinforce the accountability of leaders through information in an incontestable way, and it could provide many opportunities and powers to our people and communities. The future of South African cities can be extremely exciting when looking at the potential of infinite types of power expected to emerge with the changing and new capabilities of ICT and related e-technologies. The challenge for our country however is to find ways, "today" to empower the powerless, the poor and those that do not have access to ICT and its powers.

As we navigated through the power landscape, it became evident that ICT has empowered planners through the new e-technologies and e-tools as discussed earlier on. It is however the new urban powers and the dynamics of the urban powers and community powers that have actually made planners and planning more relevant and powerful. Planners are now (as a result of ICT) in a more powerful position to access, control and manipulate data, to structure and shape urban spaces and networks and infrastructure, to imagine (and even manipulate future images and visions). The challenge for urban planners (and the professional and ethical dilemma) however is that planners should exploit and apply powers to create quality of life and they should be careful not to abuse powers to gain control or to become more powerful.

When we looked at the impact of ICT on the City of Tshwane, I found that, given the technological capabilities of ICT, it is critical that urban planners and planning in general should embark on an ICT-informed type of planning, or an e-planning system that respects and understands the dynamics, impacts and powers of ICT. Great strides were made in the City of Tshwane during the past few years to align the municipal development planning system with ICT, through e.g., it's most recent strategic plans and policies, as well as the development of networks and free Wi-Fi. I want to argue however, that much more could be

done by the city and specifically the planners, to align planning efforts with the opportunities and powers presented by ICT and e-tools.

Now that we have summarised and reflected on the whole exploration and the various different journeys, I would like to try to bring everything together, so that we can take a snap shot view of this whole exploration and my odyssey.

5.3 Synthesising the discourse, impacts and powers

During the past few years, through the transformation of South Africa (from 1994 onwards), and with the recent developments and expansion of ICT and related e-technologies, South African urban regions have increasingly become the first choice destination for many people in this country.

The new types of communication and information, and emerging e-cultures, which developed through ICT during the past few years, were very fast and powerful. On the one hand, this had a major positive impact on human conduct and emotions, as it created so many experiences and fresh emotions as well as new opportunities to connect and communicate. However, these new e-technologies and e-cultures also had other severe impacts on human conduct and emotions, as these were increasingly being characterised by some assertiveness, violence and aggression. For instance, news and information emanating from social media shows increasing complexities of living in South Africa. The uncertainty of the economic climate, the threats to the livelihoods of the poor such as the recent social grants “crisis”, unemployment, poverty, and racial strife have marred the life climate of South Africa (or the lifeworld as referred to by Habermas). Many people, especially the poor, now look to the state and the justice system (courts) for assistance.

Amidst these complexities, we find that people have been enormously (em)powered through the growth of technology and ICT. In South Africa, the power of technology, also referred to as e-power, has also (em)powered people in many ways. Through the internet, politicians can communicate with and monitor large masses of people, crime is more easily recorded on mobile phones and reported, security is increasingly organised around internet-based software and people are better placed to hold the government accountable.

The impact of ICT on people, space and planning in South African cities is phenomenal. ICT has penetrated the DNA of every cell of South African cities, with specific reference to communication, human conduct, emotions, networks, urban space economy, urban planning and planners. Communication and information technologies have increasingly captured the fancy and imagination of South Africans, through the way in which ICT and e-technologies produce information that increasingly demonstrates the possibilities of a better quality of life, job opportunities, entertainment and e-services. Therefore, many people living in South African cities are constantly in search for new opportunities through information that is available through the internet.

The irony for me, in South Africa with its fragmented landscape (and many fault lines), is that a large proportion of poor, jobless and uneducated South Africans live in remote rural areas. Many of these people do not even know of ICT, internet or the possibilities that this new technology presents, while others who do know, can either not afford to connect, or they fall outside of the reach of the connections (or the networks). Then there is also a group of people who, in view of their background or particular circumstances, do not have the knowledge and capability to actually operate and use the technology. This is commonly referred to as the digital divide.

It was somewhat scary for me to observe, through the readings and experiences presented by scholars, how ICT and the powers thereof have penetrated people, people's places, urban spaces and the field of urban planning. However, I also found that while there was progress, the inequality in South African cities has in a sense reached its peak as a result of ICT. For example, while Government is making large investments in ICT infrastructure, there is a need for resources for basic infrastructure to meet the demands of high numbers of people migrating to South African cities because of urbanisation. Therefore, the future has become uncertain, not only for people living in South African cities, but also for urban planners and planning. I cannot refrain from making the point that urban planning and urban planners in South Africa are not doing enough to exploit and study the challenges, changes and opportunities resulting from ICT.

I now would like to start concluding my story. For me, there has to be doubt that this journey has covered the most important landscapes (bearing in mind the demarcation of the territory and the focus of the study). The study, in my humble opinion succeeded in presenting:

- The most recent discourses on topics related to ICT (within the context of the subject matter);
- Various discussions and interpretations of the discourses;
- An "initial" overview of the current and potential impacts of ICT and the emerging new technologies on people, space and urban planning;
- An overview of power, how power relates to the new technologies and the powers associated with, or created by ICT; and
- Lastly, an overview of the realities and future possibilities for South Africa, and a metro region such as the City of Tshwane.

For me, the study presented the reasons why it is important to understand ICT as a construct, its properties, opportunities and threats, its powers, as well as the possible and potential impacts of ICT on people, space and planning.

5.4 The contribution

The most important part and most challenging part of any PhD study is to present and defend the contribution of the study. In simple terms, what is the contribution that the particular study is making to the knowledge base?

Various other questions can also be asked to assess the contribution of a particular study or to actually "judge", assess, and examine the study in terms of its contribution. For example, did the study address the gaps in the knowledge base, and if so how? Did the study result in new knowledge, new principles, propositions, viewpoints, thinking etc.? Or, did the study actually challenge existing theory, or present new theory? In the more physical sciences like e.g. chemistry or medicine, the contribution of PhD studies is often judged in terms of whether the study actually resulted in new technology, a cure for a disease, a major new invention in medical technology etc. These questions, and the way in which the contribution is judged, largely differ, according to the field of study and the specific study.

Many scholars, also and often as they read a PhD, intuitively would like to think or ask whether the study will actually make a contribution, or whether it will actually change

people, or planning or spaces (in the case of this study). More often than not, such scholars are disappointed, possibly because they do not fully understand the content, the findings of the study and the contribution.

For many PhD scholars the section or chapter on "contribution" is probably also the most difficult part to write. For the purpose of this thesis, I, in view of the particular nature of the study and the findings, opted to keep the part on contribution short, to the point, but (hopefully) still punchy and powerful.

The following end-section of this thesis and our journey, presents a discussion on the various contributions emanating from this study.

These contributions of this study were largely shaped and informed by:

- The "problem" that inspired the study (Chapter 2);
- The context of the study, the discourses, contents, questions, images and findings, as presented in Chapter 4; and
- The questions and answers to the main research question and five sub-questions, as presented in foregoing section (section 5.3) of this chapter.

Improved understanding of the construct ICT: There is no doubt that this study has improved the understanding of the fast emerging and expanding ICT construct, the challenges it poses and how it relates to people, space and planning.

Exposure and references: The study presented numerous references to the views, experiences and wisdoms of other scholars involved with the subject matter, examples and case studies on the subject matter, and hence, present a bundle of fresh and valuable knowledge to scholars and even development professions involved with planning, development and urban management.

Improved understanding of the impacts (and powers) of ICT on people, space, and planning: Chapter 4 (in its totality) presents a novel discussion on the nature of ICT and related e-technologies, as well as the various positive and negative impacts (and powers) on the components of: (1) people, communication, human conduct, culture, emotions; and (2) urban space, urban space dynamics, urban space networks, the smart city, and urban space economy; and (3) planning, the role of planners, the planning profession and planning tools.

The contribution is further emphasised by the new understanding of the impacts (and powers) on a metro area such as Tshwaneand on South Africa as a whole, including the challenges in the impoverished areas. Apart from the impacts, Chapter 4 also presents some illustrations of the e-powers created by ICT and how powerful these powers are/can become, and how it actually empowers people and spaces, and again how powerful these people and spaces can become. An understanding of such powers and how they move in the power web, according to Foucault, can help us to manage such powers, to exploit the good powers and to eliminate or mitigate the bad powers. This has to be valuable in any urban planning context.

A novel presentation on the dynamics, challenges and opportunities of the emerging new virtual (urban) spaces and virtual (urban) space networks: The study has started to unravel the complexities and characteristics of the emerging virtual spaces and virtual networks created in cyber space by ICT. But more so, the study shows how these (virtual) spaces and networks are merging with, and superimposing on the physical urban spaces and urban space networks, so much so that is has become difficult to distinguish between these spaces. This new hybrid e-spaces, which in some ways are dominating the physical spaces present numerous new opportunities to communities, i.e. in terms of gathering, recreation, learning etc. Various new and interesting activities, interactions, movement patterns and power dynamics are found within "the confines" of these "borderless" spaces, along the lines of the networks, and more importantly at/in the nodes of these networks (where activities and power are concentrated). This new, almost illusive virtual/urban space configuration certainly affects urban planning and urban management as well as infrastructure and *infostructure planning* – hence the need for planners and development professions to understand the dynamics, challenges and opportunities of the emerging new virtual (urban) spaces and virtual (urban) space networks.

New areas for research and gaps identified in the knowledge base: The end of each section in Chapter 4 presents a number of questions to ponder and images (see part on this in research methodology chapter, Chapter 3). These questions cover a very large spectrum of issues relating to the various components of people, space, planning, power etc. Each of these questions in its own way, presents a possible new research field, or stated differently, identifies a possible gap in the field of knowledge.

Future actions (challenges) defined for role players: This study furthermore makes an important contribution (specifically in the field of urban planning and development, and also other fields related to ICT), as it flags a number of actions (and new challenges), for e.g. urban planners, governments, city leaders, IT specialists, development professionals, municipal managers etc. Some of these challenges are e.g. to develop new types of "live" e-plans (SDFs), e-planning tools, new management principles, e-planning approaches and guidelines, e-technologies, apps etc., that could facilitate and support sustainable development planning, development and urban management in general. If these actions and challenges are effectively and collectively addressed, they can contribute to better planning and development, increased growth, job creation and improved quality of life in all urban and rural regions of the country.

Increased awareness of possible new images, impacts and futures: The contribution of the study is further underscored by the fact that, whichever way you look at it, the content of the study, will (directly and indirectly) create a new awareness of the future impact (and power) of ICT on people, spaces and planning. For some people, this awareness can be negative (fear for the future), and for some it could be positive (hope for the future).

Closing remarks

The reality is that urban space is changing. There is an emergence of dialogues happening between people, time, power, culture, identity, governance, economy, urban space and ICT. Consequently, there is a need for a paradigm shift in urban planning from the conventional methods to new ways of accommodating rapid changes in ICT technologies and their impact on space, people, the economy and urban planning.

It is my wish that this study, apart from the contribution as presented above, will in the near future, be accessed, read and analysed by a large numbers of scholars. I also hope that this exposure and awareness will create a new e-mind set and e-culture that could enable us to: (1) effectively work with rapidly emerging and expanding ICT and e-technologies; (2) effectively manage these new technologies and impacts and powers thereof; but (3) most importantly, to exploit these e-technologies and opportunities to improve the lives of all the people in all parts of South Africa.

Perhaps other parts in the world could also benefit from this study.

Bibliography

Abaza, M. (2011). Critical Commentary. Cairos Downtown imagines: Dubaisation or Nostalgia. *Urban Studies, 48(6)*, 1075 - 1087.

Abdel - Aziz, A., Abdel-Salam, H., & El-Sayad, Z. (2016). The role of ICTs in creating the new Social Public Place of the digital era. *Alexandria Engineering Journal* (55), pp. 487- 493.

Abutaleb, Y., & Menn, J. (2016). Exclusive: Egypt blocked Facebook Internet service over surveillance - sources. Retrieved from Reuters: http://www.reuters.com/article/us-facebook-egypt-idUSKCN0WY3JZ

Agency, C. I. (n.d.). *The World Fact Book*. Retrieved from Central Intelligence Agency: https://www.cia.gov/library/publications/the-world-factbook/rankorder/2004rank.html

Allmendinger, P. 2001. *Planning in Postmodern Times*. Routledge. London and New York.

Alterovitz, R., Koenig, S., & Likhachev, M. (2016). Robot planning in the real world: research challenges and opportunities. *AI Magazine, 37.2*, p. 76.

Apple. (2014). APP store 2014.

Arribas-Bel, D., Kourtit, K., Nijkamp, P., & Steenbruggen, J. (2015). Cyber Cities: Social Media as a Tool for Understanding Cities. *Applied Spatial Analysis and Policy, Volume 8*(Issue 3), pp. 231–247.

Atkinson, R. D. (2013). Robots Aren't the Problem. *Technology Review*, p. 9.

Atkinson, R. (1996). The Rise of the Information Age Metropolis. *Futurist*, pp. 41-46.

Audirac, I. (2005). Information Technology And Urban Form: Challenges to Smart Growth. *International Regional Science Review*, April, 28(2), pp. 119 - 145.

Bartholomew, K., & Ewing, R. (2009). Land Use–Transportation scenarios and future vehicle travel travel and land consumption: a meta-analysis. *Journal of the American Planning Association, 75, number 1*, pp. 1-16.

Batty, M. (2010). *Visualising Space-Time Dynamics in Scaling Systems*. University College London: (accessed December 14, 2014).

Batty, M. (2012). Smart Cities & Big Data How We Can Make Cities More Resilient. *Smart Cities & Big Data How We Can Make Cities More Resilient*. Dublin: University College Dublin.

Batty, M. (2003). Network Geography: Relations, Interactions, Scaling and Spatial Processes in GIS http://www.bartlett.ucl.ac.uk/casa/publications/working-

research-63 Centre for Advanced Spatial Analysis, University College London: (accessed December 15, 2014).

Batty, M. (2013). *Simulating Geodesign: Designers as Agents -- Part 1 esritv* https://www.youtube.com/watch?v=QC41XsbB2L4 (accessed 2 December 2014).

Batty, M. (2013). *Talk: Smart Cities and Big Data: How We Can Make Cities More Resilient to Crises* from University College London, UK at the UCD AESOP Conference 2013 https://www.youtube.com/watch?v=cdZYDKQmias UCD GPEP (accessed 2 December 2014).

Batty, M. (2013). *City's At Different Scales* USC Workshop 2013 https://www.youtube.com/watch?v=IGsfgP1iZOg Urban Systems Collaborative (accessed 2 December 2014).

Batty, M., Crooks, A., Smith, D. & Masucci, P., 2009. *The Bartlett School Centre for Advanced Spatial Analysis.* [Online]
Available at: http://www.bartlett.ucl.ac.uk/casa/publications/working-research-146
(Accessed 14 December 2014).

Batty M, Morphet R, Masucci P, Stanilov K, (2014) Entropy, complexity, and spatial information, *Journal of Geographical Systems;* Springer October 2014, Volume 16, Issue 4, pp 363–385

Belitski, M., & Desai, S. (2016). What Drives ICT clustering in European Cities? *Journal of Technology Transfer, 41*(3), pp. 430-450.

Benguigui, L., Blumenfeld-Lieberthal, E., & Batty, M. (2008). *Macro and Micro Dynamics of City Size Distributions: The Case of Israel.* London: CASA.

BetterWorldSolutions. (2016). *Better World Solutions*. Retrieved 10 18, 2016, from Smart City Projects Rio: https://www.betterworldsolutions.eu/smart-city-projects-rio/

Blinka, L. &. Mikuska (2014). The role of social motivation and sociability of gamers in online game addiction. Cyberpsychology: Journal of Psychosocial Research on Cyberspace, 8(2) (Article 6).

Bliss, L. (2014). *City Lab; Where and When Does The Internet Sleep.* [Online]
Available at: http://www.citylab.com/tech/2014/10/when-and-where-does-the-internet-sleep/381666/
(Accessed 25 October 2014).

Bloomberg (2015). *A Mostly Deserted Chinese City Is Set to Quadruple GDP by 2017, Official Says*. Retrieved October 26, 2016, from A Mostly Deserted Chinese City Is Set to Quadruple GDP by 2017, Official Says: http://www.bloomberg.com/news/articles/2015-07-23/china-tianjin-ghost-town-to-quadruple-gdp-by-2017-official-says (Accessed 20 October 2015).

Bogart, W. T. & Ferry, W. (1999). Employment Centres in Greater Cleveland: Evidence of Evolution In A Formerly Monocentric City. *Urban Studies,* Volume 36(12), pp. 2099 - 2110.

Boix, R., 2003. Networks Of Cities And Growth: Theory Network Identification And Measurement of the Network Externality, Barcelona: Department of Applied Economics Universitat Autonoma de Barcelona.

Brack, K. &. Caltabiano, N. (2014). Cyberbullying And Self-Esteem In Australian Adults. Cyberpsychology: Journal of Psychosocial Research on Cyberspace, 8(2) (article 1).

Brenner, N., Madden, D. J., & Wachsmuth, D. (2011). Assemblage Urbanism and the Challenges of Critical urban Theory. *CITY, 15 (2),* pp. 225 - 240.

Brody, H. (2016, May-June). Do we Deserve Privacy. Technology Review, 119.3, p. 96.

Brooks, S., & Longstreet, P. (2015). Social networking's peril: Cognitive absorption, social networking usage, and depression. Cyberpsychology: Journal of Psychosocial Research on Cyberspace, 9(4),(article 1).

Brooks, M. P. 1996. Planning and Political Power: Towards a Strategy for Coping. In *Explorations in Planning Theory.* Edited by S. J. Mandelbaum, L. Mazza, and R. W. Burchell. USA: Rutgers, State University of New Jersey.

Brynjolfsson, E., McAfee, A., Jurvetson, S., O'Reilly , T., Manyika, J., Tyson, L., et al. (2015). Open letter on the digital economy: a group of technologists, economists, and investors propose a way that technological development can happen more fairly. *Technology Review (Cambridge, Mass.). , 118.4,* p.11.

Bunnell, T. (2015). Smart city returns'. *Dialogues in Human Geography 5(1): pp. 45-48.*

Byrnes, N. (2015). Cities Find Rewards in Cheap Technologies. *Technology Review, 118.1,* 59-61.

Castells, M. (1989). The Informational City: Information Technology, Economic Restructuring And The Urban-Regional Process. Oxford UK: MA Blackwell.

Castells, M. (1996). *"The Information Age: Economy, Society and Culture"* (Vol. 1, The Rise of the Network Society). Oxford: Blackwell, (1996). Oxford: Blackwell.

Castells, M. (1996). Second Edition 2000. The Rise of the Network Society: The Information Age: Economy, Society, and Culture Volume I 2nd Edition. Cambridge MA: Oxford UK Blackwell.

Castells, M. (1996). *The Information Age: Economy, Society, and Culture.* Volume 1; The Rise of the Network Society ed. Oxford: Blackwell.

Castells, M. (1997). An Introduction to the Information Age. *City,* 2(7), pp. 6 - 16.

Castells, M. (1998). *End of Millenium The Information Age Economy Society and Culture.* Volume 111 ed. Cambridge MA: Oxford UK Blackwell.

Castells, M. (1999). Grassroots The Space of Flows. *Urban Geography,* 20(4), pp. 294 - 295.

Castells, M. (2000). Published online 1 July 2010. Urban Sustainability In The Information Age. *City,* 4(1), pp. 118 - 122.

Castells, M. (2000). Published online: 01 Jul 2010, July 1). Urban Sustainability In The Information Age, City. *Analysis Of Urban Trends, Culture, Theory, Policy, Action, 4:1,* 118-122.

Castells, M. (2001). *The Internet Galaxy, Reflections on the Internet, Business and Society.* Oxford: Oxford University Press.

Castells, M. (2006). *The Network Society.* [Online]
Available at:
http://www.umass.edu/digitalcenter/research/pdfs/JF_NetworkSociety.pdf
[Accessed 27 August 2016].

Castells, M. (2008). Communication technology as material culture: Internet and autonomy building in the network society. S.l.:YouTube.

Castells, M. (2010). *Cities & Development.* Cape Town (Western Cape Province): African Centre for Cities YouTube.

Castells, M. (2010). International Seminar on Network Theory: Introduction by Manuel Castells. S.l.:YouTube.

Castells, M. (2010). Uploaded on 2 Mar 2010 Feb. 20, 2010. *Network Theories of Power.* University of Southern California: YouTube.

Castells, M. (2011). A Network Theory of Power. *International Journal of Communication, 5,* pp.773–787.

Castells, M. 2011. Recorded on 24 November 2011 Uploaded on Dec 6, 2011). *Social Movements in the Age of the Internet* [Motion Picture].

Castells, M. (2012). *Networks of Outrage and Hope. Social Movements in the Internet Age.* . Cambridge, MA. Polity Press .

Castells, M. (2012). *Communication Power In The Network Societies* [Motion Picture]. Published on Jul 20, 2012).

Castells, M. (2012). Networks of Outrage and Hope: Social Movements in the Internet Age. S.l.:LibraryOfCongress YouTube.

Castells, M. (2013). *Episode: - The Aftermath Crisis* [Interview] (23 September 2013).

Castells, M. (2013). How modern political movements straddle urban space and cyberspace. S.l.:YouTube.

Castells, M. (2013). *Communication Power*. Oxford University Press.

Castells M. (2013). *Communication Power in the Network Societies.* 2 May 2013. [Film] Directed by Manuel Castells. YouTube.

Castells M. (2013). *Conversations with History*. 15 February 2008. [Film] Directed by Manuel Castells. s.l.: YouTube.

Castells, M. (2014). *The Space of Autonomy: Cyberspace and Urban Space in Networked Social Movements* [Motion Picture]. TheHarvardGSD.

Castells, M., 2008. Communication Technology As Material Culture: Internet And Autonomy Building In The Network Society. S.l.:YouTube.

Castells, M., 2010. Cities & Development. Cape Town(Western Cape Province): African Centre for Cities.

Castells, M., 2010. International Seminar on Network Theory: Introduction by Manuel Castells. S.l.:YouTube.

Castells, M., 2012. Networks of Outrage and Hope: Social Movements in the Internet Age. S.l.:LibraryOfCongress YouTube.

Castells, M., 2013. Episode: - The Aftermath Crisis [Interview] (23 September 2013).

Castells, M., 2013. How modern political movements straddle urban space and cyberspace. S.l.:YouTube.

Castells, M., Uploaded on 2 Mar 2010 Feb. 20, 2010. Network Theories of Power. University of Southern California: YouTube.

Chambers, J. & Elfrink, W. (2014). *The Future of Cities; The Internet of Everything will Change How We Live.* [Online]
Available at: https://www.foreignaffairs.com/articles/2014-10-31/future-

cities#/cid=soc-twitter-at-snapshot-the_future_of_cities-000000 (Accessed 10 November 2014).

Chan, T. (2013). *GreenTelekomLive.* [Online] Available at: http://www.greentelecomlive.com/2013/06/26/cisco-to-develop-ict-master-plan-for-kazan-smart-city-project/ (Accessed 2014 September 23).

Chant, C., & Goodman, D. (1999). *The European Cities and Technology Reader.* London: Routlage.

Chant, C. (1999). *The Pre-Industrial Cities and Technology Reader.* London: Routledge in Association with Open University.

Chen, M. A. (2016). Technology, Informal Workers and Cities Insights From Ahmedabad (India), Durban (RSA) and Lima (Peru). *Environment and Urbanisation*.

Chiumbu, S., & Akinsanmi, T. (2011). *Open Society Initiative South Africa.* Retrieved April 7, 2017, from University of Witwatersrand Department of Media Studies Research Report: http://www.mediastudies.co.za/images/OSISA/SouthAfricaICTReport.pdf

Chokshi, M., Carter, C., Gupta, D., Martin, T., & Allen, R. (1995). *Computers and the Apartheid Regime in South Africa*. from http://www-cs-students.stanford.edu/~cale/cs201/apartheid.comp.html Retrieved November 25, 2013)

Citizen. (Sunday, May 22, 2016). *Bunge: Kigamboni City Project Is A Failure*., from http://www.thecitizen.co.tz/News/1840340-3213786-krek0yz/index.html: http://www.thecitizen.co.tz/News/1840340-3213786-krek0yz/index.html Retrieved September 23, 2016

Cocchia, A. (2014). Smart and Digital City: A Systematic Literature Review. *Smart City, Progress in IS*, pp.13 - 43.

Coetzee, P. J. van V. (2005). A Reading of Power Relations in the Transformation of Urban Planning in the municipalities of the Greater Pretoria Region (now Tshwane) 1992 - 2002. Tshwane: University of Pretoria Ph.D. Thesis.

Cole, N. L. (2015). *Definition of Base and Super Structure: concepts of Marx Theory*. Retrieved 11 October 2016, from Definition of Base and Superstructure: http://sociology.about.com/od/Key-Theoretical-Concepts/fl/Base-and-Superstructure.htm

Coleman, G. (2015). The world needs anonymity: there's a noble imperative behind not revealing who you are. *Technology Review, 118.1*, p. 11.

Cranor, L. F. (2014). Self Defence: It is difficult to Protect Your Privacy even if you know how. Technology Review, 117.3, p. 10.

Crombie, I., & Davies, H. T. (2009). *What is meta-analysis?* Retrieved August 2, 2016, from www.whatisseries.co.uk:

Crowe, S., Cresswell, K., Robertson, A., Huby, G., Avery, A., & Sheikh, A. (2011). The case study approach. *BMC Medical Research Methodology*.

CSIR. (n.d.). Retrieved 17 December 2014, from http://www.csir.co.za/enews/2007_oct/be_01.html

Da Cruz, J. D. (2014). The age of digital conflict: a review essay. *Parameters., 44.3*, p.115.

Darke, P., Shanks, G., & Broadbent, M. (1998). Successfully Completing Case Study Research, Combining Rigour, Relevance And Pragmatism. *Info Systems Journal*, 275.

Data Smart City Solutions. (2016). (T. P. College, Producer, & The President and Fellows of Harvard College) Retrieved from Data Smart City Solutions: http://datasmart.ash.harvard.edu/news/article/how-smart-city-barcelona-brought-the-internet-of-things-to-life-789

Datta, A. (2015). New urban utopias of postcolonial India: 'Entrepreneurial urbanization' in Dholera smart city, Gujarat. *Dialogues in Human Geography*, Vol. 5(1) pp. 3-22.

Datta, A. (2015). A 100 smart cities, a 100 utopias. *Dialogues in Human Geography*, Vol. 5(1) pp. 49-53.

Devriendt, L. D. (2008). Cyberplace and Cyberspace: Two Approaches to Analyzing Digital Intercity Linkages. *Journal of Urban Technology, 15:2*, pp. 5-32.

Devriendt, L., Derudder, B., & Wiltox, F. (2008). Cyber Place and Cyber Space: Two Approaches To Analysing Digital Intercity Linkages. *Journal of Urban Technology*, pp. 5 - 32. doi:http://dx.doi.org/10.1080/10630730802401926

Doane, S. (2014). HongKong Umbrella Revolution Seeks Reforms. Retrieved 15 December 2014, from CBS News: http://www.cbsnews.com/news/hong-kong-umbrella-revolution-backfiring-against-chinese-policy/

DOC. (2013). *e-Services, including e-Government.* Retrieved 15 October 2016, from Green Paper Long Version: http://www.dtps.gov.za/documents-

publications/category/22-national-integrated-ict-policy-green-paper.html?download=182:9-ict-policy-review-supplementary-insights-eservices.

Dochtermann, A. (2000). *Metaphors of the City in the Information Age.* Standford University, Math.

Donaldson, R. (2006). Mass rapid rail development in South Africa's metropolitan core: Towards a new urban form? *Land Use Policy 23(2006) pp. 344-352*, 346.

Döring, N. (2014). Consensual sexting among adolescents: Risk prevention through abstinence education or safer sexting? *Cyberpsychology: Journal of Psychosocial Research on Cyberspace, 8(1)*(article 1). doi:10.5817/CP2014-1-9

Duminy, J. (Ed), Andreasen, J. (Ed), Lerise, F. (Ed), Odendaal, N. (Ed), Watson, V. (Ed) *(2014) "Planning and the Case Study Method in Africa"* Palgrave Macmillan

Duncan, J. (2013). Mobile network society? Affordability and mobile phone usage in Grahamstown East. *Communicatio*.

Eatough, M. (2015). Planning The Future, Scenario Planning, Infrastructural Time and South African Fiction. *Modern Friction Studies, 61*(4), pp. 690 -714.

Ermoshina, K. (2014). Democracy as pothole repair: Civic applications and cyber-empowerment in Russia. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace, 8(3)*(article 1).

Ewing, R., & Cervero, R. (2010). Travel and the Built Environment. *Journal of the American Planning Association*.

Fathy, T. A. (1991). *"Telecity: Information Technology and its Impact on City Form".* New York: Praeger.

Favela, M. (n.d.). Redrawing power: #YoSoy132 and overflowing insurgencies. *Social Justice, 42*(3-4), p. 222.

Felix, M. (2015). *Berlin Startups List*. Retrieved 18 October 2016, from Berlin Startups List: http://berlin.startups-list.com/startups/crowdsourcing

Floridi, L. (2007). A look into the future impact of ICT on our lives. *The Information Society 23(1)* pp. 59–64.

Flyvbjerg, B. 1996. The Dark Side of Planning: Rationality and 'Realrationalitat'. In *Explorations in Planning Theory*. Edited by S. J. Mandelbaum, L. Mazza, and R. W. Burchell. USA: Rutgers, State University of New Jersey.

Flyvbjerg, B. 1998 (a). *Rationality and Power: Democracy in Practice*. Chicago, London: The University of Chicago.

Flyvbjerg, B. 1998 (b). Empowering Civil Society: Habermas, Foucault and the question of conflict. In *Cities for Citizens.* Edited by M. Douglass and J. Friedman. England: John Wiley and Sons Ltd.

Flyvbjerg, B. 2001. *Making Social Science Matter*. Cambridge University Press.

Forester, J. 1982. *Planning in the Face of Power*. Journal of the American Planning Association. Winter 1982.

Foroozan, H., & Foroozan, Y. (2014). Developments In Urban Space In The Age Of Information Technology. *Indian Journal of Fundamental and Applied Life Sciences, 2014 Vol. 4 (S1),* pp. 174-180.

Freestone, M. & Murphy, P. (1998). Metropolitan restructuring and suburban employment centres: cross-cultural perspectives on the Australian experience, *Journal of the American Planning Association*, 64(3), pp. 286–298.

Frost, L., & Dingle, A. (1994). *Infrastructure Technology and Change.* Vic, Australia: La Trobe University, Schools of Economics and Commerce.

Future Transportation Technology will Blow Your Mind. January 16, 2014. [Film] Directed by 100TopDocumentary. s.l.: s.n.

Gaffney, C., & Robertson, C. (2016). Smarter than Smart: Rio de Janeiro's Flawed Emergence as a Smart City. *Journal of Urban Technology*, pp. 1-18.

Garreau, J., 1991. *Edge City Life on the New Frontier.* New York: Doubleday.

Garrett, K. R., & Edwards, P. N. (2007). Revolutionary Secrets: Technology's Role in the South African Anti-Apartheid Movement. *Social Science Computer Review* (pp. 25; 13).

Gaspar, J. & Glaeser, E. L. (1998). Information Technology and the Future of Cities. *Journal of Urban Economics,* Volume 43, pp. 136-156.

Geenhuizen, M. V. (2000). Interconnectivity of Transport Networks: A Conceptual and Empirical Exploration. *Journal of Transportation Planning and Technology*, pp. 199 - 213.

Ghorbani, F., Khiali, R., Zarankesh, J. V., Mosafarei, F., Sadegh, A. P., & Dehghan, M. R. (2013). Impact of ICT on Urban Design. *Singaporean Journal of Business Economics, 1*(12).

Gillespie, A. (2002). *Digital Lifestyles and the Future City", in: N. Leach (Ed.) Designing for a Digital World.* Chichester, Leach (Ed.) John Wiley & Sons.

Goldman, M. (2010). Speculative Urbanism and the Making of the Next World City. *International Journal of urban And Regional Research IJURR.*

Gordon, P., & Richardson, H. W. (1996). "Beyond polycentricity: the dispersed metropolis, Los Angeles, 1970-1990". *Journal of American Planning Association, 62 (3).*

Gottmann, J., & Harper, R. A. (1990). *Since Megalopolis: The Urban Writing of Jean Gottmann.* Baltimore: The John Hopkins University Press.

Graham, S. & Marvin, S., 2001. *Splintering Urbanism.* London: Routledge.

Graham, S., & Marvin, S. (1996). *Telecommunications and the city: Electronic spaces, urban places.* Routledge.

Gu, B. (2008). The Cyborg Self and the Networked City. William J. Mitchell. *Technical Communication Quarterly Volume 17, Issue 2, 2008*, p. 259.

Guan, S. S., Subrahmanyam, K., Linares, K., & Cheng, R. (2015). Beauty in the eye of the beholder? Attractiveness in a virtual world. .

Gwala, X. (2016). Blesserfinder: Matching you with a sugar daddy near you. (R. 702, Interviewer)

Hall, P. (1999). The Future of Cities. *Computers, Environment and Urban Systems, 23*, pp. 173-185.

Hall, P. (2009). Planning Past and Future: Early 21st Century Reflections. *UC Berkeley Events*. UC Berkeley Events.

Healey P. 1997. *Collaborative Planning. Shaping Places In Fragmented Societies.* Macmillan Press Ltd. London.

Hickmann, L. (1990). Technology as a Human Affair. McGraw-Hill.

Hillier, J. 2002. *Shadows of power: An Allegory of Prudence in Land Use Planning.* Routledge. London 2002.

Hindraf. (n.d.). *Hindraf the voice of the voiceless*. Retrieved October 26, 2016, from Hindraf the voice of the voiceless: http://www.hindraf.co/

Donaldson, R. (2006). Mass rapid rail development in South Africa's metropolitan core: Towards a new urban form? Land Use Policy 23(2006) pp. 344-352, p. 346.

Hindraf. (n.d.). Hindraf the voice of the voiceless. Retrieved 26 October 2016, from Hindraf the voice of the voiceless: http://www.hindraf.co/

Hogg, S. (2013). *Understand and Obey the Laws of Networking* . Retrieved 11 October 2016, from Network World :

http://www.networkworld.com/article/2225509/cisco-subnet/understand-and-obey-the-laws-of-networking.html

Homann, D. 2005. *A critical analysis of the transformation of the city planning function in the city of Tshwane Metropolitan Municipality.* Unpublished Masters Thesis. University of Pretoria.

Horan, A. T., 2000. *Digital Places- Building Our City of Bits.* Washington D.C: Urban Land Institute.

Houghton, K., Miller, E., & Foth, M. (2014). Integrating ICT into the Planning Process: Impacts, Opportunities and Challenges. *Australian Planner, 51:1*, pp. 24-33.

Hoveyda, P., Garcia, E., & Zuch, M. (2012, 5 29). *South African Mobile Generation Study on South African Young People on Mobiles UNICEF New York, Division of Communication, Social and Civic Media Section Gerrit Beger, Akshay Sinha URL http://www.voicesof*. Retrieved 10 June 2014, from http://www.voicesofyouth.org/pdf/citizens/SAF_resources_mobilegeneration.pdf

http://www.feesmustfall.joburg/. (2016, August 12). *http://www.feesmustfall.joburg/*. Retrieved from http://www.feesmustfall.joburg/: http://www.feesmustfall.joburg/

http://www.unisa.edu.au/PageFiles/154925/2009%20Crombie%20What%20is%20meta-analysis.pdf

Huang, W. J. (2012). ICT-Oriented Urban Planning Strategies: A Case Study of Taipei City, Taiwan. *Journal of Urban Technology, 19:3*, pp. 41-61.

Huh, W. (2001). City Networks of Korea- A Telephone Call Flows Interpretation Networks and Communication Studies. *NETCOM*, 15(1 - 2), pp. 101 - 118.

IBM (2014). *A New Way To Make Decisions.* S.l.:YouTube. (Accessed 9 October 2014).

Internet live stats. (2014). *Internet Live Stats*. Retrieved 20 November 2014, from InternetLiveStats.com : http://www.internetlivestats.com/twitter-statistics/

Ioannides, Y. M., Overman, H. G., Rossi-Hansberg, E. & Schmidheiny, K. (2008). The Effect of Information and ICT on Urban Structure. *Economic Policy*, Volume 54, pp. 201 - 242.

IOL. (n.d.). *Mayor Starts #AskRamokgopa*. Retrieved from IOL: http://www.iol.co.za/news/south-africa/gauteng/mayor-starts-askramokgopa-to-interact-1911337

Jassem, M. (2010). Municipal WiFi: the Coda. *Journal of Urban Technology*, August, 17(2), pp. 3 - 20.

Jeffres, L. W. (2010). The Communication City: Conceptualizing Operationalizing and Policy Making. *Journal of Planning Literature*.

Jonsson, L. S., Svedin, C. G., & Hyden, M. (2014). "Without the Internet, I never would have sold sex": Young women selling sex online. *Journal of Psychosocial Research on Cyberspace, 8(1), article 1*.

Kasarda, J. D. (2000). *"New Logistics Technologies and Infrastructure for the Digital Economy".* Chapel Hill: Kenan Institute of Private Enterprise, University of North Carolina.

Katsara, A. (2008). *The Impacts of New Technologies On Urban Transformations.* Volos Greece: University of Thessaly.

Katznelson, I. (1993). Marxism and the City. Oxford University Press.

Kemerling, G. (2011). *The Development of Absolute Idealism*. Retrieved 11 October 2016, from The Development of Absolute Idealism: http://www.philosophypages.com/hy/5k.htm

Key Note Address at IAMCR. July 22, 2014. [Film] Directed by Manuel Castells. s.l.: YouTube.

Kezer, M., Sevi, B., Cemalcilar, Z., & Baruh, L. (2016). Age differences in privacy attitudes, literacy and privacy management on Facebook. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace, 10(1)*(article 1).

Kgobokoe, A. (2015). *Sharepoint*. Retrieved 10 13, 2016, from Sharepoint: http://www.tshwane.gov.za/Lists/CurrentNewsHome/DispForm.aspx?ID=6

Knight, W. (2015.). Car-to-Car Communication. *Technology Review, 118.2*, pp. 38-39.

Kolarova, D., Samaganova , A., & Samson, I. (2006). Spatial Aspects of ICT Development in Russia, *The Service Industries Journal, 26:8, 873-888, DOI: 10.1080/02642060601011673, 26:8*, pp. 873-888.

Kotkin J. and Devol, R. (2001). *"Knowledge-Value Cities in the Digital Age".* Santa Monica, CA:Milken Institute.

Kotkin, J. (2000). *"The New Geography, How the Digital Revolution is Reshaping the American Landscape".* New York: Random House.

Krasnoff, L. (2008). *Hegel's Phenomenology of Spirit: An Introduction.* Cambridge University Press.

Krizek, K & Waddell, P 2002, *'Analysis of Lifestyle Choices'*, Transportation Research Record, no. 02-3424, p. 119.

Kuo, L. (2016) *Uganda has launched a total social media blackout for the second time in three months*. Retrieved from Quartz Africa: http://qz.com/682630/uganda-has-launched-a-total-social-media-blackout-for-the-second-time-in-three-months/

Kvalem, I. L. (2014). Self-perceived effects of Internet pornography use, genital appearance satisfaction, and sexual self-esteem among young Scandinavian adults. Cyberpsychology: Journal of Psychosocial Research on Cyberspace, 8(4), article 1. doi: 10.5817/CP2014-4-4.

Landman, J. P., Bhorat, H., Van Der Berg, S. & Van Aardt, C. (2014). *Breaking The Grip of Poverty and Inequality In South Africa 2004 - 2014 Current Trends Issues and Future Policy Options*, Pretoria: Bureau of Market Research University of South Africa (UNISA).

Lang, R. E. & LeFurgy, J. (2003). Edgeless Cities: Examining The Non October 9, 2014 Centred Metropolis. *Housing Policy Debate*, Volume 14, pp. 427 - 460.

Lapintie, K. 2002. *Rationality Revisited. From Human Growth to Argumentation.* Department of Architecture. Helsinki University of Technology.

Leck, E. (2006). The Impact of Urban Form on Travel Behavior: A Meta-Analysis. *Berkeley Planning Journal, 19(1).*

Lee, B. December (2006) *"Urban Spatial Structure, Commuting, And Growth In Us Metropolitan Areas"* A Dissertation Presented To The Faculty Of The Graduate School University Of Southern California In Partial Fulfilment Of The Requirements For The Degree Doctor Of Philosophy (Planning)

Leedy, P. (1989). *Practical Research: Planning and design.* New York: Macmillan.

Leedy, P., & Ormrod, J. (2009). *Practical Research: Planning and Design.* Prentice Hall; 9th edition (2009).

Li, Y., Lin, Y., & Geertman, S. (2015). The development of smart cities in China. *CUPUM 2015.*

Lorenz, J. (2015). Water, Waste, Greator Communion: Rubem Fonseca's " The Art of Walking in The Streets of Rio de Janeiro. *MFS modern Fiction Studies, 61*, pp. 652 - 668.

Macková, A., & Macek, J. (2014). 'Žít Brno': Czech online political activism from jokes and tactics to politics and strategies. *CyberpsychologJournal of Psychosocial Research on Cyberspace, 8(3), article 1. doi: 10.5817/CP2014-3-5*.

Maeng, D. M., & Nedovic - Budic, Z. (2008). Urban Form and Planning in the Information Age- Lessons From Literature. *Spatium 1*. pp. 1-12, 17-18.

Maldonado, A. M. (2005). ICT Infrastructures as a new challenge for the Urban Planning Profession ICT Infrastructures. IsoCARP. Retrieved 20 May 2016, from http://www.isocarp.net/Data/case_studies/631.pdf.

Mandarano, L., Meenar, M., & Steins, C. (2010). Building Social Capital in the Digital Age of Civic Engagement. *Journal of Planning Literature*, 25(2) pp. 123-135.

MAPScorps. (2016). *http://mapscorps.org/*. Retrieved 18 October 2016, from http://mapscorps.org/: http://mapscorps.org/

Marceau, J. (1995). Reworking the World: Organisations, Technologies, and Cultures. New York: De Gruyter.

Marsal-Llacuna, M. & López-Ibáñez, M. (2014). Smart Urban Planning: Designing Urban Land Use from Urban Time Use. *Journal of Urban Technology*, 21(1), pp. 29 - 56.

Marris, P. 1998. Planning and Civil Society in the Twenty - First Century: An Introduction. In *Cities for Citizens.* Edited by M. Douglass and J. Friedman. England: John Wiley and Sons Ltd.

Masucci, A. P. (2009). Random Planar Graphs and the London Street Network. *The European Physical Journal B, 71 (2).* pp. 259-271.

Masucci, P., Stanilov, M., & Batty, M. (2013). *Limited Urban Growth: London's Street Network Dynamics since the 18th Century.* London: CASA PLoS ONE 8(8): e69469. arxive.

Mcclendon, B.W. 1994. *Challenges and Opportunities.*Internet: http: //www.webcom/npcj/articles/ mcc069. html. Access: 23 June 1999

Mcclendon, B. W. and Quay, R. 1992. *Mastering Change. Winning Strategies for Effective City Planning.* Washington, Chicago, Illinois: American Planning Association, Planners Press.

Mc Loughlin, J. B. 1992. Shaping Melbourne's Future. Cambridge: Cambridge University Press

Mendoza, M. (2014). *Chinese City Creates Special Lane For People Glued to Their Smart Phones.* [Online]
Available at: http://www.techtimes.com/articles/15592/20140916/chinese-city-creates-special-lane-for-people-glued-to-their-smartphones.htm
[Accessed November 2014].

Meşhur, H. F. (2013). Planners' Attitudes toward the Spatial Impacts of Information and ICT. *Gazi University Journal of Science, GU J Sci 26(3),* pp. 473-487.

Meshur, H. F. A. (2013). Planners Attitudes Towards The Spatial Impacts of Information and ICT. *Gazi University Journal of Science GU J Sci,* 26(3), pp. 473 - 487.

Merquior, J.G. (1985) \x91Chapter 8:
Foucault\x92s \x91cratology\x92: his theory of power\x92 in
Foucault published by Fontana, London.

Meshur, H. F. A. (2013). The Impact of Technological innovations On Urban Spatial Structure. *AWERProcedia Information Technology and Computer Science,* Volume 3, pp. 87 - 96.

Michel, N. (2013). *"Irhal!": The Role Of Language In The Arab Spring* . Washington, DC: Georgetown University .

Mitchell, W. (1996). *Excerpts from City of Bits: Space, Place, and the Infobahn Former Dean of the School of Architecture and Planning at MIT First MIT Press paperback edition.* Massachusetts Institute of Technology.

Mitchell, W. J. (1995). *City of Bits.* Cambridge Massachusetts: MIT press.

Mitchell, W. J. (1999). *e-topia.* Cambridge, MA: The MIT Press.

Mitchell, W. J. (2005). If Architecture Is A System Of Enclosures And Networks, Now, With The Information Networks, Buildings Acquire A Kind Of Nervous System. (P. Alsina, Interviewer)
http://www.uoc.edu/artnodes/espai/eng/art/pdf/mitchell.

Mitchell, W. J. (2007). *"Intelligent cities" (Date accessed: 29/05/2016).* UOC Papers. Iss. 5.

Mitchell, W. J. (1996). Excerpts from the City of Bits Space, Place, and the Infobahn. MA: MIT Press.

Mitchell, W. J. (1999). E-Topia Urban Life, Jim - But Not As We Know It. Cambridge MA: MIT Press.

Mitchell, W. J. (2007). Intelligent Cities UOC Papers. *UOC Papers E-Journal on the Knowledge Society,* October.

Mitchell, W. J. (2007). Where I'm @. *Journal of the American Planning Association,* 26 November, 67(2), pp. 144 - 145.

Mokhtarian, P. L. (1997). Now That Travel Can be Virtual Will Congestion Virtually Disappear. *Scientific American,* 277(4).

Molloy, M. (2016). *Telegraph*. Retrieved 18 October 2016, from Revealed: The most important inventions of the 21st Century – as voted by the public: http://www.telegraph.co.uk/news/uknews/12126335/Revealed-The-most-important-inventions-of-the-21st-Century-as-voted-by-the-public.html

Monette, D. R., Sullivan, T. J. & DeJong, C. R. (1990). *Applied Social Research: Tool for the Human Services.* S.l. Linda Schreiber - Ganster.

Moss, L. M. (1998). Technology and Cities. *City Scape; A Journal of Policy Development and Research,* Volume 3(3), pp. 107-127.

MSDF 2012 Tshwane Municipal Spatial Development Framework 2012

Muller, C., Chapman, L., Grimmond, C. & Cai, X. (2013). Sensors and the City: A Review of Urban Meteorological Networks. *International Journal of Climatology,* 33(7), pp. 1585 - 1600.

Mzekandaba, S. (2017). *IT web enterprise architecture*. Retrieved 17 April 2017, from SA's e-govt strategy showing strides: http://www.itweb.co.za/index.php?option=com_content&view=article&id=158754

MyBroadband. (2016). *A history of phones in South Africa – 1878 to 2015*. Retrieved 21 October 2016, from MyBroadband.co.za: http://mybroadband.co.za/news/telecoms/133008-a-history-of-phones-in-south-africa-1878-to-2015.html

Neale, P., Thapa, S., and Boyce, C. (2006). A Case Study: A Guide for Designing and Conducting a Case Study for Evaluation Input *Pathfinder International Tool Series Monitoring And Evaluation –1* http://www2.pathfinder.org/site/DocServer/m_e_tool_series_case_study.pdf (Accessed on 26 October 2013).

Nissenbaum, H., & Varnelis, K. (2012). The Architectural League NY - Publications. Retrieved February 14, 2013, from The Architectural League NY: http://archleague.org/publications/

Network_Computing. (2014). *Smart City: High Hopes for the City of Tshwane & Huawei's Smart City*. Retrieved 14 November 2016, from Smart City: High Hopes for the City of Tshwane & Huawei's Smart City: http://www.networkcomputing.com/infrastructure/smart-city-high-hopes-city-tshwane-huaweis-smart-city/1138980541

Networks of Outrage and Hope. 2 May 2013. [Film] Directed by Manuel Castells. s.l.: YouTube.

Neuhaus, F. (2009). *UrbanDiary - A Tracking Project PhD Researcher*. Retrieved from Centre for Advanced Spatial Analysis (CASA), Paper 151: https://www.bartlett.ucl.ac.uk/casa/pdf/paper151.pdf

New York City. (2016). Mayor's Office of Technology and Innovation. (2016). *Building a Smart and Equitable City City of New York*. Retrieved 18 October 2016.

Odendaal, N., 2010. Information and Communication Technology and Urban Transformation In South African Cities. Johannesburg: University of the Witwatersrand Ph.D. Thesis.

OECD (1998). The 21st Century Technologies Promises and Perils of a Dynamic Future.

OECD. (2011). The Gauteng City Region South Africa 2011, OECD Territorial Reviews. Retrieved 14 October 2016, from www.oecd.ilibrary.org: www.oecd.ilibrary.org

OECD. (2015). OECD governing the city. Retrieved 14 October 2016, from OECD: http://www.keepeek.com/Digital-Asset-Management/oecd/urban-rural-and-regional-development/governing-the-city_9789264226500-en#.WAEFSfl96M9#page52

Ookla (2015). *Net Index.* [Online] Available at: http://www.netindex.com/download/4,4352/Pretoria/ [Accessed 17 March 2015].

Oranje, M. C. (1997). The Language Game of South African Urban and Regional Planning: A Cognitive Mapping from Past into The Future. Tshwane: University of Pretoria Ph.D. Thesis.

Orlikowski (1992). The Duality Of Technology: Rethinking The Concept of Technology in Organizations. Organization Science, 3(3):398-427.

Oz, S. (2015). Clever Vehicles. *Technology Review*, p. 10.

Özdemir, Z. (2014). Overview of the Information Society and the Informational City in Turkey. *Planlama, 24(1)*, pp. 6-9.

Paden, R. (2003). Marxism, Utopianism, and Modern Urban Planning. *Utopian Studies, Vol. 14*(1).

Panayides, A., & Kern, C. R. (2005). "Information Technology and the Future of Cities: An Alternative Analysis", Urban Studies, 42(1), 163–167. *Urban Studies, 42(1)*, pp.163-167.

Parliament. (2013). *http://www.parliament.gov.za/content/Tshwane_General_and_Regions_Report_2013.pdf.* Retrieved 10 13, 2016, from City of Tshwane General and Regional Overview : http://www.parliament.gov.za/content/Tshwane_General_and_Regions_Report_2013.pdf

Pascal, A. (1987). "The Vanishing City". *Urban Studies, 24*, pp. 597–603.

Paskaleva, A.K. (2009). Enabling the smart city. *International Journal of Innovation and Regional Development, 1(4)*, pp. 405-422.

Paster, P. (2010). *What is the Role of ICT In Sustainable Development?* [Online] Available at: http://www.treehugger.com/corporate-responsibility/what-is-the-role-of-ict-in-sustainable-development.html (Accessed 28 October 2013).

Peet, R. (1975). Inequality and Poverty: A Marxist Geographic Theory. *Annals of the American Association of American Geographers, 65*(4).

Petko, D. E. (2015). Coping through blogging: A review of studies on the potential benefits of weblogs for stress reduction. Cyberpsychology: Journal of Psychosocial Research on Cyberspace, 9(2)(article 5).

Petko, D., Egger, N., Schmitz, F. M., Totter, A., Hermann, T., & Guttormsen, S. (2015). Coping through blogging: A review of studies on the potential benefits of weblogs for stress reduction. Cyberpsychology: Journal of Psychosocial Research on Cyberspace, 9(2), article 1. doi: 10.5817/CP2015-2-5

Pettitt, J. (2015). How drones are being used for safety and rescue. Retrieved 10 November 2016, from CNBC: http://www.cnbc.com/2015/11/20/how-drones-are-being-used-for-safety-and-rescue.html

Pfister, N., Freestone, R. & Murphy, P. (2000). Polycentricity or Dispersion? Changes in Center Employment In metropolitan Sydney 1981 - 1996. *Urban Geography*, Volume 21, pp. 428 - 442.

Pinzón, L. (2013). Beyond connectivity: The impacts of social media in urban development in Puerto Ayora, Ecuador. *Dpu Working Paper No. 160*. London: UCL.

Pitkin, B. (2001). A Historical Perspective on Technology and Planning. *Berkley Planning Journal*, pp. 32-55.

Ponting, A. (2013). High Tech Urbanism - The Political And Economic Implications of the Smart City. Honours Thesis on Urban Studies, Stanford University.

Presidency. (2011). *NDP National Development Plan* . Pretoria.

Quan, L., Heidemann, J. & Pradkin, Y. (2014). When The Internet Sleep: Correlating Diurnal Networks With External Factors (extended) USC/ISI Technical Report, s.l.: s.n.

Ramana, K. M. (2016). Digitised cities and sustainability: A study on the role of ICT in Development of Sustainable Cities. *K I I T Journal of Management, 12.1*, pp. 71-76.

Reporter, S. (2014). *Poverty levels in South Africa dropping: report*. Retrieved 14 October 2016, from South Africa Info: http://www.southafrica.info/about/social/poverty-040414.htm#.WAEBjfl96M9

Rosedale, P. (2015). *Why Virtual Reality will Compete with the Real World.* Retrieved 5August 2016, from MIT Technology Review: https://www.technologyreview.com/s/527101/why-virtual-reality-will-compete-with-the-real-world/

Rotman, D. (2015). Who will own robots. Technology Review, 118.4, pp. 26 - 33.

Rotman, D. (2013). How Technology is Destroying Jobs. Technology Review, 116.4, p. 28.

Rowley, J. (2002). "Using case studies in research". *Management Research News*, Vol. 25 Iss: 1, pp.16 - 27.

Rutherford, J. (2011). Rethinking the Relational Socio-Technical Materialities of Cities and ICTs. *Journal of Urban Technology*, 18(1), pp. 21 - 33.

Ryser, J. (2014). Planning Smart Cities ... Sustainable, Healthy, Liveable, Creative Cities ... Or Just Planning Cities? In CORP (Ed.).

SAHO, 2013. *South African History Online.* [Online]
Available at:) http://www.sahistory.org.za/topic/pretoria-timeline-1800-2009
(Accessed 11 November 2013).

SALGA. (2015). *IN.KNOW.VATION.* Pretoria: SALGA.

Sassen, S. (2001). *Global Cities and Global City Regions: A Comparison* (Vols. A. J. Scott ed. Global City-Regions: Trends, Theory, Policy). Oxford: Oxford University Press.

Scott, A. J. (1988). Flexible production systems and regional development: the rise of new industrial spaces in North America and western Europe. *International Journal of urban and Regional Research*.

SDI. (2012). *South African SDI Alliance*. Retrieved 10 20, 2016, from South African SDI Alliance : http://sasdialliance.org.za/what-we-do/community-based-planning/

Seeburger, J. (2012). Influencing the Experience of People in Urban Public Spaces Through Mobile Mediated Interactions. A thesis submitted to the school of design creative industries faculty, Queensland University Of Technology, in the fulfilment of the requirements of the Doctor of philosophy.

Servon, L. (2002). Bridging tDigital Divide. Ma: Blackwell Publishers.

Shah, J. (2014). Among us: robots will be more useful when they can work alongside us. *Technology Review (Cambridge, Mass.). 117.*

Sheerwood, Y. P. (2016). Toward, with, and from a Fourth World. Fourth World Journal, pp. 15-26.

Skelton, D. (2015). *Tshwane leaders to engage with citizens via 'digital imbizo'*. Retrieved 13 October 2016, from Times Live: http://m.timeslive.co.za/local/?articleId=14768493

SmartSantander. (n.d.). Retrieved 18 October 2016, from SmartSantander Santander on Fire: http://www.smartsantander.eu/

Smith, S. B. (1984). Considerations of Marx's Base and Super Structure. *Social Science Quarterly (University of Texas Press), 65*(4), 940-954

Smith, D., 8 June 2010. Welcome Aboard The Gautrain, Africas First High-Speed Urban Train South Africa unveils Rail Link That Will Transport World Cup Fans Into Johannesburg At Speeds of Up To 100mph. [Online]
Available at: http://www.theguardian.com/world/2010/jun/08/gautrain-africa-

high-speed-train
[Accessed 18 November 2014].

Snyman, A. (2016). Webafrica. Retrieved 8 April 2017, from Social Media – The Latest South African Stats: https://www.webafrica.co.za/blog/social-media-2/social-media-latest-south-african-stats/

Solomon, R. C. (1983). *In the Spirit of Hegel: A Study of G.W.F. Hegel's Phenomenology of Spirit.* Oxford: Oxford University Press (1983).

Staff_Writer. (2014, November 19). *Bussiness Tech*. Retrieved April 8, 2017, from SA among fastest growing Internet economies: https://businesstech.co.za/news/general/73906/sa-among-fastest-growing-internet-economies/

SpinUnit, 2 December 2013. *Urban Meta/Morphology.* [Online]
Available at: http://www.spinunit.eu/urban-meta-morphology/
[Accessed 8 April 2016].

SOMO. (2015). Rich Corporations, Poor Societies.

Presidency. (2011). *NDP National Development Plan.* Pretoria. South Africa:

Talbot, D. (2016). Remaking Social media for the next Revolution. *Technology Review, 119.3*, pp. 26-28.

Talbott, B. (2011). *Marx's Reaction against Hegel.* [Online]
Available at: https://faculty.washington.edu/wtalbott/phil332/trmarx.htm
(Accessed 6 April 2016).

Talvitie, J. (2003). *The Impact of Information and Communication Technology on Urban and Regional Planning*, Helsinki: the Helsinki University of Technology, Department of Surveying; Institute of Real Estate Studies.

Talvitie, J. (2004). *Incorporating the Impact of ICT into Urban and Regional Planning European Journal of Spatial Development.* [Online]
Available at:
http://www.nordregio.se/Global/EJSD/Refereed%20articles/refereed10.pdf
(Accessed 7 April 2016).

Telkom. (n.d). Retrieved October 21, 2016, from
http://www.telkom.co.za/history/TelkomHistory/xml/1900-1990.xml

The Global Financial Crisis and Alternative Economic Cultures. 17 May 2012 published 31 May 2012. [Film] Directed by The New York School in New York

City, Milano School of International Affairs Management and Urban Policy. s.l.: YouTube.

Tellis, W. M. (1997). Introduction to Case Study. *The Qualitative Report*.

Thomas, R. & Bertolini, L. (2017). Defining critical success factors in TOD implementation using rough set analysis. *Journal of Transport and Land Use*. *JTLU,* 10(1), pp. 1 - 16.

Thorns, D. C. (2002). The Transformation of Cities, Urban Theory, and Urban Life. s.l. Palgrave Macmillan.

Tiidenberg, K. (2014). Bringing sexy back: Reclaiming the body aesthetic via self-shooting. Cyberpsychology: Journal of Psychosocial Research on Cyberspace, 8(1), article 1. doi: 10.5817/CP2014-1-3.

Tranos, E. & Gertner, D. (2012) Smart Networked Cities?. *Innovation: The European Journal of Social Science Research,* Volume 25, pp. 175 - 190.

Tranos, E. & Gillespie, A. (2011). The Urban Geography of Internet Back Bone Networks In Europe Roles And Relations. *Journal of Urban Technology,* Volume 18, pp. 35 - 49.

Tschangho, J, Matthew C, Joseph S. Rank, and Yu X. (2009) "Technology and Cities: Processes of Technology-Land Substitution in the Twentieth Century" Journal of Urban Technology, Volume 16, Number 1, pp. 83-84.

Tshwane Integrated Development Plan (IDP) (2011)

Tshwane Metropolitan Spatial Development Framework (MSDF) 2012

Tshwane 2013 Integrated Development Plan (IDP)

Tshwane. (2015, May 14). *State Of The Capital Address By His Worship The Executivemayor Of The City Of Tshwane Councillor Kgosientsoramokgopa, Freedom Park, Tshwane.* Retrieved 10 20, 2016, from http://www.tshwane.gov.za/Documents/SOCA_2015_EM_autoqueue_final_version.pdf.

Twitter. (2016, 10 13). *Twitter*. Retrieved October 13, 2016, from Twitter #askMmusi: https://twitter.com/search?q=%23askmmusi

UN. (2016). *UN E-knowledge data base*. Retrieved 15 October, 2016, from https://publicadministration.un.org/egovkb/en-us/Data/Country-Information/id/159-South-Africa/dataYear/2016

UNDP, n.d. *UNDP South Africa Country Office Reports.* [Online]
Available at: http://www.za.undp.org/content/south_africa/en/home/library.html
(Accessed 2014).

UNDP. (2007). *E-governance for Local Government in the Eastern Cape.* Retrieved 15 October 2016, from E-governance for Local Government in the Eastern Cape: http://lgict.org.za/document/e-governance-local-government-eastern-cape

UNHABITAT, 2008/9. *State of The World Cities* [Online]
Available at:
http://www.unhabitat.org.jo/en/inp/Upload/105056_Cover%20page.pdf
[Accessed 2009].

UNHABITAT. (2016). Urbanisation and Development Urban Futures. UNHABITAT.

University_of_Pretoria. (2016, October 18). SMS. *Free Access To Internet Through Tshwane WiFi and ALwayson*. University of Pretoria.

SPIN Unit (n.d.). *Urban Meta/Morphology | a short visual essay*. () Retrieved August 2, 2016, from http://www.spinunit.eu/urban-meta-morphology/: http://www.spinunit.eu/urban-meta-morphology/

Wadha, V. (2014). Our lagging laws: making new laws is a slow process. Technology moves too fast to care. *Technology Review (Cambridge, Mass.).117.4*, p.11.

Waldeck, L. (2012). The potential impact of urban growth simulation on the long-term planning of our cities. *4th CSIR Biennial Conference: Real problems relevant solutions.* Pretoria: CSIR.

Waldeck, L. (2013). Overview of urban growth simulation: With examples of results from three SA cities. In: Statistics South Africa GIS day. Pretoria: CSIR.

Watson, V. (2013). African urban fantasies: dreams or nightmares? *Environment and Urbanisation*.

Watson, V. (2015). The allure of 'smart city' rhetoric: India and Africa. *Dialogues in Human Geography, Vol. 5(1)*, pp. 36-39.

Watson, V. 2001. *Change and Continuity in Spatial Planning: Metropolitan Planning in Cape Town under Political Transition*. PhD Thesis (Town and Regional Planning) University of Witwatersrand. Johannesburg.

WCG. (2012). *e-Government Strategy 2012-2019.* Retrieved from Western Cape Government (WCG): https://www.westerncape.gov.za/text/2012/10/wcg-draft-e-government-strategy-for-public-comment-october-2012.pdf

Webber, M. (1964). *"The Urban Place and the Nonplace Urban Realm"* (Vols. J. M. Dyckman, D. L. Foley, A. Z. Guttenberg, W.L.C. Wheaton, and C. B. Wurster ed., Explorations into Urban Structure,). Philadelphia.

WikiLeaks to Wiki-Revolutions: The Internet and the Culture of Freedom. 18 April 2011. [Film] Directed by Manuel Castells. s.l.: YouTube.

Worthington, H. (2013). What are Systematic Reviews? by Professor Helen Worthington. YouTube methodsMcr.

Wray, C., Musango, J., Damon, K. & Cheruiyot, K. (2013). *Modelling Urban Spatial Change: A Review of International and South African Modelling Initiatives,* s.l.: Gauteng City Region Observatory.

www.urbanmorphologyinstitute.org

www.mapable.co.za/

Yin, R. K. (2009). *Case Study Research. Design and Methods.* Sage Publications.

Yin, R. K. (1994). *Illustration Research: Design and Methods.* 2nd ed. Newbury Park, CA: Sage Publications.

Zuydam, L. (2013). *Tshwane to Launch Free WiFi.* [Online] (Accessed 7 January 2014).