Technological change and the effectiveness of domestic government agencies and international organisations.

How does technological change impact the effectiveness and benign political character of domestic government agencies and international organisations?

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I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own.

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VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

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Table of Contents

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

Introduction:

Studies examining the relationship between technological advancements and politics demonstrate that this relationship remains closely connected. Numerous research efforts have focused on unpacking and further understanding this relationship to develop a better idea on the ways in which technology has acted as a motor of history, driving the transformation of factors such as class structures, ideas and institutions across the globe. This research is guided by an understanding and acknowledgement of the political nature of technological development. In highlighting this link, a valuable foundation for understanding this relationship is achieved, which is necessary when seeking to explore the ways in which innovative technologies influence the effectiveness and benign political character of domestic government agencies and international organisations.

In order to ensure that an evaluation of the ways in which innovative technologies can impact the effectiveness and benign political character of domestic government agencies and international organisations is undertaken, this research is focused on firstly unpacking the relationship between technological advancement and politics through the use of a comprehensive literature review. It remains imperative to note that the study on the relationship between technological advancement and politics is incredibly broad. As such, for the purposes of this research emphasis will be placed on dealing with a small and focused aspect of this relationship, namely the impact of technological advancements on the effectiveness and benign political character of domestic government agencies and international organisations. Through examining the work of scholars that have undertaken research focused on technological advancements and the impacts this has on politics and vice versa, a holistic understanding on the topic is achieved. Key arguments presented by scholars such as Feenberg, Ganne, Kamel and Sussman will be studied to ensure a rich vein of knowledge on the complex relationship of technology and politics is developed. Once this understanding has been established, an examination into two key schools of thought, namely technology as a tool of control or domination, and technology as a benign instrumental force are studied to highlight the main arguments presented by scholars that have studied the topic over decades. In order to ensure that an in-depth analysis is achieved, the positive and negative impacts of technological advancements on politics will be explored through assessing arguments presented by scholars

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

that are focused on understanding the ways in which politics and technology are related.

An examination into the ways in which innovative technologies can be leveraged to enhance the operations and benign political character of domestic government agencies and international organisations will be undertaken. For the purposes of this research, blockchain technology has been selected as the innovative technology to be studied in relation to how domestic government agencies and international organisations can harness the opportunities presented by the technology. As such, an in-depth explanation into blockchain technology will be presented as well as a discussion pertaining to the opportunities and challenges associated with this technology. When examining the opportunities presented by blockchain technology two key features, namely improved transparency as well as efficient and cost-effective international payments will be discussed. With regards to the challenges associated with the use of blockchain technology, issues such as infrastructural infancy, limited organisational capacities, data privacy concerns and issues of governance will be outlined and discussed. This will ensure that an in-depth understanding into blockchain technology and its uses is demonstrated, which in turn contributes to a sound understanding when analysing the selected case studies used in this research.

Once an understanding of the relationship between technological advancements and politics, as well as blockchain technology and its uses is established an analysis of the four selected case studies can be undertaken and effectively comprehended. For the purposes of this research, a case study methodology has been selected in terms of the focus on the use of blockchain technology. This is an area of study in which there has been much academic research conducted, but there are few analytically powerful theories that can help us understand recent technological changes. The potential impact of contemporary technological innovations, such as Blockchain, remains poorly understood. This study will use exploratory case studies to identify key processes and questions for further study, including concerning how the notions of "effectiveness" and "benign character" might be clarified and operationalised in further studies.

A multi-case study approach has been taken in relation to the selection of examples included as case studies. These cases have been chosen both from the operations of domestic agencies

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

and from the operations of international organisations in order to shed preliminary light on the differences between the domestic and international spheres of political and administrative activity.

In order to begin to assess the ways in which innovative technologies influence the operations and benign political character of domestic government agencies and international organisations, four key case studies have been selected to be included in this research.

An assessment into the "e-Estonia" case study, where essential services and information flows were significantly improved as a result of the digitalisation of services made possible due to effective collaborations between by public and private sectors will be discussed as the first key case study. Secondly, an examination into the South African Reserve Bank's "Project Khokha" will demonstrate the opportunities and benefits associated with intentional research and exploration into the use of innovative technologies to enhance operations of domestic government departments. The e-Estonia and "Project Khokha" case studies are included in this research as they demonstrate the ways in which domestic government agencies have explored the use of technology to enhance their operations, while also highlighting key lessons learnt in the implementation of these projects.

An assessment of the World Food Programme's "Building Blocks" initiative, will demonstrate the value of the exploration of innovative technologies such as blockchain for international organisations. This initiative demonstrates the ability of blockchain-based solutions to enhance operations and the distribution of aid for international organisations such as the World Food Programme. Finally, the UNICEF's Venture Fund has been included as a case study in this research to explore and demonstrate the ways in which disruptive technologies can be harnessed for positive change on a global scale.

Through the use of the case studies listed above, the research will explore how and whether opportunities and potential are presented by innovative technologies such as blockchain for both domestic government agencies and international organisations. This research will also seek to understand barriers that currently exist when looking to implement blockchain-based solutions across the globe, how these limitations can be understood, and whether they are likely

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

to be overcome with increased knowledge of the technology, and greater contributions by scholars interested in understanding the ways in which domestic government agencies and international organisations can enhance their operations through embracing innovative technologies.

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

Methodology:

The central aim of this research is to contribute to our understanding of the relationship between technological advancement and politics. As a result of the broad nature of this relationship, a specific focus will be placed on a small aspect of this relationship, namely understanding the impact technological advancements have on the effectiveness of international organisations and domestic government agencies. Through establishing this understanding, this research will seek to answer how innovative technologies such as blockchain can influence the operations of international organisations and domestic government agencies. The intention of this research is to contribute to the ongoing debate and literature focused on the use of innovative technologies such as blockchain technology by various actors such as international organisations and domestic government agencies, as well as the present and future role of technologies such as blockchain for both governmental and non-governmental actors.

For the purpose of this research, a case study research design has been selected and undertaken. According to Yin, case study research can be defined as an empirical inquiry that investigates a contemporary phenomenon within its real-life context, where the boundaries of the phenomenon and context are not clearly evident and multiple sources of evidence are used (Yin, 1994: 23). He states that in order to undertake an effective case study design, a logical sequence connecting collected empirical data to the research question needs to be established (Yin, 1994: 23). Babbie and Mouton present similar arguments through claiming that a case study methodology allows the researcher to undertake an in-depth investigation and analysis of the research phenomenon, and state that case study research provides the researcher with an admirable opportunity to "discover rather than confirm" (Mouton & Babbie, 2001: 280).
Meyer provides useful insights that have been considered in the conceptualisation and undertaking of this research. She offers a wide-ranging perspective on the use of a case study research design and highlights key methodological considerations that prove valuable and have guided this research development. Meyer defines case studies as a method for exploring new processes, behaviours or phenomenon where little is understood on the topic, and states that this approach has proven valuable when seeking to answer the *how* and *why* relating to contemporary events (Meyer, 2001: 330). A key component associated with the design of a case study method is based on the selection of cases and determining whether a single case or

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

multiple cases will be utilised (Meyer, 2001: 332). Meyer highlights the dominant concern regarding the use of a single case in case study research, and states that limitations in terms of generalisability as well as information-processing biases need to be acknowledged and addressed when a researcher elects to undertake research focusing solely on one case (Meyer, 2001: 332). Leonard-Barton notes similar concerns and states that an effective way to respond to these issues is through employing a multi-case approach in research, which generates greater levels of confidence in research findings (Leonard-Barton, 1990: 256). She claims that through examining a range of both similar and contrasting cases, a deeper and richer understanding of a topic can be developed through a wider exploration of research questions and theories (Leonard-Barton, 1990: 256). Gustafson similarly claims that the use of a multi-case study approach offers a valuable opportunity for deeper learning through providing the researcher with the ability to analyse questions and data both within and across cases, allowing the researcher to clarify whether findings can be compared or contrasted (Gustafsson, 2017: 1). Although the design of this research is focused on understanding the ways in which innovative technologies can influence the operations of international organisations and domestic government agencies, a single technology (namely blockchain) has been selected as the technology to be focused on. However, concerns relating to the use of a single case study methodology as highlighted above contributed to the use of multiple case studies within the field of blockchain technology. As such, two cases relating to the experimentation with blockchain technology by international organisations and two cases relating to the experimentation with blockchain by domestic government agencies have been included in this research.

In seeking to understand the ways in which innovative technologies impact or influence international politics, significant research into the interconnected relationship between technology and politics was undertaken. An analysis on how history has been shaped as a result of technological developments present within an era, as well as how technological advancements have similarly been shaped as a result of the historical contexts has been undertaken. This research seeks to contribute to the debate exploring whether or not it is appropriate or necessary for international organisations and domestic government agencies to leverage technological advancements such as blockchain technology to improve their operations and in turn the enhance the impact for beneficiaries and citizens. An analysis of the

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

similarities and contrasts presented in the cases selected for this research contribute to a deeper understanding and an ability to determine the ways in which innovative technologies influence international organisations and domestic government agencies.

Significant research focusing on the relationship between politics and technology exists, however research into innovative and new technologies such as blockchain remains relatively under-researched. As such, the researcher has actively monitored and tracked any progress or newly released studies undertaking research on this technology. This process has taken place over a two-year period, with a familiarisation and in-depth understanding on the topic developing further with each new study. The researcher has familiarised herself with the topic through participating in numerous events, panel discussions, podcasts, online forums and books launches taking place in both Cape Town and Johannesburg during 2018 and 2019 to supplement her knowledge stemming from academic journals, online articles and academic research papers.

This research is also intended to contribute to filling the gap in current literature on the feasibility of the use of blockchain-based solutions for development organisations through assessing the key opportunities as well as challenges associated with these proposed solutions. The use of multiple academic sources such as journal articles, books and research papers form the basis of the literature review, with four selected case studies being included to illustrate arguments highlighted in existing literature. The initial chapters of the research focus on unpacking and understanding literature examining the relationship between technology and politics. Once this understanding has been demonstrated, a review into cases where international organisations and domestic government agencies have or are currently leveraging technological solutions to improve their operations is undertaken.

Two case studies focused on the use of technology by domestic government agencies were carefully selected based on a predetermined criterion developed by the researcher. The cases of e-Estonia and "Project Khokha" were selected by the researcher as they provided learnings on cases where domestic government agencies had harnessed blockchain technology to improve their operations. These cases were specifically selected for the purpose of comparison, with the e-Estonia case providing learnings from the perspective of a project being undertaken

9

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

in a developed country with the support of significant resources, while the "Project Khokha" case provides insight into the use of blockchain technology by the South African Reserve Bank, where the perspective of the implementation of a project within a developing country can be gained.

Following this, an examination into the ways in which international organisations have explored the idea and harnessed technological solutions to improve their operations is undertaken. Two cases studies including the United Nations Children's Fund and the World Food Programme's "Building Blocks" initiative is discussed. As a result of the United Nations and World Food Programme's track records within the international development sphere, these case studies were selected due to the added credibility associated with their exploration and use of blockchain technology in looking to enhance their operations on a global scale.

The use of these case studies and associated literature demonstrates that significant opportunities are presented when international organisations and domestic government agencies explore using innovative solutions to solving complex issues. However, in order to present a thorough analysis, this research also examines the limitations associated with the use of technological-based solutions, while making recommendations for further studies. Through examining multiple research studies and exploring case studies where international organisations and domestic government agencies have experimented with harnessing innovative technologies to improve their operations, this research seeks to shed light on the role that innovative technologies can play in improving and shaping future developmental impacts.

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

Chapter 1:

1.1 Understanding the relationship between technological advancements and politics:

When looking to develop an understanding on the ways in which technological advancements and politics are linked, arguments presented by a range of scholars provide valuable insights into this complex relationship and demonstrate the importance of understanding this relationship to harness the benefits thereof.

In looking to examine the role that technology plays in great democratic movements, Feenberg encapsulates the complex relationship between technological advancements and politics through stating that technology remains a medium of daily life within modern societies, where every major change or advancement of a technical nature reverberates throughout economic, political, religious and cultural levels (Feenberg, 1999: 1). He further claims that the fate of democracy is directly bound to man's understanding of technology and argues that the key purpose of his work is to think about, and understand the vital connection (Feenberg, 1999:2). Ganne presents similar arguments and demonstrates a thorough understanding of the relationship between technology and politics through stating that the world is continually changing, and that this change is driven by technological innovations that essentially impact the way people live and do business (Ganne, 2018: 1). He argues that an intimate link between the history of the world economy and technological progress exists through focusing on examples such as the invention of the steam engine mechanising production, or the discovery of electricity enabling mass production (Ganne, 2018: 1).

Kamel claims that technology is becoming an increasingly valuable and powerful tool that has the potential to contribute significantly to driving development, enhancing competitiveness amongst nations, promoting innovation, providing nations with heightened opportunities to remain connected to a global network and improve partnerships amongst actors such as states, businesses and civil society (Kamel, 2005: 305). Similar sentiments are shared by Davison, Vogel, Harris and Jones who argue that over the past two decades significant development within the Information and Communication Technologies (ICT) sphere has taken place (Davison et al., 2000: 1). They state that as a result of developments within this sphere, the exertion of notable influence over most aspects of daily life, including economic activities, education, entertainment, communication and travel is evident (Davison et al., 2000: 1). They

11

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

further state that these developments have seen to be directly linked to aspects such as economic prosperity and power, arguing that technology has a revolutionary impact on the ways in which the world does business, while also impacting the ways in which the world and its citizens communicate (Davison et al., 2000: 1).

Sussman provides valuable insight into the relationship between technology and politics through claiming that the intrinsic link between technology and politics can be understood when acknowledging that technologies do not simply arrive by accident, nor are they developed for the primary use of the general population (Sussman, 1997; 9). Rather, he argues that technology is developed as a result of careful business investment decisions-which are based on an existing technical know-how, a significant allocation of financial resources, market-related data and scientific talent (Sussman, 1997; 9). Similarly, Grubler argues that it remains imperative to note that when studying any technological change, it is important to acknowledge that all technological changes, both incremental and radical take place within the economic system present at the time (Grubler, 1998: 40). These changes take place as a result of newly perceived opportunities, incentives, deliberate research and development efforts, experiments, marketing and entrepreneurship (Grubler, 1998: 40). As with the arguments presented by Sussman, Grubler simply claims that technological change and advancements do not "fall like manna from heaven", but rather focuses on a combination of factors contributing to this development (Grubler, 1998: 42). He further states that when examining factors affecting technological changes and development in recent decades, these developments can be attributed to deliberate research and developmental efforts which have taken place in government labs or universities (Grubler, 1998: 42). The arguments presented by Sussman and Grubler provide a salient foundation for a better understanding of the complex relationship between technological advancement and politics. These scholars highlight the contribution and role of various factors that result in the development or advancement of technology throughout history, and place emphasis on understanding the important dynamics that emerge as a result of this interconnectedness.

Through focusing on the core components contributing to the development of technology and the complex connection between the two, Sussman's arguments present and highlight the political nature of technological development through stating that the individuals that hold

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

positions to make decisions determine the boundaries of technological development and advancement (Sussman, 1997: 1). These individuals are able to influence the development of technology as they determine the areas within both public and private spheres that receive the necessary investment and allocation of required resources to enable research into technological advancement (Sussman, 1997: 1). Through highlighting the political nature of technological development, Sussman provides an interesting perspective for understanding the ways in which politics and technology are linked through assessing this relationship from the developmental phases. Sussman claims that political actors play a central role in the extent and pace at which technology is developed, and the ways in which this development is funded and supported (Sussman, 1997: 2).

Cascio and Montealegre present similar arguments to Sussman through their research findings focused on understanding the key developments of technology and the ways in which these developments affect work and organisations. They claim that the impacts and effects of technological development over the course of history remains well documented, with researchers being able to track the growth and advancement of civilisation through understanding the three eras (agricultural, industrial and digital) in accordance to the core technological infrastructures present during each era (Cascio & Montealegre, 2016: 351). They state that each of these three eras were significantly affected by the ability to acquire new information and knowledge, and that each era resulted in the enablement of new economic structures, cultural transformations, social revolutions and work models (Cascio & Montealegre, 2016: 351).

Similar arguments are presented by Grubler, who states that when looking to develop a deeper understanding on technological development, it remains imperative to note that the social and economic contexts in which technology evolves need to be accounted for to grasp a thorough understanding on the production and use of technology (Grubler, 1998: 22). Many of the arguments presented by Grubler are based on an understanding of how technology has emerged and advanced over periods. He states that when looking at the shifts that have taken place in society from the era of nomadic hunters and gatherers as a result of agricultural development, as well as the shifts that have occurred as a result of the development of markets and money, it can be argued that both markets and agriculture played fundamental roles in the emergence of cities (Grubler, 1998: 38). As a result of this emergence, notable technological revolutions took

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

place which resulted in the development of fields such a construction, navigation, military technology and materials which have all in turn played significant roles in the shaping of history (Grubler, 1998: 38). Grubler notes that the role of technological advancements in affecting and shaping history has taken the focus in many studies undertaken by anthropologists, philosophers, historians and economists looking to understand the relationship between economic growth and technological change, with classical economics writers such as Karl Marx highlighting the relationship between the structure of production and the related impacts on social relations (Grubler, 1998: 38).

While Sussman examines the emergence and development of technologies, Akaev and Pantin focus on examining the ways in which technology and politics impact one another at a later stage. Akaev and Pantin argue that through the introduction of new technologies, changes in the balance of political, economic and military power amongst leading powers as well as between economic, regional and political unions will become evident (Akaev & Pantin, 2014: 870). Weare supports the claims made by Akaev and Pantin through claiming that when looking to understand the ways in which technology and politics affect one another, researchers need to consider the causal paths that connect technological change and systems of political communication (Weare, 2002: 662). In order to support his arguments demonstrating the causal link between technological advancements and politics, Weare studies the introduction and rise of the internet as a source of technological advancement to effectively support the claims that he presents throughout his work. A central focus that Weare shapes his arguments around is based on understanding the channels and structures of communication that various political actors use to perform key functions (Weare, 2002: 675). He argues that communication channels perform the function of mediation between political actors to contribute to the enactment of key functions (Weare, 2002: 675). Downward communications such as broadcasting information to citizens plays a key role in functions such as mobilising support and ensuring citizens are informed on rules and policies while also legitimizing authority (Weare, 2002: 675). The use of horizontal communication such as conversation facilitates the performance of functions such as negotiation, debate and deliberation (Weare, 2002: 675). The central argument highlighted by Weare is based on acknowledging that the use and structure of different communicative channels contributes to the feedback and ways in which governments and organisations demonstrate and exert power (Weare, 2002: 675).

14

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

He states that this has been demonstrated through the study of factors such as greater citizen involvement and empowerment as a result of the rise of the internet (Weare, 2002: 663). Weare supports his arguments on the causal link between technological advancement and politics through stating the debates over encryption technology, the provision of information over the internet by governments, copyright issues as well as domains are a few of the political issues that have contributed to the shaping of the internet (Weare, 2002: 662).

1.2 <u>Technology as a tool of control:</u>

As an understanding on the multifaceted relationship between technological advancements and politics has been reviewed in the above section, it remains important to outline the ways in which scholars have considered technology as a tool of domination, as well as a tool for emancipation. The following section will firstly explore the ways in which technology has been viewed as a tool of control or domination, followed by an examination on the ways in which technology has been viewed as a benign instrumental force, or tool of emancipation. Through examining these two topics, a deeper understanding into the complex relationship between technology and politics can be understood, as the insights of scholars that have studied the roles of technology in society will be examined. This will also prove valuable when examining the ways in which technologies impact or influence international organisations and domestic government agencies, as a thorough examination into the potential roles and functions presented by technology will be undertaken.

In his article "Technology, Technological Domination, and the Great Refusal: Marcuse's Critique of the Advanced Industrial Society", Ocay presents important arguments relating to the potential role of technology to become either a tool for emancipation or a tool for domination (Ocay, 2010: 57). He claims that the value and uses ascribed to technology remains solely dependent on the motive of the user, and claims that in cases where technology is used as a tool of domination, it can be seen that the user has employed the technology in the wrong way, or to serve their own interests (Ocay, 2010: 58). Ocay further states that according to Marcuse, the role of technology within the advanced industrial society can be understood as a tool for domination as the role of technology in such a society is based on serving the interests

15

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

of the administrators of the society, where the subjection of technology to politics and economics results in technology being used as a tool of domination (Ocay, 2010: 58).

The role of technology as a tool for domination is further discussed by Ocay in relation to the capitalist mode of production as discussed by Marcuse. Ocay and Marcuse argue that as a result of the capitalist mode of production hinging chiefly on technological advancements, the development of technological rationality can be observed and further examined (Ocay, 2010: 58). Marcuse claims that due to the assignment of mental powers to technological tools, a call for unreserved compliance and coordination of the individual operating the machine is expected, which in turn contributes to the subordination of the thoughts of the individual and an observation of the machine directing the individual instead of vice versa (Ocay, 2010: 58). He further argues that technological rationality can be examined across numerous spheres of life, which eventually results in the significant reduction of critical thinking and the replacement with the idea of compliant efficiency and a reduction of autonomy (Ocay, 2010: 59). Similar arguments are presented by Cotgrove who provides insight into the thoughts of writers such as Marcuse, Ellul, Habermas and Weber. Cotgrove states that these scholars highlight the ways in which technology can be viewed as a tool for domination, or a threat to human values and states that this can be understood within two main ideas (Cotgrove, 1975: 60). Firstly, he argues that technology, or a technology-driven society should be viewed as the antithesis of creativity, critical thinking and spontaneity as the introduction of technology into tasks performed by man results in limitations and a reduction of scope for human judgement and choice (Cotgrove, 1975: 60). He claims that this reduction emerges as a result of the forced rationalisation, routinisation and formalisation of actions or tasks performed by individuals that are associated with the introduction of new technologies (Cotgrove, 1975: 60). Secondly, Cotgrove states that technology can be viewed as a tool of control in that the role of science and technology as predominant modes of thought result in the exclusion of any value rationality that is not merely based on scientific data (Cotgrove, 1975: 60). He further highlights key arguments presented by Weber in relation to advocating for routinisation and efficiency associated with the automation of tasks and introduction of technology, versus spontaneity and creativity, and argues that significant potential to investigate the far-reaching implications of technology on the quality of social life exists (Cotgrove, 1975: 61).

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

In examining the ways in which technology has been observed to be a tool of control or domination, Wajcman provides an interesting perspective in her articles "Feminist theories of technology" through examining the role of technology in society through a feminist theory lens. Wajcman argues that through an increased engagement at the intersection of science and technology studies (STS) and feminist scholarship, a valuable enrichment of both fields has been observed, with a focus on studying both contemporary and earlier feminist debates on the role of technology in society (Wajcman, 2009: 1). She states that studies into the relationship between technology and feminism needs to firstly recognise and acknowledge the complexity of this relationship, as well as evolution of studies focused on understanding science, technology and feminist discourse (Wajcman, 2009: 4). This evolution was initially focused on understanding how women could be treated more equitable within and by science, followed by a shift in identifying the distinct masculinity of technological projects (Wajcman, 2009: 4). Wajcman claims that developments in feminist analyses of technology saw significant shifts that had focused on understanding the levels of women's access to technology and science, to delving further and seeking to understand the gendered nature of technology and the ways in which this has manifested in gendered technical expertise and gendered divisions with STS (Wajcman, 2009: 4).

Two key illustrations of the gendered nature of technological development as discussed by Wajcman are clear within medical institutions and militarism (Wajcman, 2009: 4). Wajcman uses these two cases to present radical feminist understandings on the ways in which men and women experience fundamental differences in relation to power, and argues that technology can be viewed as a tool which has contributed to the domination of women by men within these spheres of society (Wajcman, 2009: 4).

In examining medical institutions and the role of technology as a tool of domination, Wajcman claims that Western technology and sciences have traditionally been deeply patriarchal institutions, and states that these claims can be examined in relation to feminist responses to human biological reproduction developments during the 1980's (Wajcman, 2009: 4). She states that during the 1980's, radical feminists were strongly opposed to new developments in reproductive technologies, such as in the case of in-vitro fertilisation and that this opposition can be best understood in relation to patriarchal fears that technological developments in these spheres would further result in the control and exploitations of women's bodies (Wajcman,

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

2009: 4). Wajcman states that the case of opposition to reproductive developments led by men during the 1980's demonstrates the arguments made by radical feminists that gender power relations are deeply embedded within the field of technoscience, and that these arguments formed the foundation for feminist calls for new technologies to be based on both male and female values (Wajcman, 2009: 4). Wajcman states that through studying various feminist theories and approaches to understanding technology, it remains evident that these debates are centered on technology and the use and abuse of these tools through understanding their political qualities (Wajcman, 2009: 4).

1.3 <u>Technology as a benign instrumental force:</u>

When examining debates presented by scholars on the ways in which technology can be used as a tool for control and domination as presented in the previous section, it remains imperative to explore the arguments made by authors on the ways in which technology can be viewed as a benign instrumental force, or as a tool for emancipation to ensure that a holistic understanding on the potential roles of technology is achieved. Although Ocay and Wajcman present important arguments on the role that technology has played as a tool for domination, both of these authors provide resounding arguments on the ways in which technology can also be viewed as a benign instrumental force. The scholars present their arguments in relation to various scenarios and highlight the important aspects to consider when seeking to determine whether technology should be viewed as a tool for domination, or an instrument for emancipation.

Wajcman's "Feminist theories of technology" provides valuable insight into the role technology can play as a tool of domination, as demonstrated above in seeking to examine technology as a tool of control. The arguments discussed above focus on feminist theories emerging during the 1980's in response to inequalities experienced by women in fields such as medicine and the military as a result of technological advancements. However, Wajcman argues that although significant negative sentiments in relation to technology and the role technological advancements played in domination were highlighted during this period, contemporary feminist approaches demonstrate notable enthusiasm for the dawn of the digital age (Wajcman, 2009: 5). She states that feminist approaches of the 1990's and today provide

18

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

valuable insights into the positivity expressed towards the opportunities presented by technology, and the role technology can play as a benign instrumental force (Wajcman, 2009: 5). Wajcman argues that technological advancements in fields such as genetic engineering, reproductive technology and virtual reality already challenge fundamental traditional notions of gender identity and as such can be viewed as transformational when studying the relationship between women and technology (Wajcman, 2009: 6).

When examining the arguments presented by Ocay on the role technology can play as a tool for emancipation he states that it remains imperative to note that domination or control over people does not necessarily occur as a result of the introduction of a new technology, especially in relation to the industrial labour market (Ocay, 2010: 66). Ocay argues that technology can be viewed as a very decisive tool for emancipation and should not be held responsible for repression or enslavement of man, rather he states that the masters in charge of organising societal labour relations should be viewed as responsible for domination as they determine the planned obsolescence, need and place for individuals within the larger system (Ocay. 2009: 66). In relation to the role of technology as a liberating or benign instrument, Ocay argues that technology can be considered one of the most imperative aspects required in the realisation of liberation for the working class within the industrial society as the development and introduction of new technologies has resulted in a significant reduction of working hours for workers through the automation of tasks (Ocay, 2009: 69). He argues that the automation of many of the tasks associated with industrial societies provides the opportunity for a reduction of exploitative and destructive productivity, which in turn means that man is able to work less and enjoy more while still ensuring similar levels of productivity are achieved as experienced before the automation of tasks, which in turn would contribute to a society where individuals no longer face exploitation or toil and are able to pursue things required for the attainment of a "complete being" (Ocay, 2009: 76). Furthermore, the automation of tasks can be viewed as emancipatory as a result of the improvement in equipment and safety due to developments and improvements to systems that had previously been responsible for severe injuries or death within the workplace.

In "*Blockchain and the new architecture of trust*" Kevin Werbach provides valuable insight into the ways in which technology, specifically the benign character of blockchain-based

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

technology can be understood. Werbach argues that blockchain technology provides the opportunity to develop a legal platform that is able to shape the behaviour of governments and organisations in a way whereby significant social value can be harnessed (Werbach, 2018: 319). He refers to blockchain as a "foundational technology" and argues that within years to come, society will be transformed by blockchain technology similarly to how society was transformed by the internet, through the creation of a platform that facilitates transactions in an effective and instant manner.

Through highlighting the opportunities presented by blockchain-based solutions, and the ways in which these solutions can be harnessed by numerous sectors of society, Werbach emphasizes the benign characteristics associated with blockchain technology. This emphasis, as well as Werbach's claims that blockchain technology should be considered foundational and important for the future of technology and the ways in which this impacts society, remains imperative to consider when seeking to understand how technological changes or advancements could impact the effectiveness and benign political character of domestic government agencies and international organisations.

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

Chapter 2:

2.1 Explaining blockchain technology:

Lin and Liao claim that blockchain technology has become one of the most popular topics in recent years, with significant impacts evident on various areas of life as a result of the influence the technology has achieved over numerous businesses and industries (Lin & Liao, 2017: 653). Blockchain technology has traditionally been known for and associated with the financial sector for its role in Bitcoin technology as the first successful decentralised peer-to-peer cryptocurrency (Zambrano, 2017: 6). Lin and Liao argue that blockchain technologies are not merely a single technique, rather elements of cryptography, algorithms, economic models and mathematics that are integrated to develop a multi-field infrastructure (Lin & Liao, 2017: 653). The scholars state that six key elements can be identified when looking to better understand the composition of blockchain technology. Firstly, decentralisation remains the first key element (Lin & Liao, 2017: 653). This foundational feature of blockchain technology means that a reliance on a centralised node is no longer required (Lin & Liao, 2017: 653). Rather, data is recorded and stored across nodes (Lin & Liao, 2017: 653). Secondly, the transparency of each node contributes to the significant levels of trust in a blockchain system (Lin & Liao, 2017: 653). The third element is based on the concept of open source data, where the system remains open to all participants to be recorded and checked publicly, thereby reiterating the transparency of the technology (Lin & Liao, 2017: 653). Autonomy has been identified as the fourth element with the ability of all nodes on the blockchain to transfer or update data safely, forming a key element to the way in which the system functions (Lin & Liao, 2017: 653). The inability for records to be changed or altered unless 51% of a node is controlled contributes to the fifth key element, the immutability of a blockchain system (Lin & Liao, 2017: 653). Finally, the level of anonymity associated with participating in blockchain-based platforms means that in order to transfer data or complete a transaction, only a blockchain address is required (Lin & Liao, 2017: 653).

Crosby, Pattanayak, Verma and Kalyanaraman define blockchain technology as a public ledger, or distributed database of records that contains all transactions or digital events that have been shared or executed by participants (Crosby et al., 2016. 8). Analysts and users have stated that one of the central features of blockchain technology is based on the fact that once

information has been entered into the ledger, it can never be erased or altered, while verification of every entry is also required by all participants (Crosby et al., 2016. 8). As a result of peer verification and the inability to alter information entered into a blockchain ledger, this technology provides attractive attributes to many sectors (such as the developmental sector) where greater efforts are being seen to enhance transparency and reporting.

De Vrji states that blockchain technology was first introduced to the world in 2008 for its instrumental role in the Bitcoin cryptocurrency (de Vrji, 2018: 15). Blockchain technology acts as the source responsible for recording all transactions that take place on the network (Zambrano, 2017: 6). These transactions are all recorded sequentially within a decentralised peer-to-peer network consisting of nodes that store up-to-date versions of the data, which is automatically shared among nodes, and in turn all users (Zambrano, 2017: 6). De Vrji claims that although blockchain technology has been traditionally linked to cryptocurrencies as a result of its abilities to create an incorruptible digital ledger of all transactions performed on the network, assessments of its uses in other sectors have been undertaken and findings demonstrate that blockchain possesses the ability to act as a major disruptive technology in the future (de Vrji, 2018: 15).

Pisa and Juden provide a basic and valuable explanation of blockchain technology. This understanding will form the foundation of the arguments presented within this research. Pisa and Juden state that at a basic level, blockchain can be best understood as a data structure that is based on every modification to the data on the structure being agreed to by participants within the network (Pisa & Juden, 2017: 1). Once the modification of the data has been agreed upon by all participants, the data is stored in a 'block' along with any other modifications that have taken place within the same timeframe (Pisa & Juden, 2017: 1). This 'block' is then connected to the 'chain' of previously agreed-upon 'blocks', which then results in the creation of a complete and transparent record of all data modifications which have ever taken place (Pisa & Juden, 2017: 1). As a result of the mathematical link and unique identifier between transaction blocks, altering or deleting data on any of the blocks (transactions) remains nearly impossible (Zambrano, 2017: 6). The only way in which data can be altered on the ledger is through consensus from all nodes or participants, which are run on an algorithm among the network nodes. Information or a block can only be added to the ledger once the algorithm has been

22

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

validated the result of the addition (Zambrano, 2017: 6). The use of cryptographic tools in blockchain technology means that users are not required to create a profile or provide personal information to join a network, which highlights a key contrast in comparison to most social media platforms in existence (Zambrano, 2017: 6).

A central consideration that needs to be accounted for when understanding the role that blockchain technology could play in facilitating transactions is based on the trust that is traditionally required between intermediaries when transactions take place. Pisa and Juden unpack the idea of trust in transactions, and state that currently virtually all economic exchanges that take place do not do so on a face-to-face basis, but rather require the intervention of a trusted third-party intermediary such as a bank or government agency (Pisa & Juden, 2017: 5). The trusted third-party actor is relied on to oversee the transaction through verifying the identities of participants involved in transactions, overseeing the settlement of the transaction, creating and storing a record of the transaction and enabling the participants within a transaction to exchange goods without having to trust one another (Pisa & Juden, 2017: 5). Rather, the required trust is placed on the third-party such as the bank or government agency which increases the opportunities for exchange and transactions between parties that would otherwise not have taken place. Examples of these transactions include when goods or items are purchased online, the buyer relies on credit card companies or banks to verify and process the payment (Pisa & Juden, 2017: 5). Alternatively, when an individual seeks to establish ownership over an asset, a reliance on central authorities which includes governmental actors is expected to verify and confirm asset-related rights (Pisa & Juden, 2017: 5).

Although these trusted third parties perform valuable roles in facilitating transactions, several concerns relating to this reliance need to be expanded on to highlight the role of innovative solutions such as blockchain technology to the benefit of the end-user. Firstly, concerns relating to the fees and costs associated with the use of intermediaries such as banks need to be considered as transaction fees contribute significantly to the overall costs when looking at organisational and government spending. The World Bank stated that in 2016 the average fee associated with sending remittances was set at 7.4% (Pisa & Juden, 2017: 6). The reliance on third-party actors when looking at an organisation such as the World Bank highlights inefficiencies when considering that cross-border financial transaction requires the

23

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

involvement of multiple intermediaries and take an average of 3-5 business days to be completed (Pisa & Juden, 2017: 6).

The figure below depicts a transaction on a basic blockchain-based system. As explained by Pisa and Juden, the blockchain system is based on the premise that all transactions or modifications to the system are only effective when all participants on the node have agreed. The figure illustrates the process whereby one of the parties with permission to access a node will request a transaction, followed by this transaction request being sent to all participants on the network. Once these requests are distributed across the participating nodes, a pre-existing and agreed upon algorithm is run to approve or decline transactions. If a transaction is approved, it will be included on the public ledger and is represented as a block. Once a transaction is added to the ledger, it is complete and permanent. Any alterations or modifications can only be made if consensus is received from all participating nodes.
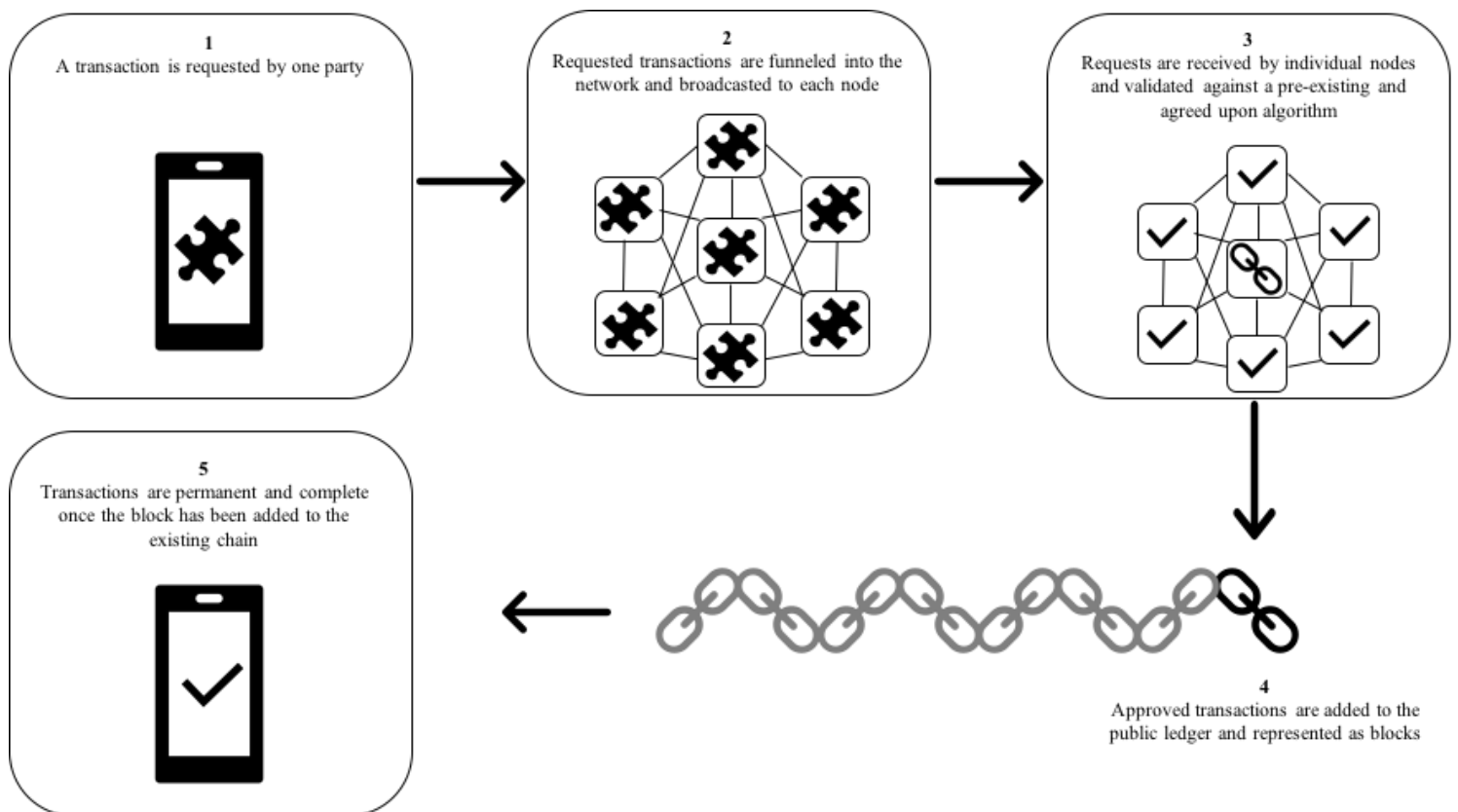

Figure 1: What is blockchain? A basic overview, adapted from Ramella, 2019

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

2.2 Opportunities presented by blockchain technology for developing countries:

When examining the growth and pace of innovation, an increasing number of researchers and development experts have shifted their focus to understanding innovative technologies to determine if potential exists within the developmental arena to reduce poverty and improve the lives of vulnerable populations across the globe. Pisa and Juden state that the growing interest in understanding technological innovations by development experts can be attributed to the appeal that these innovations can be used to enhance both public and private sector functions in a world where the budgets of developmental aid agencies are facing increasingly mounting pressures (Pisa & Juden, 2017: 1). Pisa and Juden state that although development experts have been interested in a range of technologies that provide opportunities for enhancing operations, recently blockchain technology has caught the attention of many development experts through the opportunities presented by the technology to address long-standing economic challenges (Pisa & Juden, 2017: 1). Similar sentiments are evident when examining the Deloitte's 2019 Global Blockchain Survey, where 53% of survey respondents stated that blockchain technology has become a "critical priority for their organisation in 2019" (Pawczuk, Massey & Holdowsky, 2019: 3). Furthermore, the authors argue that notable shifts between the 2018 and 2019 surveys are observed, with the exploration of the uses of blockchain technology by the financial technology sector gaining notable momentum (Pawczuk, Massey & Holdowsky, 2019: 3).

As developments in blockchain technology are fast paced it remains important to consider the ways in which innovative technologies such as blockchain are relevant or useful in developing countries, where the provision of services and goods can be enhanced through the introduction of such technologies (Zambrano, 2017: 7). It remains imperative to examine the use of blockchain technology for developing countries while taking the infrastructural challenges present within most developing nations into account. Pisa and Juden identify three key advantages of utilising a blockchain-based system to conduct aid payments from the perspective of the donor (Pisa & Juden, 2017: 33). These include the improved speed of the transaction, enhanced levels of transparency and the ability to transfer funds without the use of traditional financial intermediaries (Pisa & Juden, 2017: 33).

Zambrano argues that within most developing countries and economies, governments are the key actors responsible for the provision of public goods and services such as health, education

25

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

and security (Zambrano, 2017: 7). Although blockchain technology has traditionally been associated with the financial sector, a range of key areas and sectors that can be impacted by the introduction of blockchain have been identified. These areas include the provision of government services and programs, land titles, identity services, anti-corruption efforts, electoral processes and aid as supported by international donors and organisations (Zambrano, 2017: 7).

2.2.1 Improved transparency

De Vrji assesses the state of the current humanitarian aid system and argues that the lack of transparency continues to characterise the system (de Vrji, 2018: 9). She argues that the demand for increased and improved transparency relating to humanitarian aid has been placed at the top of the agenda on a global level (de Vrji, 2018: 9). Similar sentiments are echoed by Pisa and Juden who state that both critics and supporters of development aid in its current form constantly highlight the levels of corruption and fraud present within the sector (Pisa & Juden, 2017: 31). They state that as a result of poor monitoring systems in place by developmental aid agencies, estimates on the amount of aid lost to cases of corruption is uncertain and cannot be quantified, and it is predicted that the issue of aid lost to corruption will continue to increase as a focus point for policymakers (Pisa & Juden, 2017: 31). De Vrji also states that as a result of aid beneficiaries and individual recipients being largely unknown to donors, the risk of a lack of transparency is heightened due to the lack of accountability and donor fragmentation (de Vrji, 2018: 9). Pisa and Juden also claim that the topic will continue to attract attention in the future given that most development aid agencies are likely to direct increased shares of aid towards conflict and post-conflict-ridden countries which they believe a higher risk of corruption is present as a result of weak institutions (Pisa & Juden, 2017: 31).

Kshetri and Voas present interesting arguments when examining the opportunities presented by blockchain technology within the context of developing countries. They state that as a result of the tamper-proof digital ledger created by blockchain, significantly improved levels of transparency are achieved which reduces violations such as fraud and corruption that have been linked to donor aid in the past, while also reducing the transaction costs (Kshetri & Voas, 2018: 3).

The use of blockchain-based solutions for addressing issued such as corruption and fraud has attracted the attention of many researchers. Kshetri and Voas explore the use of blockchain technology in developing countries for disadvantaged groups such as refugees and displaced persons (Kshetri & Voas, 2018: 3). They highlight the issues associated with the current systems in place to disperse aid to these disadvantaged groups, and state that factors such as fraud, inefficiency, misallocations of resources and transaction fees (which traditionally account for 3.5% per transaction), as well as recorded losses of up to 30% of development funds failing to reach recipients due to mismanagement and third-party theft, could all be addressed through the introduction and use of blockchain-based solutions (Kshetri & Voas, 2018: 3). Additional uses for blockchain-based solutions have been studied by Pisa and Juden who claim that blockchain-based solutions can be used to improve the monitoring and evaluation of aid agency programmes to ensure the enhanced transparency of funds is achieved (Pisa & Juden, 2017: 31). They argue that two proposed models present interesting considerations and opportunities presented by blockchain technology to address issues of transparency. The first model is structured to focus on including project funding and associated metrics on a blockchain whereby all participants along the development supply chain such as donors, recipients, implementing partners and auditors are able to live-track all information relating to the state of the project and where funding has flowed to (Pisa & Juden, 2017: 32). At the same time, pre-determined metrics (such as the number of children attending a school per day) could be input by implementing partners and tracked on an ongoing basis by all participants in the blockchain network (Pisa & Juden, 2017: 32). The second proposed model is based on utilising a blockchain-based solution to provide a platform whereby aid in the form of cash-based transfers are provided to participating beneficiaries (Pisa & Juden, 2017: 32). It is argued that this system produces better results for aid beneficiaries as they are more aware of their needs than donors are, while also benefiting from the lack of logistical coordination required when distributing goods and not cash (Pisa & Juden, 2017: 32). This system is based on both donors and participants being connected to the same blockchain network where the flow of funds can be directly tracked on the system and beneficiaries are able to receive the intended aid through their identity being verified in the form of a digital ID which is often connected to a biometric system on the receiving end (Pisa & Juden, 2017: 32).

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

2.2.2   Efficient and cost-effective international payments

A key benefit associated with the use of blockchain technology according to numerous researchers remains the opportunity to process near to real-time payments across international borders. Achanta argues that the opportunity to process more efficient and effective international payments through using blockchain technology has resulted in significant research efforts by many banks and financial institutions, with many establishing innovation labs to explore the ability to harness this technology (Achanta, 2018: 3).

The significant costs and time delays in processing international payments are discussed by Pisa and Juden, who argue that as a result of the lack of single global payment system or infrastructure, cross-border payments remain inefficient and expensive and often to the detriment of international aid organisations (Pisa & Juden, 2017: 16). As a result of the current ineffective system, international development aid agencies are required to process payments by means of a series of payments through correspondent banks that hold accounts in banks in other countries to facilitate the movement of money to required destinations (Pisa & Juden, 2017: 16). The significant costs associated with these transactions currently vary according to the area the remittances are sent to, and despite significant efforts by the international policy community to reduce this cost to 3% as set out in the Sustainable Development Goals, the current remittance costs remain on average 4.5% above the 3% target (Pisa & Juden, 2017: 17). Through the introduction of a blockchain-based system to transfer funds internationally, developmental aid agencies would be equipped with a platform to facilitate and monitor the immediate transfer of funds to local partnering agencies. Through the removal of third-party intermediaries such as local banks in partnering countries, a block-chain based solution would create faster and cheaper transactions facilitated by developmental aid agencies.

2.3   Challenges associated with the use of blockchain technology:

Through identifying the opportunities presented by blockchain technology in sectors beyond only the financial sector, notable challenges are evident and require consideration to ensure a holistic understanding of the technology is achieved. Pisa and Juden argue that several challenges have been highlighted when studying the use of blockchain technology, specifically in relation to the study of blockchain-based developmental solutions and the adoption thereof (Pisa & Juden, 2017: 12). It is important to note that despite the potential benefits and

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

opportunities presented by blockchain-based solutions for development aid agencies, the nature of these organisations means that they remain slow to innovate as a result of the levels of risk aversion (Pisa & Juden, 2017: 34). As a result of the vital role played by these organisations and the role they play in stewarding the funds and resources of other countries for the intention of servicing beneficiaries in need, the reluctance to make significant shifts in their operations can be understood, while contributing to the challenges in introducing new technologies to enhance operations.

The following section will seek to examine challenges and hurdles associated with blockchain-based solutions to ensure that a thorough investigation into the use of the technology has been undertaken. Issues such as infrastructural infancy, organisational capacity, data privacy concerns and governance will be discussed to ensure a consideration on the challenges and limitations associated with blockchain technology within the developmental arena as well as within the context of domestic government agencies are discussed. Although these issues highlight important concerns relating to the use of blockchain-based solutions for international development aid agencies, according to Pisa and Juden the most important challenge as identified from their research is based on the required buy-in from local partners and central authorities (Pisa & Juden, 2017: 15). As discussed in the World Food Programme's "Building Blocks" initiative case study, blockchain-based solutions provide development aid agencies with the opportunity to significantly streamline and reduce costs associated with transactions. However, this is only possible in cases where development agencies shift their operations to provide financial aid in the form of credit that can be spent at local partners instead of directly providing goods. This model is based on settling aid beneficiary payments to approved local partners at the end of a period, instead of in advance as per under previous models. As such, it remains imperative for aid agencies to establish legitimate and trusted partnerships with approved local partners for such a model to be successful.

2.3.1 Infrastructural infancy

Zambrano argues that in most developing countries, the use of blockchain-based solutions to provide citizens with goods and services remains infant (Zambrano, 2017: 8). This infancy is based on a key barrier in which nearly four billion people living in developing nations do not

29

have reliable access to the internet (Zambrano, 2017: 8). In its current form, blockchain technology relies on running fully on an internet connection (de Vrji, 2018: 19). Without the required infrastructure such as access to internet, it remains unlikely that these citizens would be able to participate on a blockchain network or run the software necessary to benefit from the technology (Zambrano, 2017: 9). This concern also needs to be examined within the context in which many aid transactions take place. Areas affected by natural disasters, conflicts or countries where the full access to the internet is not supported by the government means that a blockchain-based solution would prove ineffective as the need for skilled people, computers and servers is imperative to the functioning of a blockchain network (de Vrji, 2018: 19). This concern is also highlighted when examining areas of conflict where the government is responsible for shutting down the internet frequently as has been in the case in many countries recently (de Vrji, 2018: 19). The nature of a blockchain network means that the technology and platform are incredibly energy-intensive and consuming and are not as fast as the speed associated with transactions such as those taking place on the Visa network (de Vrji, 2018: 19). These concerns remain relevant within the context of international organisations as well as domestic government agencies, as infrastructural infancy would negatively impact the introduction and use of a blockchain-based solution for both groups.

In addition to the infrastructure required to successfully run a blockchain network, the role and lack of infostructure in developing countries (which includes the policies, roles and procedures necessary to secure information transferred on the network) pose significant barriers to the use of blockchain technology as a result of the reliance on these tools for the use and effective functioning of the platform (Zambrano, 2017: 9). In addition to the challenges posed by the lack of infrastructure and infostructure of developing countries required to participate on the blockchain network, a notable degree of capacity building is required to ensure the network is understood and all users are able to navigate and effectively utilise the platform (Zambrano, 2017: 9). Concerns relating to the financing of the hardware and capacity building required to ensure an effective use of the system have been cited by many researchers examining the technology, as research demonstrates that significant costs are associated with setting up and growing the network to sufficiently handle the required capacity (de Vrji, 2018: 19).

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

2.3.2 Organisational capacity

Pisa and Juden echo the points highlighted by Zambrano above when focusing on the learning that would be required by international organisations or domestic government agencies that look to using blockchain-based solutions in the future. They argue that in order to consider and implement blockchain-based solutions, sufficient staff capacity and knowledge of the technology to ensure effective implementation thereof is needed (Pisa & Juden, 2017: 14). The required knowledge of the technology is based on understanding both the limitations and potential benefits of using blockchain-based technology, while also being able to provide reliable guidance to partners, communities and citizens (Pisa & Juden, 2017: 14). This concern needs to be taken into account when examining the impact of constraints deriving from a system based on blockchain wherein data outputs are directly related to data inputs on the system. As such, the role of staff in inputting correct and reliable data needs to be examined when exploring concerns of blockchain-based solutions. Pisa and Juden provide an illustrative example highlighting this risk through stating that as with any database, a blockchain-based solutions is based on a "garbage-in, garbage-out" system, thereby depicting the importance of reliable data being input to ensure the outcomes (Pisa & Juden; 2017: 15).

Similar sentiments are evident in the 2019 Global Blockchain survey undertaken by Deloitte, with data indicating that the key organisational barrier preventing greater levels of investment into blockchain based technologies is based on the lack of implementation due to having to replace or adapt legacy systems (Pawczuk, Massey & Holdowsky, 2019: 6). 37% of respondents in the survey stated that the lack of implementation acted as a barrier to improved levels of investment, while 28% also stated that a lack of in-house capabilities such as skills and understanding required to effectively use blockchain acted as a key barrier (Pawczuk, Massey & Holdowsky, 2019: 6).

2.3.3 Data privacy concerns

Concerns relating to data privacy in relation to the use of blockchain technology are discussed by Pisa and Juden, and valuable concerns are raised that require attention. They state that most blockchain-based solutions are based on sensitive data of individuals to ensure that data can be linked to an individual identity (Pisa & Juden, 2017: 12). An example of this within the developmental arena includes when aid is sent to beneficiaries using a blockchain-based

31

solution, identifying information of the specific aid recipient is required to ensure that the aid is distributed to the intended recipient (Pisa & Juden, 2017: 12). As a central characteristic of blockchain technology is based on the idea of a public and transparent database, concerns relating to the publishing of private individual information are important to be noted, and these concerns extend to governmental institutions and businesses (Pisa & Juden, 2017: 13). One avenue that has increasingly been explored by those with privacy concerns relating to information stored on the database is related to the use of permissioned networks. This option provides the opportunity to limit the number of actors that are able to access a ledger, which in turn reduces the exposure of the data stored on the blockchain (Pisa & Juden; 2017: 13). Additional options include the introduction of a 'zero-knowledge proof' system whereby transactions remain publicly verified without disclosing the underlying data of the transaction (Pisa & Juden; 2017: 13).

2.3.4   <u>Governance</u>

The central idea characterising blockchain technology is based on the approach where the technology provides a decentralised and peer-driven platform, which in turn could lead to the replacement of traditional trusted intermediaries. This characteristic in turn raises concerns with regards to the governance of the platform, as there is no specific allocated role equipped with being responsible for dictating and enforcing rules governing the system (Pisa & Juden, 2017: 14). Pisa and Juden discuss the concerns relating to the lack of governance in blockchain-based solutions in relation to developmental aid agencies, and argue that although the risk of having very little to no control over the system when using blockchain-based solutions exists, if aid agencies adopt permissioned networks as discussed above they are able to maintain a greater sense of control (Pisa & Juden, 2017: 14). This control is discussed specifically with regards to the rule design and dispute resolution of the system as they are able to control which participants are included in the system as these participants are required to reach a consensus on the network to ensure data is input, and that stakeholders are able to dispute any resolutions based on designed rules (Pisa & Juden, 2017: 14).

Zambrano argues that although it remains imperative to consider the challenges associated with the introduction and use of blockchain technology (especially in relation to developing

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

countries) consideration into the ways in which blockchain technology can be used to complement governing processes should take place to ensure that innovative and disruptive technologies can be leveraged and used to enhance governing functions (Zambrano, 2017: 11).

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

Chapter 3:

3.1 How domestic government agencies have experimented with the use of innovative technologies:

A significant degree of research into understanding the uses of blockchain technology across fields and sectors has emerged, with these studies continuing to develop at a rapid pace. Olnes, Ubacht and Janssen argue that blockchain has been viewed as one of the most crucial technological trends that will influence societies across the world in years to come (Olnes et al., 2017: 355). Although blockchain technology traditionally became widely known in relation to its role in Bitcoin, the technology has been seen to work across a range of applications and sectors beyond only the financial sector (Crosby et al., 2016: 7). Although she focuses more widely on examining the relationship between technology and international politics, Bjorklund argues that the relationship between technology and politics can be better understood when examining case studies of e-Governments, where digitally-based solutions that have been designed to service the public sector have been developed as a result in advances in private sector digitisation (Bjorklund, 2016: 915). She argues that discussions focusing on understanding e-Government fit well within both academic and political discourse on improving democracies through enhanced transparency within the public sector (Bjorklund, 2016: 915).

In looking to examine the ways in which domestic government agencies have harnessed or deployed innovative technology-based solutions, Bwalya and Healy explore the ways in which e-Government solutions have been adopted and rolled out within the Southern African Development Community (SADC) (Bwalya & Healy, 2010: 23). Their analysis provides a valuable lens that can be utilised when looking to better understand the ways domestic government agencies have explored the use of innovative technologies to improve their service offering. Through developing a better understanding on the ways in which domestic government agencies have experimented with innovative technologies, a better understanding on the ways in which technological change impacts the effectiveness of domestic government agencies can be achieved.

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

Bwalya and Healy argue that there has been a significant increase in the rate of adoption of e-Government initiatives within the SADC region, with notable sources of evidence that can be studied to understand cases where these projects have failed or succeeded in the region (Bwalya & Healy, 2010: 23). The scholars claim that these studies form part of an important contribution to understanding the opportunities and challenges associated with harnessing innovative technologies in order to improve service delivery, and as such they advocate for the importance of developing a thorough understanding of the challenges, risks and failures that could arise with these projects before actual implementation is commissioned (Bwalya & Healy, 2010: 23). A range of factors for the consideration and implementation of technology-based projects for governments are discussed by the scholars which are intended to address any risks or challenges associated with implementation. They state that through carefully authoring an e-Government adoption strategy that accounts for the local context as well as the multi-dimensionality of e-Government, an improved chance of project success exists (Bwalya & Healy, 2010: 23).

When assessing the adoption of e-services by domestic government agencies within the SADC Region, Bwalya and Healy claim that recent studies have highlighted the increased rate of adoption of digital and knowledge economies by resource-constrained African countries (Bwalya & Healy, 2010: 23). They claim that through these countries embracing digital concepts, a notable increase in the effective use of digital applications such as e-Government, e-Health or e-Learning has been demonstrated across a growing number of countries (Bwalya & Healy, 2010: 23). Additionally, Bwalya and Healy discuss the potential benefits associated with the adoption of e-Government systems in the SADC Region and argue that a reduction in public service delivery costs, enhanced social inclusion and improved participatory governance are demonstrated across states that have effectively adopted and implemented these systems (Bwalya & Healy, 2010: 24). They claim that effective projects or case studies worth focusing on include the e-Government Action Plan (e-Gap) being implemented in Singapore as well as the implementation strategies and roadmaps developed by Tanzania and Mozambique (Bwalya & Healy, 2010: 24).

Studies that Bwalya and Healy have focused on have highlighted key factors that need to be accounted for to ensure that the efficient and effective adoption of digital applications is

35

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

achieved. Firstly, the scholars argue that it remains imperative to develop institutional and regulatory frameworks that are dedicated to advancing the adoption of e-Government services within a country (Bwalya & Healy, 2010: 23). Through developing these strategies, a focus on ensuring poor and marginalised individuals and communities are drawn into e-Government applications can be achieved. Bwalya and Healy state that the most significant risk associated with e-Government systems or applications remains low adoption rates. As such, through ensuring poor and marginalised groups are incorporated into digital strategies from the onset, a significant reduction of this risk becomes evident (Bwalya & Healy, 2010: 23). Additional factors that contribute to the effective adoption of e-Government solutions include a local knowledge of new technologies and associated risks, IT capabilities and infrastructures, managerial competencies, external pressures as well as data protection and security (Bwalya & Healy, 2010: 24). The scholars also note the importance of trust associated with the effective adoption of e-Government services or systems and state that several studies have been undertaken to determine the impact of trust and risk perceptions associated with e-services (Bwalya & Healy, 2010: 24). One such study conducted by Bélanger and Carter focuses on analysing the impact that trust and risk perceptions linked to e-Government services or models affect the overall willingness of citizens to participate or engage in these initiatives (Bélanger & Carter, 2008: 170).

Understanding the role of trust and risk in the adoption of e-government services remains imperative as this understanding could act as a foundation for examining the potential risks or challenges associated with exploring the uses of innovative technologies in different contexts. Bélanger and Carter claim that in order to ensure effective wide-spread adoption and citizen confidence in e-government systems or models, trust of the Internet (TOI) and trust of the government (TOG) are imperative (Bélanger & Carter, 2008: 170). The theory presented by Bélanger and Carter draws distinct links between the importance of trust in the government and the internet to ensure effective and wide-spread adoption of e-Government systems, and they argue that results from surveys conducted demonstrate that trust of the government negatively affects the perceived risks associated with the intentions of an e-Government service, while also negatively affecting the rates of use (Bélanger & Carter, 2008: 180).

Bwalya and Healy's emphasis on the importance of including the poor and marginalised is echoed by Tracy Westen in her study on exploring whether technology can save democracy.

36

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

Westen draws important links between democracy and access to information, stating that politicians such as James Madison and Thomas Jefferson were among many to understand this vital connection (Westen, 1998: 47). She argues that Madison and Jefferson focused on the importance of providing citizens with access to information and ideas to prevent confusion, despair and mob tyranny which could be associated with the lack of information on which to base an informed vote or decision on (Westen, 1998: 47). This notion discussed by Westen can be linked to the arguments presented by Bwalya and Healy through highlighting the central, common idea that in order to ensure high levels of adoptions to new systems (in Bwalya and Healys case the adoption of e-Government and in Westens case the new experiments in government that placed the power of an electorate into the hands of ordinary citizens) access to information, the inclusion of the masses and trust remain vital. Notable similarities between arguments presented by Westen and those presented by Bélanger and Carter highlight the central role of trust between citizens and states, and the ways in which this trust impacts flows of information and the willingness of citizens to participate in or adopt new systems.

Kamel presents valuable arguments when examining the role that technology has played within the banking sector across developing nations. This case study highlights important notions that contribute to the broader research topic through the core idea that the coupling of information and technology can result in a propelled development process (Kamel, 2005L 305). He argues that the importance of technology and access to information spreads across many industries and sectors with the ability to draw distinct links between these factors and the transformation of these sectors resulting in multiple positive outcomes (Kamel, 2005: 305). The scholars focus on examining transformation within the banking sector as a result of the introduction of technology and the associated infrastructure demonstrates the ways in which development processes can be influenced by the introduction of new technologies. Kamel argues that within the banking sector, many examples exist where technology-based applications have been used to build new markets and in turn fuel the economy (Kamel, 2005: 305). His use of examples such as the introduction of automated teller machines (ATM's) and the benefits associated with the use of this solution (including efficiency for communities and reduced costs) demonstrate the important role technology can play in improving operations (Kamel, 2005: 305). Kamel further argues that although the ATM case study remains merely one example of the benefits associated with technology-based solutions, recent years have demonstrated that significant

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

investment into building up and improving technological infrastructure in developing nations is evident as a result in the growing interest and understanding of the benefits of technological solutions (Kamel, 2005: 306).

The arguments and claims presented by the scholars as discussed above highlight the complex role technology and access to information can play in relation to the implementation or adoption of technology-based systems or models. Case studies examining e-Government solutions contribute to this understanding through lessons learnt and through noting key factors that need to be accounted for when looking to adopt and implement new or innovative projects. In order to demonstrate the ways in which domestic government agencies have adopted innovative technologies, two case studies exploring the experimentation with blockchain-based projects by domestic government agencies, and the impact these have had on improving effectiveness will be discussed below.

3.1.1   Case Study: e-Estonia:

According to Bjorklund, significant levels of increased interest have been shown by social sciences scholars in relation to e-Governments and e-Governance (Bjorklund, 2016: 914). She claims that the increased cases of digitalisation of essential functions within the public sector in both industrialised and developing parts of the globe has been identified as a growing trend (Bjorklund, 2016: 914). Following the fall of the Soviet empire and the reestablishment of Estonia as an independent state in the late 1990's, Bjorklund argues that the introduction of an e-Government system in Estonia can be best understood in relation to the significant investments in technology that occurred at the time (Bjorklund, 2016: 915). Close collaborations between both public and private interests saw the development of the e-Government system, with the Estonian banking system taking a leading role in strengthening the process (Bjorklund, 2016: 915).

Bjorklund argues that the case of Estonia, who have taken a leading role in digitising services to create an e-Government system remains a valuable case to examine as the country has experimented with, and demonstrated the potential opportunities to improve efficiency as a result of the digitalisation of essential services and information (Bjorklund, 2016: 914). The

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

Estonian government have sought to provide electronic internet-based services since 2001 (Galen et al, 2018: 22). Since the launch of the first e-ID cards issued in 2001, digital signatures were made possible for all citizens forming the basis of verification for essentially all government-related services (Galen et al, 2018: 22). These services include land titles, healthcare and business registries, and more than 1000 governmental services being made available through the online network named e-Estonia (Galen et al, 2018: 22). As the Estonian government started the shift in 2001 to offer most of its services on the e-Estonia network, the need for enhanced data privacy, security and integrity became imperative (Galen et al, 2018: 22). As such, the government sought to implement blockchain technology in 2008 to ensure a live and constant system which enabled situational awareness on both government and citizens data was developed (Galen et al, 2018: 22). This system ensured that any attempts to modify, attack or compromise the system were detected instantly, which later contributed to the building of public trust required to ensure such a system or network is successful (Galen et al, 2018: 22). The secure system went online in 2012, giving all citizens the ability to track and monitor all government-related transactions on an audit log that can be accessed on the live portal (Galen et al, 2018: 22).

In addition to enhanced privacy and data security that was made possible through the use of blockchain technology in the e-Estonia case study, Galen et al argue that as a result of the use of innovative technological solutions, the levels of efficiency of the Estonian government remained a key benefit of the project (Galen et al, 2018: 22). Guardtime, the distributed ledger technology company that was commissioned by the Estonian government to undertake the project have reported that a key characteristic of the technology stems from the fact that 99% of the Estonian citizens utilising the service do not need to be familiar, or have an in-depth knowledge of blockchain technology to interact successfully with the system (Galen et al, 2018: 22). This benefit remains valuable when assessing the potential challenges in developing nations where concerns relating to the use of such a system have been raised in contexts where large portions of the populations are illiterate. Furthermore, Galen et al claim that further levels of increased efficiency are demonstrated when examining the Estonian governments "once only" policy (Galen et al, 2018: 22). The "once only" policy is based on the idea that any branch of government is only required to request information from a citizen once and may not ask for the same information again (Galen et al, 2018: 22). This policy was made possible due to the

39

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

introduction of blockchain technology as a result of the technologies ability to create and maintain databases on information successfully that can be carefully tracked and monitored on a live basis.

The e-Estonia case study demonstrates valuable lessons and findings that can be used when looking to examine the suitability and scalability of blockchain-based solutions in different countries. A notable finding in the case study stems from the fact that gradually the system has been able to gain the trust of both the government and public, to the extent that system continues to exist as government control has changed between different political parties (Galen et al, 2018: 22). Estonian citizens interviewed as a part of Galen et al's research stress the importance of the transparency of the system, which raises interesting points for consideration when looking to explore implementing similar projects in other parts of the world (Galen et al, 2018: 22). One such consideration is based on the fact that the e-Estonia system has generated the levels of success that it has as a result of a commitment of all domestic government agencies in Estonia to share data across agencies (Galen et al, 2018: 22). This has ensured that policies such as the "once only" policy have been successful, while also contributing to the overall transparency of the system. As the key benefit of a blockchain-based system is based on the principle of transparency, recreating and implementing similar systems in countries where a lack of transparency exists between government agencies, or there is a lack of willingness of commit to sharing data presents significant challenges in implementing successful blockchain-based solutions.

When studying the e-Estonia case as discussed above, a clear argument that blockchain technology can be viewed as a benign instrumental force can be made. The case clearly highlights notable key opportunities presented by the successful implementation of this technology. Firstly, improved transparency was achieved whereby all citizens and partnering institutions were able to monitor and track all activity linked to government-based transactions on a live audit log. This ensured that citizen's level of trust in the government was significantly improved, in turn further contributing to the success of the project due to higher levels of citizen buy-in and participation on the platform. Secondly, this case clearly demonstrated how technology can impact the effectiveness of domestic government agencies when exploring the "once only" policy that was developed under the e-Estonia project. Through developing a

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

system where the information of participating citizens would only need to be collected once off, this project highlights the efficiency that was created amongst several Estonian government departments who as a result of the policy would be able to access information of citizens through the blockchain database. As such, a central database of all required information would be created once off and could be accessed by all departments that formed part of the project. This in turn created improved levels of efficiency for both citizens and government departments as information would not need to be collected numerous times, rather this information would be collected once and merely need to be updated if required.

3.1.2   Case Study: South African Reserve Bank "Project Khokha":

Numerous studies geared towards understanding the ways in which domestic government agencies have embraced technological advancements and harnessed these advancements to better improve their operations exist. Research into the South African Reserve Bank's "Project Khokha" highlights valuable findings that can be assessed when examining the ways in which domestic government agencies have experimented with innovative technologies to address challenges or improve their operations, specifically within the South African context. Additionally, this case study highlights key findings and insights that need to be considered when assessing the use of technology by states within developing countries that can prove valuable in further studies.

"Project Khokha" has been described as an innovative and collaborative initiative spearheaded by the recently established Fintech unit within the South African Reserve Bank. A central tenant of this project is focused on involving a range of actors within the national banking community to examine, and further contribute to global initiatives seeking to understand the application and uses of distributed ledger technology within the banking sphere (PriceWaterhouseCoopers, 2018: 11). Francois Groepe, Deputy Governor of the South African Reserve Bank states that the roles of banking institutions, central banks and financial market infrastructures are being rapidly disrupted within both domestic and international arenas (PriceWaterhouseCoopers, 2018: 11). As a result of this growing shift, Groepe states that the South African Reserve Bank is committed to the principle of researching and contributing to harnessing innovation and technology in a way whereby the financial system experiences

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

enhanced efficiency, while also remaining focused on protecting and promoting the safety and security of the South African financial system (PriceWaterhouseCoopers, 2018: 5).

The "Project Khokha" case study presents important findings that contribute to a better understanding when seeking to examine ways in which domestic government agencies have adopted innovative technological solutions to enhance their effectiveness. This project was launched in early 2018, with the project running for a total of fourteen weeks, from January to April 2018 (PriceWaterhouseCoopers, 2018: 9). The central focus of the project was based on experimenting with the use of distributed ledger technology (DLT) as a platform for managing payments between settlement banks (PriceWaterhouseCoopers, 2018: 9). The 2018 PriceWaterhouseCoopers report claims that DLT remains one of the most rapidly developing technologies, with the use thereof increasing significantly (PriceWaterhouseCoopers, 2018: 11). An analysis of the trends of DLT, as well an examination of the 2008 seminal paper authored by Satoshi Nakamoto where bitcoin technology is outlined formed the foundation to notable research that has been undertaken on "Project Khokha" (PriceWaterhouseCoopers, 2018: 11). PWC state that an imperative phase associated with the exploring and implementation of new technology is based on the idea that the process moves through three stages as the technology is accepted by its users (PriceWaterhouseCoopers, 2018: 12). The first stage entails a focus on the object or system the technology is replacing. Followed by this, a better understanding of the technology is established which results in the product or system becoming cheaper and more abundant (PriceWaterhouseCoopers, 2018: 12). These factors result in the development of necessary supporting structures, which contributes to the final stage whereby the technology becomes universal, with an almost invisible role played in everyday life (PriceWaterhouseCoopers, 2018: 12). PWC argue that these stages of technological adoption can be seen when examining the use of DLT or blockchain technology, with the early applications of the technology already replacing existing technology with the intention of enabling experiments using the technology (PriceWaterhouseCoopers, 2018: 12).

Numerous cases of financial services experimenting with DLT to overcome challenges that existing technologies cannot overcome are evident, which PWC claim contributes to the enablement of new business models and a broader range of user capabilities (PriceWaterhouseCoopers, 2018: 12). PWC argue that although many of these experiments

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

have been undertaken by commercial banks across the globe, central banks have become increasingly cognisant of the opportunities presented by fintech (PriceWaterhouseCoopers, 2018: 14). As such, efforts to develop structures to experiment with the use of DLT have been undertaken by specialists within central banks (PriceWaterhouseCoopers, 2018: 14). Numerous cases of the establishment of 'sandboxes' can be studied, where businesses have a regulatory 'safe space' to experiment with new technologies such as DLT (PriceWaterhouseCoopers, 2018: 14). Four key case studies are examined by PWC wherein central banks have experimented with the use of blockchain technology. Firstly, in August 2017 the Central Bank of Brazil undertook research into identifying and building a working prototype to develop a 'realistic' functionality for a system processing 'real-time' gross settlement, and well as the development of a proof of concept on DLT (PriceWaterhouseCoopers, 2018: 15). In September 2017 Canada launched "Project Jasper", which focused on experimenting to create a wholesale interbank payments proof of concept using blockchain technology (PriceWaterhouseCoopers, 2018: 15). "Project Jasper" also focused on exploring the scalability and flexibility of the proof of concept that was developed (PriceWaterhouseCoopers, 2018: 15). "Project Stella" was launched as a joint venture between the European Central Bank and the Bank of Japan in September 2017 (PriceWaterhouseCoopers, 2018: 15). Similar to the project undertaken by the Central Bank of Brazil, "Project Stella" focused on building a 'real-time' gross settlement proof of concept to determine and analyse the performance of the system (PriceWaterhouseCoopers, 2018: 15). Similarities between the projects launched by the Central Bank of Brazil and "Project Stella" can be drawn to "Project Ubin" launched by the Monetary Authority of Singapore, wherein a consortium was developed to research the multi-year project with several phases all aimed at exploring the benefits of DLT within the banking sector (PriceWaterhouseCoopers, 2018: 15). "Project Ubin" and "Project Khokha" share notable similarities in that both projects are connected to ConsenSys, a technical studio focused on the development of decentralised applications and end-user tools for blockchain platforms (PriceWaterhouseCoopers, 2018: 25). According to PWC, ConsenSys played a pivotal role in the architecture and technology for "Project Ubin" and was later brought in to assist in the development of solutions to assist participants that experienced technical challenges during "Project Khokha" (PriceWaterhouseCoopers, 2018: 25).

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

The above-mentioned case studies demonstrate the importance and value of innovative government-led collaborations focused on using technological advancements to improve systems and essentially enhance service delivery. The four case studies highlight key considerations that need to be accounted for when implementing a technological platform such as blockchain on a broader scale. These cases also provide valuable insight to consider when examining the South African "Project Khokha" as a case study. According to PWC, South Africa is known to have an innovative and sophisticated financial services industry, with a 37th out of 137 position for countries ranked by the World Economic Forum's Global Competitiveness Report (PriceWaterhouseCoopers, 2018: 15). PWC also state that as a result of the robustness of its regulatory framework, South Africa managed to deal with the 2008 financial crisis well (PriceWaterhouseCoopers, 2018: 15).

2016 marked the first collaborations around blockchain by South African commercial banks and other financial institutions (PriceWaterhouseCoopers, 2018: 16). As a result of this collaboration the South African Financial Blockchain Consortium (SAFBC) was established. The SAFBC was established for the purpose of analysing and demonstrating the transformative potential offered by blockchain technology for the South African financial sector (PriceWaterhouseCoopers, 2018: 16). 2017 marked the formal establishment of the Fintech unit within the South African Reserve Bank, which is geared towards better understanding the ramifications of fintech for the Reserve Bank.

The core mandate of the South African Reserve Bank as the central bank of South Africa is based on achieving and maintaining price stability for the purposes of ensuring balanced and sustainable economic growth for the country (PriceWaterhouseCoopers, 2018: 17). As a result of the role played by the Reserve Bank, the potential and risks of innovative technologies need to be recognised and examined to ensure that robust, appropriate policies and frameworks are established to respond to any changes that may arise as a result of fintech (PriceWaterhouseCoopers, 2018: 17). The establishment of the fintech unit sought to ensure that the Reserve Bank has a dedicated department focused and committed to exploring these opportunities and risks. In 2018 the unit announced the three key initiatives that would guide their exploration. Firstly, the approach to policy and the regulation of crypto currencies would be examined, followed by an in-depth investigation into innovative structures such as hubs, regulatory 'sandboxes' and accelerators (PriceWaterhouseCoopers, 2018: 17). Finally,

44

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

"Project Khokha" would be launched to experiment and test with DLT for interbank clearing and settlement (PriceWaterhouseCoopers, 2018: 17).

"Project Khokha" is defined as a collaborative experiment using DLT to assess the case and contribute to ongoing global research and debates on the technology. In order to ensure successful collaboration, a technical partner ConsenSys was engaged, as well as South African banks including ABSA, Capitec, Investec, Standard Bank, Discovery Bank, FirstRand and Nedbank (PriceWaterhouseCoopers, 2018: 17). Although the project was focused on creating a distributed ledger between the involved banks, the project was also focused on building on previous initiatives developed by global actors working on similar research projects (PriceWaterhouseCoopers, 2018: 22). As such, the ability to expand the skills base within the South African banking industry existed, while also contributing to and complementing work that has already been undertaken within this area (PriceWaterhouseCoopers, 2018: 22).

The central focus of the project was based on creating a functioning distributed ledger between participating banks to facilitate a payment platform whereby participating banks are able to pledge, redeem and track balances of a tokenised rand on the ledger (PriceWaterhouseCoopers, 2018: 22). Through developing this platform, the Fintech unit was able to observe and examine the performance, scalability, privacy and resilience of a DLT solution (PriceWaterhouseCoopers, 2018: 22). This experiment was conducted in an as near-to-real situation in that each of the participating banks was responsible for its own nodes on the system (PriceWaterhouseCoopers, 2018: 22). Further to simulating an as realistic experiment as possible, the project also focused on important practical elements associated with the use of a DLT system. As such, significant investments were made to ensure participants received adequate training to ensure a suitable level of acquaintance with the technology before the experiment was launched (PriceWaterhouseCoopers, 2018: 22).

An important element to examine in the case of "Project Khokha" remains the participants and their roles within the experiment. The South African Reserve Bank drew participants for the project from the financial industry to ensure that the impact of the experiment was best positioned. Although the South African Reserve Bank remained the project owner, primarily responsible for ensuring that project strategies were well-crafted, significant input from the participating banks (ABSA, Standard Bank, Capitec, Nedbank, Investec, FirstRand and

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

Discovery) was seen, with each bank remaining responsible for implementing and running their own nodes (PriceWaterhouseCoopers, 2018: 25).

"Project Khokha" was established to develop a proof of concept that was built on a private blockchain that would facilitate the tokenisation of the South African Rand, with a focus on demonstrating that this tokenised rand can be transferred between commercial banks on a blockchain (PriceWaterhouseCoopers, 2018: 27). The two core goals of the project were based on firstly creating the DLT between the participating banks that would be backed by central-bank deposits, and secondly determining how a DLT system compares to the capabilities of current technological systems used by the South African Reserve Bank and the participating commercial banks (PriceWaterhouseCoopers, 2018: 27).

The model used for the implementation of "Project Khokha" can be used and replicated as a successful model for cases wherein innovative technologies or systems are being explored. Phase one focused largely on education. As a central goal of the project was based on the idea of ensuring participants were able to gain hands-on experience, initial project phases focused on providing participants with adequate training (PriceWaterhouseCoopers, 2018: 33). This contributed to the success of the experiment as it ensured that all participants gained a base level of knowledge on blockchain technology, which ensured the successful use of the system once live. Phase two of the project was geared towards developing an ecosystem within the South African financial industry whereby each participating bank was responsible for establishing their own node (PriceWaterhouseCoopers, 2018: 33). ABSA and Standard Bank were the first two participating banks to develop and connect their nodes to the network, with the other participating banks following in staggered stages, contributing to increased rates of peer-to-peer learning (PriceWaterhouseCoopers, 2018: 33). Phases three and four focused largely on developing the platform executions and conducting performance tests to establish whether the system could deal with stress-test scenarios (PriceWaterhouseCoopers, 2018: 33).

According to PWC, "Project Khokha" generated notable successes that contribute significantly to research on the use of blockchain-based systems and solutions within the South African context. The project focused on utilising lessons learnt from previous South African financial industry initiatives as well as global research projects seeking to understand the future role of DLT and blockchain for the financial sector. A key success factor of the project stems from the

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

successful rates of collaboration between participating banks and the South African Reserve Bank (PriceWaterhouseCoopers, 2018: 53). This collaboration indicates positive outcomes for similar future initiatives, where effective collaboration is likely to become increasingly important when considering the growing role of movements such as open banking (PriceWaterhouseCoopers, 2018: 53).

In analysing the ways in which "Project Khokha" can be examined as a case study to demonstrate how technological change can impact the effectiveness and benign political character of domestic government agencies, valuable insights as highlighted in the case study require consideration. The analysis of this case study demonstrates how the South African Reserve Bank set out to conduct research and overcome the challenges associated with the use of blockchain technology as discussed in chapter two. The four key issues, namely infrastructural infancy, organisational capacity, data privacy concerns and governance were all considered and addressed from the conceptualisation to the implementation of this project. The developmental phases of "Project Khokha" emphasized the importance of collaboration within the South African banking sector, thus leading to the involvement of numerous banks within the country. An additional factor that received significant focus and resource allocation was the importance of equipping all project participants with a base-knowledge of blockchain technology and its uses. This focus dealt with the challenges of both infrastructural infancy and organisational capacity, as the developmental phases saw the provision of all required equipment and skills to ensure a successful outcome. As the project was run on a permissioned blockchain system, only participating banks were able to access and work on the blockchain system. Furthermore, participating banks were also only able to access and manage their own nodes thereby removing any concerns on data privacy. Finally, as the project was spearheaded by the South African Reserve Bank, defined policies and procedures were in place, with the SARB being the main participant on the node controlling which participants were granted permission and access to work on a node. These controls ensured that suitable governance structures were in place to eliminate any governance related concerns connected to blockchain-based systems.

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

3.2 How international organisations have experimented with the use of innovative technologies:

When examining the ways in which domestic government agencies across the globe have explored the use of innovative technologies to enhance their service delivery, strong lessons can be observed that are valuable when examining this theory in relation to other actors such as international organisations. As per Bwalya and Healy's arguments outlining the increasing role technology-based solutions are playing in developing countries within the health and educational spheres, similar scenarios within the developmental and international organisational space can be studied. Gulati argues that a significant increase in the idea of learning 'using' technology or digital-based solutions can be better understood as a global phenomenon (Gulati, 2008: 1). Her arguments relating to the use of technology for e-Learning echo those presented by Bwalya and Healy in their study of the challenges and benefits offered when technological solutions are facilitated by and implemented through governmental actors. Similarly, Gulati explores this notion in relation to the use of technology by international actors, with a particular focus on educational endeavours in developing nations. Gulati claims that notable cases of non-governmental actors or international agencies advocating for the use of technology to ensure operational costs are reduced, while being able to reach thousands of beneficiaries who lack access to information and learning materials exist (Gulati, 2008: 1). Through Gulati's use of e-Learning as a case study valuable lessons are learnt that contribute to the broader theme of better understanding the role technology can play in enhancing the operations of domestic government agencies and international organisations.

3.2.1 Case Study: The World Food Programme's (WFP) "Building Blocks" initiative:

The use of innovative solutions targeted to improve humanitarian aid distribution has been and continues to be explored by international organisations such as the United Nations and The World Food Programme. As discussed in the literature above, the relationship between technology and politics is one that has a long-standing track record where the two are connected, with technology providing solutions that contribute to enhanced operations of political institutions. De Vrji states that the potential of innovative solutions such as blockchain technology to play a role in improving the humanitarian aid sector is still under discovery (de

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

Vrji, 2018: 21). She further states that as blockchain technology remains a new and innovative technology, many of the project or initiatives undertaken by international organisations such as the World Food Programme are at the pilot stage, with findings of these pilots contributing to the broader study on the role of technology in these organisations (de Vrji, 2018: 21).

Pisa and Juden argue that supporters of blockchain technology claim that the technology provides important opportunities for international organisations to reduce their current reliance on intermediaries such as financial actors, while also increasing opportunities to collaborate within the developmental space (Pisa & Juden, 2017: 1). International organisations such as the UN and WFP have invested significantly into researching and better understanding innovative solutions that could be valuable when seeking to enhance operations to improve efficiency and turn improve the overall impact achieved for stakeholders.

One such initiative that has focused on understanding and harnessing innovation to improve beneficiary experiences is the WFP's "Building Blocks" project (Zambrano, Young & Verhuist, 2018: 2). According to the UN, blockchain-based solutions are likely to be the future of all WFP cash disbursements, with growing levels of trust in the technology becoming evident when assessing the numerous projects currently in pilot stages across the globe (de Vrji, 2018: 21). Given the role that an organisation such as the UN plays in the architecture of international aid, the bold stance taken on researching, piloting and implementing projects that are based on blockchain builds a strong case for analysing the technology and the future roles it could play (de Vrji, 2018: 21).

The World Food Programme has been referred to as one of the "most successful and politically legitimate agencies in the United Nations" (de Vrji, 2018: 21). Given the nature of the work undertaken by the WFP, a reliance and expectation on operations being fast and agile to respond effectively to humanitarian crises is assumed (de Vrji, 2018: 21). Currently the WFP supports over 14 million refugees by means of financial assistance which has until recently taken place in the form of the distribution of cash vouchers or prepaid debit cards (Zambrano, Young & Verhuist, 2018: 2). Traditionally, the WFP's humanitarian assistance took form through the distribution of items such as food, clothing and sanitary products. However, high costs and significant logistical challenges contributed to the shift in providing financial assistance whereby aid beneficiaries are rather able to purchase items needed directly from

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

approved local partners instead of receiving these items directly from the WFP (Zambrano, Young & Verhuist, 2018: 2). Through shifting towards cash-based transactions, the WFP has been able to leverage and collaborate further with local actors and has produced significant improvements in health, nutrition and poverty-alleviation of beneficiaries (Zambrano, Young & Verhuist, 2018: 2). These shifts have taken place under the WFP's "Building Blocks" initiative, which was developed through harnessing the opportunities presented by blockchain technology to service over one hundred thousand refugees living in the Azraq refugee camp in Jordan (Zambrano, Young & Verhuist, 2018: 3).

Under the programme, cash-based transfers are received by refugees and are used to purchase required basic goods from approved local partners (Zambrano, Young & Verhuist, 2018: 3). A central goal of the initiative is based on enhancing the overall efficiency of the cash-based scheme which includes registering refugees, as well as streamlining financial processes (Zambrano, Young & Verhuist, 2018: 3). This goal is based is on an evaluation of the current way in which the WFP's system operates. As the WFP plays an instrumental role in facilitating and coordinating the movement of aid from donors to beneficiaries, many intermediaries such as regional and local banks are involved at various levels of the designed interventions (de Vrji, 2018: 21). Shifts in operations that have seen the WFP moving from providing beneficiaries with in-kind donations to cash transfers have generated benefits at two separate levels. Beneficiaries are provided with cash that they are able to spend at local food markets, which means that they are able to choose exactly what they need, while also contributing to the local economy instead of receiving food and donations from donor countries (de Vrji, 2018: 21). As such, the goal of the "Building Blocks" initiative as depicted below is constructed around the idea of reducing hurdles currently affecting cash transfers while also making transfers more transparent and secure (de Vrji, 2018: 22).

The "Building Blocks' initiative requires the use of blockchains, digital databases and biometrics as the participating beneficiaries are able to purchase goods from approved vendors through beneficiaries scanning their irises upon purchasing goods (Zambrano, Young & Verhuist, 2018: 3). Through using a blockchain-based network, the "Building Blocks" initiative is focused on achieving a reduction in transaction costs, enhanced control of financial risks and setting up better response times in emergency cases (de Vrji, 2018: 21). An additional benefit highlighted in the "Building Blocks" initiative is based on that fact that through the use

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

of blockchain-based solutions, vulnerable people such as refugees are only required to disclose personal details to the WFP to receive goods instead of to other entities such as banks or intermediaries as previously required (Zwitter & Herman, 2018: 28). This project is largely based on the learnings and findings from a similar project run in Pakistan in 2017 which was marked as the WFP's first experiment with blockchain technology (de Vrji, 2018: 22).

The scanning of the iris in the "Building Blocks" initiative ensures that beneficiaries do not have to carry debit cards, vouchers or identification documents around when purchasing items, but rather beneficiary data and all transactions are recorded on a blockchain in live time (Zambrano, Young & Verhuist, 2018: 3). This system requires refugees to register once off, to ensure their information is loaded to the database to be accessed at a later stage. Once beneficiaries have scanned their irises, their identity is verified against the database and authenticated on a blockchain, which is linked to a virtual wallet stored on the network containing information pertaining to the credit and entitlements of the individual whose iris has been scanned (Zambrano, Young & Verhuist, 2018: 3). This process means that refugees in Jordan are able to shop and pay at partnering stores located within the refugee camps, and the user experience is made more efficient as the use of a blockchain 'wallet' eliminates the need for any paperwork at the time of purchasing (de Vrji, 2018: 23). Beneficiaries transactions are recorded directly onto a centralised blockchain, which results in a record of beneficiary transactions being created, while partnering vendors are at the same time able to use a blockchain wallet to track transactions and receive payments directly from the WFP without the use of a banking intermediary (Zambrano, Young & Verhuist, 2018: 3).

While the initiative assists in improving the beneficiary experience in that refugees are not required to carry or produce any documentation when looking to purchase needed goods, the project is centrally designed to streamline and enhance the financial allocation and expenditure associated with providing refugees with essential items (Zambrano, Young & Verhuist, 2018: 4). This approach significantly reduces transaction fees associated with local financial intermediaries given the ability to transfer and distribute money to refugee's accounts without the use and costs of local bank accounts that were traditionally required (Zambrano, Young & Verhuist, 2018: 4). The initiative is structured in a way whereby refugees are only able to access allocated funds by means of biometric verification, with the multiple verification steps forming a central characteristic of the system to ensure effective and transparent transactions

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

(Zambrano, Young & Verhuist, 2018: 4).

According to a pilot study conducted in Jordan, the WFP saw a reduction in 98% of transaction fees traditionally associated with the distribution of financial aid to refugees, with monthly estimated savings of $150 000 recorded (Zambrano, Young & Verhuist, 2018: 4). Once the pilot study had been completed, the WFP determined that financial transactions had been significantly reduced from 10 000 payments done upfront to banks in a month, to 200 monthly settlement transactions to approved local partners and retailers (Zambrano, Young & Verhuist, 2018: 4). The pilot demonstrated the ability to successfully develop and implement a programme using innovative technologies such as blockchain and presented significant potential for scaling. Reviews on completion of the pilot study highlighted that blockchain demonstrates potential for creating and storing digital identities for individuals such as refugees which could be used across platforms extending beyond only the one used for cash-based transfers (Zambrano, Young & Verhuist, 2018: 5). In addition to the blockchain-based solution reducing transactional paperwork and costs, the technology also contributed to the improved reconciliation of purchases that had taken place within a period (de Vrji, 2018: 23). The blockchain used to run the "Building Blocks" initiative is based on a private permissioned blockchain which means that the WFP has control over which participants have access to the network (de Vrji, 2018: 23). Through the use of a permissioned blockchain, the initiative has seen significant improvements in the speed in which transactions can be processed, while also reducing the costs traditionally associated with these transfers (de Vrji, 2018: 23).

Although the pilot study demonstrated that international organisations such as the WFP can improve the effectiveness of the organisation through utilising technological solutions such as blockchain to enhance operations, risks and concerns deriving from the study were noted and require consideration when looking to examine whether these technologies can be utilised and if they should be scaled. The central concern arising from the study was based on the fact that as blockchain performed it's intended function to reduce transaction costs and facilitate a system of authentication and verification, this function was moved from intermediaries such as banks that had previously performed these functions to the blockchain. As a result, the need for these actors was significantly reduced, resulting in major costs savings as discussed above for the WFP, while also posing the risk to the local financial sector that stands to lose valuable and reliable clients such as the WFP (Zambrano, Young & Verhuist, 2018: 5). These concerns

52

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

were taken into account by the WFP following the pilot study, who have stated that they are working closely with central banks within local areas that they work in to ensure that unintended negative impacts on jobs and economic growth are avoided with the introduction of new solutions such as blockchain (Zambrano, Young & Verhuist, 2018: 5).

An additional concern that has been raised by researchers interested in the "Building Blocks" pilot is based on the criticism that the scope and impact of the pilot was narrow and that given the lack of numerous studies and experiments using blockchain technology the results do not provide an accurate and full depiction on it's true role going forward (de Vrji, 2018: 24). Furthermore, critics of the pilot highlight their concerns relating to the use of a new and innovative platform such as blockchain for experiments with people that are in an already vulnerable position (de Vrji, 2018: 24). These opponents argue that the use of blockchain technology during humanitarian crises poses the risk of storing data of vulnerable people on networks and technologies that have not been extensively tested and studied, noting concerns if this data were to be accessed by those with wrong intentions devasting consequences for beneficiaries could be experienced (de Vrji, 2018: 24).

De Vrji states that the WFP has acknowledged the concerns raised by opponents of blockchain-based solutions and argues that while being aware of the concerns, the WFP is undertaking extensive research efforts to contribute to broader literature and opinions on blockchain-based solutions to ensure that they are able to fulfil their core mandate associated with blockchain which is based on providing refugees and vulnerable individuals with legitimate forms of identification (de Vrji, 2018: 24). The WFP states that the blockchain-based solutions currently being experimented by them are able to fulfil this mandate, which in turns allows vulnerable individuals with access to social services such as healthcare, education or finance which they have previously been unable to access (de Vrji, 2018: 24). The creation of a digital wallet and linked identity on a blockchain provides the growing numbers of people that are affected by or fleeing from disasters with digital services that can enhance the effectiveness of humanitarian aid (de Vrji, 2018: 24).

The case of the "Building Blocks" project proves valuable when examining the ways in which technological advancements and politics are closely linked, as well as how the studied advancements could impact the effectiveness of international organisations such as the United Nations. As argued by Ganne, changes in society are largely driven by technological

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

innovations and advancements which in turn affect the way society lives and does business (Ganne, 2018: 1). Ganne's arguments are based on examining the relationship between the progression of the world economy and technological advancements that existed at the same time (such as with the invention of the steam engine and the role this played in mechanising production on a large scale). A central tenant of the argument presented by Ganne is based on the idea that society and businesses evolve and appear differently based on the what technological solutions are present within the period they are functioning within. As such, this argument can be applied to the case of the World Food Programme, where initatives such as the "Building Blocks" project demonstrate that the project was developed within the wider context of an increased interest and research into blockchain technology.

3.2.2 Case Study: UNICEF's Venture Fund

Although the connection between technological advancements and politics has been discussed in-depth above, it remains imperative to explore the ways in which this connection can be applied. De Vrji explores the potential ways in which technologies such as blockchain can be harnessed by international humanitarian organisations to improve their effectiveness in delivering aid (de Vrji, 2018: 17). She claims that actors across various industries are invested in researching the ways in which innovative solutions can be used to disrupt current workings of organisations that are based on outdated models and are associated with high transaction costs as well as the loss of resources as a result of issues such as corruption and fraud, and the inefficiencies associated with time delays in areas of crises (de Vrji, 2018: 17). Fowler argues that for large organisations such as the United Nations, experimenting with new technologies is not always easy, however it provides organisations with the ability to accelerate and achieve change when research into these efforts is undertaken (Fowler, 2019: 1). She further argues that innovative technologies such as blockchain are currently being explored by several United Nations agencies, particularly in the form of blockchain-based applications (Fowler, 2019: 1). De Vrji echoes this notion when discussing shifts in the ways in which organisations such as The United Nations currently disburse aid and argues that in the past in-kind donations have been the focus area for large organisations providing aid (de Vrji, 2018: 17). However, as a result of organisations striving to shift their operating style to providing more cash transfers than in-kind donations, blockchain-based solutions offer a platform to enhance the

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

disbursement of cash transfers which will contribute to organisations seeking to provide more direct aid effectively (de Vrji, 2018: 17).

Thomason states that as a result of the notable changes occurring across the globe, significant untapped opportunity exists whereby innovative technologies can be leveraged to contribute to positive transformations (Thomason, 2017: 3). She further argues that blockchain technology can be considered a key innovative technology that will contribute to the shaping of society over the next decade, with the World Economic Forum referring to the technology as a "mega-trend" that could store 10% of the global GDP by 2027 (Thomason, 2017: 3). Similarly, in a 2017 white paper titled *Unpacking the disruptive potential of blockchain technology for human development,* Zambrano argues that technologies contribute significantly to the propulsion of global innovation (Zambrano, 2017: 5). He explores the relevance and use of new technologies to address socio-economic issues and to achieve internationally committed targets and goals (Zambrano, 2017: 5). Through focusing on the use of blockchain technology to achieve human development goals, Zambrano's claims are centred on the key argument that blockchain can be applied beyond for the sole use of cryptocurrency to ensure better delivery of key services by organisations globally.

In examining the role that technological innovation could play in meeting global objectives and goals such as the Sustainable Development Goals, de Vrji argues that the ultimate focus and aim for both policymakers and aid workers is based on tracking every dollar from the donor to the intended beneficiary to ensure donations end up in the right hands for the intended purpose (de Vrji, 2018: 17). As such she states that innovative solutions such as blockchain technology could fill the current gap in humanitarian aid distribution through providing a platform that created increased transparency and facilitates transactions that cannot be tampered with or intercepted by actors such as corrupt governments (de Vrji, 2018: 17).

The UNICEF Office of Innovation have and continue to play a leading role in exploring the use of technologies such as blockchain to better understand the ways in which these technologies can be leveraged to impact the lives of children across the world. Fabian argues that UNICEF have developed a 70-year track record for researching and investing in new solutions and technologies that can offer benefits for children across the globe (Fabian, 2018: 30). In order to ensure the organisation is able to effectively function in a world where rapid

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

technological, social and political changes take place, the constant need to reinvent and rethink the use of specific tools is imperative (Fabian, 2018: 31). As such, the organisation has established a Venture Fund to research and invest in emergent technologies that demonstrate the potential to create positive impacts for one billion children (Fabian, 2018: 31). The Venture Fund functions in a way whereby technological trends are tracked and examined to assess the ways in which problems that UNICEF seeks to tackle can be overcome should these technologies be leveraged (Fabian, 2018: 31). Once emergent technologies that demonstrate potential to the Venture Fund have been selected, a process for the exploration of this technology is undertaken and consists of three central steps. Firstly, researchers seek to develop an in-depth understanding on the technology, which informs the development of platforms (such as apps) that can be tested to inform frameworks at a later stage of the process (Fabian, 2018: 32). Secondly, researchers focus on developing partnerships through platforms such as conferences, academic collaborations and workshops (Fabian, 2018: 32). Finally, a call for proposals is developed and is used to identify potential companies that can be invested in. This ensures that the Venture Fund is able to conduct credible assessments and due diligence on the companies that have been invested in to further contribute to the overall understanding of the use of emerging technologies through testing multiple hypotheses simultaneously with a significantly reduced risk (Fabian, 2018: 32).

In looking to understand how technological advancements such as blockchain can impact the effectiveness of an organisation such as UNICEF, it remains important to acknowledge the use of blockchain beyond only within the financial sector. UNICEF have stated that three key benefits to the use of blockchain technology within their context includes enhancing the ways in which donors are able to provide funding, achieving improved transparency for their internal processes and the improving the ability to reduce frictions in transactions (UNICEF, 2018). Significant research has been undertaken by the Office for Innovation to analyse the technical, social, legal and ethical challenges associated with the use of a technology such as blockchain. UNICEF have adopted an approach whereby constant research into blockchain technology is undertaken to ensure that both internal and external processes (such as facilitating faster and transparent payments to local partners is achieved) are made more efficient.

When examining the use of blockchain technology and its role in improving the effectiveness

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

of an organisation such as UNICEF, an analysis on a case study such as the Venture Fund developed by UNICEF can be undertaken at two levels. Firstly, the Venture Funds seeks to investigate and finance blockchain-based solutions by local partners to overcome barriers experienced in partnering countries. As such, an analysis on projects being undertaken in these countries (such as the blockchain-based system being run in South Africa monitoring the attendance of children in ECD centres, or the blockchain-based system run in Uganda facilitating the registration of new births) demonstrates that technological solutions have in fact improved the overall effectiveness of the work done by UNICEF within the partnering country. At a second level, an analysis into the internal use of blockchain-based solutions by UNICEF as an international organisation demonstrates that the technology has provided UNICEF with a platform to achieve significant improvements in internal transparency, while also using blockchain to facilitate faster and cheaper international payments to partners. Through analysing both levels, it becomes evident that through exploring and utilising a technological solution such as a blockchain-based platform, UNICEF as an international organisation has benefitted from the introduction and use of blockchain to improve its overall effectiveness.

3.3 <u>Analysis</u>

Two key issues require consideration when analysing the case studies presented above. Firstly, an understanding on whether or not blockchain-based technology is in fact benign and effective, and secondly whether the domestic and international spheres differ in this regard is required. When assessing these considerations in relation to the four case studies included in this research, it becomes evident that although a blockchain-based solution may present challenges, the case studies do demonstrate that the technology can be viewed as benign and effective.

In looking to examine the ways in which domestic government agencies have experimented with the use of blockchain-based solutions, the e-Estonia case study and the South African Reserve Bank's "Project Khokha" were unpacked.

The use of the e-Estonia case demonstrated that significant opportunities are presented by innovative technologies for domestic government departments and highlighted notable improvements in service delivery and efficiency when harnessing the benefits of technological

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

advancements. The e-Estonia case study demonstrates that blockchain technology can be viewed as benign and effective in nature as the technology contributed to the successful overhaul of the domestic Estonian government system, whereby the issuing of identity documents, land titles, business registries and over 1000 government-related services were improved through the implementation of a blockchain-based service. The e-Estonia service, underwritten by blockchain technology saw a significant improvement in the delivery of domestic services through reduced processing times, reduced associated costs and the creation of a public, transparent audit log of all activity on the system.

The South African Reserve Bank's "Project Khokha" demonstrated the value domestic government actors can derive from harnessing innovative technological-based solutions to overcoming issues experienced in their functions. This case was included as a result of the valuable findings presented within the context of a developing country, with many key lessons learnt that added distinguished value to the overall research. The case also demonstrates that blockchain technology can be considered benign and effective as it highlights that innovative technologies such as blockchain can be harnessed to create domestic government-led projects that contribute to improved efficiency and service delivery. "Project Khokha" further highlights the opportunity for domestic collaboration between actors, through functions such as transparency, accurate audit logs and shared-valued.

In looking to examine the ways in which international organisations have experimented with the use of blockchain-based solutions, the World Food Programme's "Building Blocks" initiative and the UNICEF Venture Fund were examined.

The WFP's "Building Blocks" initiative was included in this research to demonstrate a successful project that has been conducted to tackle improving efficiency and transparency in Jordanian refugee camps. In the World Food Programme's (WFP) "Building Blocks" initiative, the benign and effective nature of blockchain technology is proven when acknowledging that a blockchain-based solution has resulted in significant reductions in aid distribution costs, streamlined distribution processes and improved collaboration between the World Food Programme and domestic actors. Furthermore, the technology has ensured the protection of beneficiary data, while also improving access to essential goods by beneficiaries.

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

The inclusion of UNICEF's Venture Fund as a case study in this research demonstrated the significant benefits both internally and externally for an international organisation seeking to conduct transparent and efficient work. The case of UNICEF's Venture Fund demonstrates that blockchain technology can be viewed as benign and effective as the nature of the Fund is based on undertaking in-depth research into technological trends, to determine whether any of these are applicable and valuable to international organisations. Considering that blockchain technology has been identified by the Fund as a technology that possesses the opportunity to shift the ways in which international organisations and donors are able to transact, enhance transparency and improve both internal and external operations demonstrates the benign and effective nature that the technology possesses.

In analysing the selected case studies included in the research, key findings with regards to the differences between the use of technology by domestic government agencies and international organisations are highlighted. These differences stem from the contexts wherein each case study is undertaken, where two (e-Estonia and "Project Khokha") are implemented within a domestic context and two within the international contexts ("Building Blocks" and UNICEF Venture Fund). Two key differences when examining the differences between the domestic and international contexts arise when analysing the included case studies. These differences include the allocation of resources and the levels of risk. The two key differences relating to the allocation of resources and levels of risk are evident across all four case studies.

The e-Estonia and "Project Khokha" cases highlight important findings with regards to the allocation of resources when implementing a blockchain-based solution within a domestic context. When analysing these projects, it is clear that notable resources were allocated to ensure the successful implementation thereof while also highlighting the important role collaboration across sectors and departments plays when developing innovative solutions. As the projects developed by domestic government agencies seek to improve operations within the country, linked to goals of the relevant governments, the allocation of resources such as funding, research and technical skills appears to be significantly more abundant than when examining the cases of projects being developed by organisations such as the United Nations. Domestic government agency projects such as e-Estonia and "Project Khokha" were able to secure require resources from various budgets and participating partners to ensure that adequate training and tools were accessed before implementation of the projects. When examining

59

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

projects such as "Building Blocks" or the UNICEF Venture Fund linked to international organisations, it remains imperative to acknowledge the mandate of the organisation or project as an understanding for the way in which recourses are allocated. As international organisations experience mounting pressure on budgets and the need to follow important internal procedures linked to finances, very few organisations are positioned to spend additional money on experimenting with projects linked to innovative technology.

The levels of risk associated with the development of projects differ when examining domestic or international contexts. When studying the four included case studies included in this research, these differing levels of risk are evident should a project not be successful.

In the case of e-Estonia, the unsuccessful management or outcome of the project would not offer life-threatening conditions to any of the involved parties. This may mean delays in the issuing of documents such as identity cards or passports, but the implications of the failure of such as project would be largely administrative. The "Project Khokha" project was developed to be facilitated within a 'think tank' setting, where all risks and failures could be contained to not affect the investments of any clients from the participating banks. Both of these domestic case studies demonstrate that experiments related to implementing technological and innovative solutions can be done in a low-risk manner to ensure minimal loss or damaging implications.

However, when examining the "Building Blocks" and UNICEF Venture Fund, both of these case studies demonstrate that the implementation of innovative solutions proves to be of higher risk within the international contexts than in the domestic. As both of the projects are implemented in the contexts whereby 'real-life' participants are involved, the risks are significantly higher and more damaging than when implementing a project in a 'think tank' setting. In a case such as the "Building Blocks" project, should there be a failure of the designed system or the removal of a local partner, the implications will result in the failure to obtain basic necessities by project beneficiaries. Thus, highlighting a key important difference when studying the use of technology by domestic government agencies and international organisations.

The above research highlights that discussions on innovative technologies such as blockchain-based solutions are currently largely based on small-scale pilot projects and experiments. As highlighted in the literature above, blockchain technology offers significant opportunities to

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

address challenges currently facing both domestic government agencies as well as international organisations. However, most of these solutions have been tested on a micro level, as demonstrated in the case of the "Building Blocks" initiative of the WFP focused on assisting refugees in a Jordanian camp, and limited research exists on the role of blockchain-based solutions at a macro level. The e-Estonia case study demonstrates the success of a blockchain-based project at a larger scale; however, this remains one a very few well-documented cases that can be studied. Although numerous international organisations such as the United Nations are involved in researching the ways in which innovative solutions can be used within the developmental arena, notable benefits could derive from research studies focusing on using blockchain technology on a bigger scale. As stated by Johnston in his research titled *Blockchain Technology: Implications for development,* research surrounding blockchain technology lacks concrete, qualitative evaluations of cases where blockchain has actually been implemented (Johnston, 2018: 5). This research highlights the key benefits offered by block-chain based solutions in enhancing transparency, improving data security and privacy and improving the efficiency of many functions performed by domestic government agencies and international organisations. However, without reliable sources of information and knowledge on the solutions offered by innovative technologies such as blockchain, improving current systems and introducing new projects remains a challenge.

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

Conclusion

When seeking to develop an understanding on how technological change impacts the effectiveness and benign political character of domestic government agencies and international organisations, it becomes evident that a significant degree of research and debate around the level of influence has been undertaken by scholars. The above research demonstrates how technological changes have impacted the effectiveness and benign political character of domestic government agencies and international organisations throughout history through the inclusion of understanding how technology has acted as a motor of change throughout the eras. The use of blockchain-based solutions in the included case studies have clearly demonstrated that this technology presents significant opportunities to improving the effectiveness of operations, while also highlighting the benign nature of the technology. The research demonstrates that innovative technologies offer solutions to issues such as transparency, communication, aid distribution, service delivery, trust of citizens and good governance practices. These are all issues that are pertinent to both domestic government actors and international organisations, that are becoming increasingly important to address.

In looking to fully understand the ways in which technological changes or advancements impact the effectiveness of domestic government agencies and international organisations, a foundational understanding on the relationship between technology and politics is essential. The above research clearly depicts that the relationship between technology and politics remains a deeply connected and complex one. Scholars that have sought to study the broader relationship have been able to identify certain eras based on the technological advancements that have taken place during numerous eras throughout history. Examples of this relationship can be best understood when looking at periods such as the Industrial Revolution, where technological advancements at the time played a significant role in shaping the class structure, labour force, ideas and institutions. The literature examined in the research above clearly demonstrates that technology has acted as a motor of history and has contributed to the ways in which society has structured itself across the globe. In order to demonstrate a thorough understanding into the ways in which technological advancements impact domestic government agencies and international organisations, two key schools of thought were examined.

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

Firstly, an investigation of the arguments presented by scholars that view technology as a tool of control was undertaken, followed by an investigation into arguments where scholars state that technology should be viewed as a benign instrumental force. Key arguments that were covered in the research when viewing technology as a tool of domination focus on concerns of scholars such as Marcuse, that claim that as a result of capitalist modes of production mental capacities are shifted to technological tools that requires unreserved compliance and coordination by the individual operating the machine, resulting in the subordination of their thoughts and creativity. Similar arguments presented by Cotgrove highlighted the concerns of researchers that claim that the automation of tasks results in the lack of critical thinking, spontaneity and creativity while also limiting human judgement and choice. In addition to these key concerns, the above research also explored technology as a tool of domination from a feminist approach, unpacking key arguments relating to the gendered nature of technological development and the impacts that has on society.

Secondly, an assessment into the ways in which technology can be viewed as a benign instrumental force unpacked arguments by scholars such as Ocay highlighting the benefits associated with technology and the automation of tasks through stating that technology can be considered one of the most imperative aspects required in the realisation of liberation for the working class within the industrial society as the development and introduction of new technologies has resulted in a significant reduction of working hours, and improved safety for workers through the automation of tasks. Through examining Werbach's arguments as well as the analysis on the case studies included, the research demonstrates that innovative technologies do impact the operations and effectiveness of domestic government agencies and international organisations. The four case studies demonstrate that significant improvements in the operations of actors utilising blockchain-based solutions have been achieved.

In order to demonstrate that technological advancements impact the effectiveness and benign political character of domestic government agencies and international organisations, the research set out to examine the ways in which innovative technologies can and have be leveraged enhance operations. A focus on the use of blockchain-based technologies was adopted, while noting that numerous additional examples of technologies that can be used to

VZYJAC008
Jacqualine van Zyl
MSocSci International Relations

enhance the operations of domestic government agencies and international organisations exist. An in-depth explanation on the key components, structure and operating nature of blockchain technology formed the theoretical understanding used to examine the ways in which the technology could be applied within the developmental arena. This explanation further highlighted the key opportunities presented by blockchain technology such as improved transparency as well as efficient and cost-effective international payments. Additionally, a discussion into the challenges associated with factors such as infrastructural infancy, a lack of organisational capacity, data privacy concerns and poor governance was undertaken to ensure a holistic assessment of the use of blockchain-based solutions was presented.

The above research demonstrates that innovative technologies such as blockchain can in fact be leveraged by both domestic government agencies and international organisations to better enhance their current operations and functions. Through an understanding of the technology and the use of case studies, the above research depicts the significant opportunities are presented by technologies such as blockchain if a knowledge of the applications, and a commitment by involved parties is achieved.

Through identifying future research recommendations, this research highlights that although notable challenges and limitations exist when looking to implement innovative technology such as a blockchain-based solution, many of these limitations can be overcome through an increased understanding of the technology and greater research contributions by scholars interested in exploring how innovative technologies can contribute to the improved operations of domestic government agencies and international organisations, which essentially leads to improved impact being achieved.

VZYJAC008
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