Edited by
Elena G. Popkova · Bruno S. Sergi · Lubinda Haabazoka
Julia V. Ragulina

Supporting Inclusive Growth and Sustainable Development in Africa - Volume II

Transforming Infrastructure Development

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Introduction

The global goals in the sphere of sustainable development, adopted in 2015 by the international community under the guidance of the UN, which are officially known as "Transforming Our World: the 2030 Agenda for Sustainable Development", are officially supported by all countries of the world, but are implemented with the help of different approaches. Sustainable development goals are oriented at solving the current problems of modern society, law, and economy. These problems are universal and peculiar for all countries of the world, but they are more vivid in developing countries, which bear the main costs of economic growth of the global economic system.

The global goals in the sphere of sustainable development include the goals of increasing the population's quality of life (liquidation of poverty and famine, development of healthcare, and increase of accessibility of clean water); the goals of provision of social justice (the guarantee of gender equality, the creation of an inclusive society, the creation of effective normative and legal institutes, and the development of justice); the goals of the development of human potential (wide accessibility to high-quality education, the provision of decent work and opportunities for career growth for economically active population); the goals of environment protection (the creation of circular cities and communities, responsible consumption and production, fighting

climate changes, and preservation of sea and land eco-systems); and the goals of industrialization, innovative development, and international integration for sustainable development.

These problems are very urgent in the countries of modern Africa, and their solutions are complicated due to the deficit of the infrastructural provision of sustainable development. Infrastructure is to become a guarantee of the future society-oriented and innovations-oriented economic growth of the countries of modern Africa. This book presents a view into the future of Africa. Scientific methodology is used for determining and substantiating the perspective directions of Africa's development during realization of the sustainable development goals. Infrastructural barriers on the path of practical realization of these barriers are determined, and complex recommendations for overcoming these barriers and achieving the sustainable development goals in modern Africa are offered.

The book consists of two parts. The first part is devoted to scientific substantiation of the current contribution of infrastructure into the provision of sustainable development in countries of Africa and the development of the concepts of maximization of this contribution based on improvement of the infrastructure, its modernization, expansion, and increase of accessibility. The second part considers the current infrastructural projects and determines their advantages for sustainable development of society and economy in Africa. The authors reflect and systematize the modern experience of infrastructure's development on various territories of the African region of the global economic system, due to which the book is oriented toward a the very wide target audience, which includes representatives of the international academic community, who study the process of realization of the global goals in sustainable development, sustainable development of emerging markets, economic growth, social progress, innovative development, and infrastructural provision of African countries.

The book's target audience also includes representatives of state regulation of the African economy, which are ready to start new infrastructural projects in their countries, representatives of African business, international investors who are interested in participation in

modern Africa's infrastructural projects, and people who are interested in the future perspectives of Africa's sustainable development. This book contains the leading studies that reflect the results of the latest scientific works on the topic of infrastructural provision of modern Africa's sustainable development.

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Part I

Transforming Infrastructure Development

1

Corporate Governance in South Africa: A Comparative Aspect

Alla S. Laletina and Igor A. Kosyakin

1 Introduction

The Republic of South Africa (South Africa) is of particular interest for research through the prism of the Russian experience. The country is a member of BRICS (Brazil, Russia, India, China and South Africa)—the organization of the largest developing countries, leaders in their regions. South Africa, like Russia, in the early 1990s underwent a transit of the political system and during the 1990s significantly transformed its economic model towards greater inclusivity. The creative evolution of the Anglo-Saxon legal system and corporate governance model among BRICS members can be very well traced on the example of South Africa.

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2 Materials

The theoretical framework to solve the above problems has been provided by works of foreign (J.J. du Plessis, R. Croucher, L. Miles, V. Padayachee, C.W.J.C. Swart, etc.) and Russian (A.G. Dementyeva, A.V. Gabov, V.K. Verbicky, etc.) scholars who have studied the theory of corporate governance in South Africa and Russia, its organizational foundations, corporate governance best practices and their significance in the legal system from the standpoint of both economic and legal sciences.

The empirical framework has been provided by the legal acts of South Africa, the Russian Federation, and some other countries, as well as sources of best practices of corporate governance (in particular—King's Kommitee's reports, Russian Corporate Governance Code, and listing rules of Johannesburg Stock Exchange).

3 Methodology

The research is based on the universal dialectical-materialistic method, general scientific methods (analysis, synthesis, induction, deduction, modeling) and particular scientific methods (comparative-legal, historical-legal, legal forecasting), the combined use of which allows a comprehensive study of the most important aspects of corporate governance in South Africa.

4 Results

4.1 Legal Regulation

The basic act regulating the activities of South African corporations is Companies Act 2008, which came into force on 1 May 2011 (such a long period of implementation, in the authors' opinion, has to do with the fate of close corporations, which numbered more than 2 million; since the entry into force of Companies Act 2008, they are not registered). In this, regulation is similar to the British one: all types of companies are

considered under one law. In addition, the literature notes that the concept of the law was significantly influenced by the New Zealand Companies Act 1993 (du Plessis 2009, 274–275).

However, according to the authors, Companies Act 2008 has an original character: its institutions are generated by the specific historical and economic situation in South Africa.

The act itself contains cases of by-law regulation, which is the responsibility of the member of the Cabinet of South Africa (Minister of Finance), in charge of company oversight. Regulations can be adopted on a variety of topics: from the issue of shares to the internal structure of a Corporation.

In comparison, in the Russian Federation, regulation of financial markets is the responsibility of the Bank of Russia (in particular, it approved additional requirements for the preparation, convening and holding of general meetings of shareholders and standards for the issue of securities). However, a number of acts were adopted by the Government of the Russian Federation, a body of general competence.

The reform of corporate law has been discussed for a long time: in 1993, the Corporate Governance Committee was formed, headed by a retired judge of the Supreme Court of South Africa, Mervyn E. King. Gradually, at the state level, the need to design a new system of corporate governance began to be realized (South African Company Law for the Twenty-first Century). The King Committee issued four reports: before the adoption of Companies Act 2008 in 1994 and 2002, and after in 2010 and 2016 (similar national corporate governance reports have begun to appear in different countries: the best known is the report of the British Committee on the financial aspects of corporate governance (Cadbury Committee) in 1992). In fact, the King Committee's reports are collectively the national code of corporate governance.

The introduction of best corporate governance practices is a mandatory requirement for issuers on the Johannesburg Stock Exchange. Generally, these rules relate to the internal structure of the Corporation (the presence of a corporate secretary, committees of the board, financial director) and the adoption of a number of acts (remuneration policy, report on the implementation of corporate governance practices). The listing rules also reflect the national specificities of South Africa: the need to maintain gender and racial diversity on the board of directors is emphasized.

One of the main markers of the evolution of the corporate governance architecture in South Africa, which should be mentioned now, is a departure from the principle of "acting in the interests of the company as a whole and maximizing profits"—still common in Russian legislation and dominating in Russian judicial practice—to the principle of taking into account the interest of all stakeholders—including at the level of legislation (Croucher, Miles 2010, 369–370).

Thus, there is a typical Anglo-Saxon regulatory system: a single law and complementary best practices of corporate governance (reports of the King Committee and listing rules). In Russia, on the other hand, the basics of the legal status of joint-stock companies alone are regulated by two (the Civil Code of the Russian Federation and the law on a specific type of legal entity), and of state corporations and some other non-profit organizations—by three legislative acts (the Civil Code of the Russian Federation, the law on non-profit organizations and the law on a specific type of legal entity). The separate law is devoted to insolvency. Russian corporate governance practices are more formalized (the Bank of Russia adopted the Corporate Governance Code of 2014, approved by the Government of the Russian Federation). However, only public companies, which are forced to comply with the listing rules, attach importance to these practices, comparable to legislative norms.

Judicial practice plays a crucial role in the South African legal system. For example, the law does not resolve the issue of representation on behalf of the company's directors. The rule that an individual director must be specially authorized for representation by the decision of the board or the Memorandum of Incorporation of the company, was arrived in: One Stop Financial Services (Pty) Ltd v Neffensaan Ontwikkelings (Pty) Ltd 2015 4 623 (WCC) (Swart, Lombard, 676).

For comparison, a number of provisions of the Russian legislation (introduction of the principle of business judgment rule) first developed within the framework of arbitration practice and were summarized by the Supreme Court. In fact, all decisions of the highest court—the Supreme Court (also the Supreme Arbitration Court in economic cases until 2014) are part of Russian legislation, since the lower courts follow the legal positions contained in them. Thus, in the Russian Federation, the country of the continental legal family, judicial practice plays a supporting role in relation to legislation, which is considered the pinnacle or endpoint of law of sorts.

4.2 The System of Legal Entities

South African companies are divided into commercial and non-commercial. Commercial companies can be classified as follows:

- Companies whose legal status is regulated by the General rules of Companies Act 2008 (private sector companies—private and public company) and companies whose status can be changed by the Executive authorities (public sector companies—state-owned company);
- Companies in which former and current directors are fully jointly and severally liable for all debts of the company during the performance of their duties (subspecies of private company—personal liability company) and companies in which liability is limited and should be due to unfair or unreasonable actions (all other companies);
- Companies that have the right to freely place their securities, including on the stock exchange (public company) and those whose Memorandum of incorporation limits the turnover of shares and prohibits their offer to other persons (private company) or such placement is not provided by law (state-owned company).

This system in its main division into public and private company is very similar to the Russian one, where after the reform of 2014, public and non-public corporations appeared in the Civil code of the Russian Federation.

Only stock corporations can be public in Russia. Shares of the latter are freely placed or traded (Article 66.3 of the Russian civil code). Non-public are both stock corporations and limited liability companies. In short, the difference between them is as follows: the authorized capital of a joint-stock company is divided into shares—securities. Shares in a limited liability company are not. The law on limited liability companies provides for a number of rules aimed at maintaining the personal composition of the business—the pre-emptive right to buy a share, the ability to establish a ban on the alienation of the share to third parties. The ban on the alienation of shares is void.

These forms of legal entities were replaced by open and closed joint-stock companies, divided on the basis of the composition of shareholders. Their re-registration as public or non-public companies is carried out when the company makes changes to its Charter for the first time.

4.3 The Internal Structure of the Company

The supreme governing body of the company in South Africa is the general meeting of shareholders. An annual meeting in public companies is to be held for the first time not later than 18 months after the date of company registration and subsequently every calendar year, but not later than 15 months from the date of the previous one (Companies Act 2008, 61 (7). At the annual general meeting, the report of the directors and the audit committee are presented, as well as the financial statements, the election of the directors (unless otherwise provided by Memorandum of Incorporation) is held, the auditor (to confirm the annual statements) and the audit committee are appointed.

As such, there is no limitation of competence: any issues that a shareholder deems necessary may be submitted to the general meeting of shareholders. In Russia, however, the general meeting is competent to resolve only those matters expressly mentioned by Federal Law №208-FZ of 26.12.1995 "On Stock Corporations" (hereinafter—208-FZ). Only in a non-public corporation, by a unanimous decision of all shareholders, may additional issues be referred to the competence of the general meeting (p. 3 and 4, art. 59 208-FZ).

The Anglo-Saxon model of corporate governance is a one-tier model. This means that in addition to the general meeting of shareholders, a single board is created in the company, which primarily performs managerial functions and resolves strategic issues.

Taking into account corporate governance practices—both in South Africa and in Russia, the board *(sovet directorov)* combines the functions of the classic Anglo-Saxon Board and the German supervisory Board *(Aufsichtsrat)*.

It is important to note that the Russian board of directors and executive bodies are different entities. The sole executive body (*generalniy director*—managing director) is mandatory and its competence includes all matters not related to the competence of other bodies. He cannot even be chairman of the board. The board of directors resolves issues within its competence by the law and the Charter. A collegial executive body *(pravlenie)* is created in only few Russian societies (unlike Germany, where *Vorstand* is mandatory).

In South Africa, in a private company—the board can be represented by one person. A public company board must consist of at least three persons.

South African law also provides for the following original features that can be established in the Memorandum of Incorporation:

- Direct appointment of a director or directors by a person named in the Memorandum of Incorporation;
- Status of director ex officio (for example, CFO of the parent company is the director of subsidiaries, which is specified in their charters). It seems that it is convenient for jurisdictions with an abundance of vertically integrated holding companies, including Russia, where there is no such rule;
- Appointment of alternate directors in the event of the inability of directors to perform their duties (Companies Act 2008, 66 (4)).

However, the use of such opportunities is limited: the general meeting of all types of companies (except state-owned companies) should directly elect at least 50% of directors and alternate directors.

Vacancies on the board can be filled either individually or together—if the next meeting of shareholders occurs or if the number of directors is less than the minimum established by the Memorandum of Incorporation (Companies Act 2008, 68). The powers of directors may be terminated separately—this requires a simple majority of votes at the general meeting (Companies Act 2008, 71).

In South Africa, a director may be a capable individual who meets the requirements of the Memorandum of Incorporation, and has not been disqualified. The board of directors of a Russian stock corporation is elected annually in full, unless otherwise provided by the Charter of a non-public corporation (Art. 66.3 of Civil Code, Art. 66 208-FZ). In a limited liability company, the procedure for electing the board of directors is provided for by the Charter (Art. 32 of Federal Law of 08.02.1998 №14-FZ "On Limited Liability Corporations").

Board committees in South Africa are not, unlike in Russia, advisory bodies. They may be delegated the competence of the board. Unless otherwise provided by the Charter, board committee membership may not be limited to directors.

For public and state-owned companies, it is mandatory to create an audit committee. For the members of the audit committee, the act establishes the requirement of independence (e.g., not to be a supplier or employee of the company) and separation from current management functions. The Minister may also prescribe the creation of a social and ethics committee, which keeps the social responsibility and business ethics.

In South African public and state-owned companies, a corporate secretary has to be appointed—at the incorporation or later, by the board of directors. The functions of the corporate secretary may be assigned to a legal entity. His responsibilities include informing the directors, including on issues of law, communication to the board on any violation, the keeping of protocols, the confirmation of his part of annual financial statements. Public and state-owned companies must also appoint an external auditor.

For comparison, Russian legislation pays little attention to the corporate secretary, whose status is almost entirely regulated by best corporate governance practices.

5 Some Comments and Conclusions

The national system of corporate governance is determined by a wide range of factors of economic and political nature.

As it seems to the authors, South Africa as a whole has passed a democratic transit. South Africa is a multinational country with strong political institutions (in particular, Congress of South African Trade Unions, part of the so-called "Alliance of three"—the government coalition—along with the African national Congress and the South African Communist Party).

Therefore, even at the level of the law, employee representation is allotted significant importance (unlike in Russia, rescue procedures involve not only a creditor committee but also an employees' committee (Companies Act 2008, 144, 148); trade unions have the right to file indirect claims (Companies Act 2008, 165 (2c)). Russian Federation of the Independent Trade Unions of Russia, successor of the Soviet

government-organized trade unions, on the other hand, does not articulate its interests on an equal basis with public authorities and employers.

Neither South Africa nor Russia is representative of the Anglo-Saxon (outsider) or continental (insider) model of corporate governance in its pure form. The history of South Africa and its economic ties led to the development of corporate governance on the Anglo-Saxon model. However, South Africa of the 1990s can be characterized as a country of "family capitalism", more typical of, for example, France. The evolution of the capital structure and the increase in the inclusiveness of the economy are very slow (Padayachee 2013, 260–262). In this regard, the strong position of the CEO is seen not so much as a consequence of the dispersion of capital, as it happens in the United States, but, on the contrary, as a consequence of the concentration of capital. Accordingly, South Africa can be attributed to the Anglo-Saxon model of corporate governance on the content of norms, but not on the structure of the economy.

The Russian legal system belongs to the Romano-German family. Russian corporate law has been influenced by both German traditions (supervisory functions of the board of directors, the possibility to provide for the executive board) and Anglo-American innovations (this mainly concerns the rules aimed at protecting the interests of minority shareholders—indirect claims, disclosure of information, etc.). Therefore, Russian researchers, speaking about legal models, distinguish Russian corporate governance with a special model ((Dementyeva 2017, 345–354) (Gabov 2017, 257–268) Frolova and others).

However, the capital structure in Russia is highly concentrated. According to a study by Deloitte in 2015, the average value of the largest stake in the sample of 120 public companies is 57.6%, the average free float—25%. The authors believe that this data, considering foreign policy trends, is at least relevant.

The attitude towards the public sector as the "driver of change" is characteristic of developing countries. According to a number of legislative provisions, the status of public and state-owned companies in South Africa is equivalent. The fourth report of the King Committee draws attention to the fact that corporate governance approaches "are equally applicable and equally valuable for all organizations: private and public, large and small, for-profit and not-for-profit" (King IV 2016).

In Russia at the end of the 2000s, there emerged a trend to improve corporate governance in the public sector: a number of regulations were issued, introducing the most applicable corporate governance practices, and the open selection of independent directors in companies with state participation began. As a result, according to the Russian expert community, corporate governance in the public sector has become only slightly inferior to the level of corporate governance in public companies. For example, the study of the Russian institute of directors notes that compared to the sample of companies with a listing, companies with state participation managed to minimize the lag in all respects, except for information disclosure. Positive dynamics has been observed since 2011 (The survey of corporate governance practice in Russia).

According to the authors, it is important not so much to choose as to consistently implement the best practices of corporate governance. Some Russian scholars note a downward trend associated with the sanctions pressure and the subsequent decline in the investment attractiveness of the country (Dementyeva, Milovidov 2018, 86–87) Inshakova, Goncharov).

In Russian the words "governance" and "management" are denoted by one word *"upravlenie"*. Therefore, for the Russian-speaking reader it is not difficult to understand that corporate governance is aimed not only to increase investment attractiveness, but also to establish the proper process of rational and effective functioning of management.

Corporate governance in South Africa is in a trend that can be described by the words "corporate governance is not an end in itself".

Let us consider this conclusion with the example of principle 7 of King IV Code on Corporate Governance, which states that "the governing body should comprise the most appropriate balance of knowledge, skills, experience, diversity and independence for it to discharge its governance role and responsibility objectively and effectively".

All companies do not need to pedantically meet the standard on independent directors and introduce corporate governance practices point by point. There must be a proper balance between executive directors (who represent the board's management point of view), non-executive directors and independent directors (King IV 2016).

The board in Anglo-Saxon countries, including South Africa, is at the center of the corporate governance system. Therefore, in contrast to

Russia, the understanding of the board as a means of control in the broadest sense (as governance and management) is directly reflected in the practices of corporate governance: there should be as many directors as are needed for the board and its committees to worked effectively (Verbicky). We need those corporate governance practices that reflect the scale, industry and ownership specifics of the business.

It seems to the authors that both basic models of corporate governance have common foundations of management order, less subject to national specifics and more—as shown by the example of South Africa and Russia—to economic conditions.

References

Burkaltseva, D. D., Borsch, L. M., Blazhevich, O. G., Frolova, E. E., & Labonin, I. V. (2017). Financial and Economic Security of Business as a Primary Element in the Economic System. *Espacios, 38*(33), 3.

Corporate Governance Structures of the Russian Public Corporations. Study of the Corporate Governance Center "Deloitte" in CIS. (2015). Retrieved from www2.deloitte.com/ru/ru/pages/risk/articles/2016/corporate-governance-structures-of-public-russian-companies.html.

Croucher, R., & Miles, L. (2010). Corporate Governance and Employees in South Africa. *Journal of Corporate Law Studies, 10*(2), 367–389.

Dementyeva, A. G. (2017). *Corporate Governance: Textbook*. Moscow: INFRA-M, 496 p.

Dementyeva, A. G., Milovidov, V. D. (Ed.) and Others. (2018). *Corporate Governance in Russia: Innovations and Trends*. Monography. Moscow: MGIMO-University.

Dolinskaya, V., Kalinina, A., Inshakova, A., & Goncharov, A. (2019). Corporate Conflicts in the System of Public Relations, Law, and Legislation of the Russian Federation. In E. G. Popkova (Ed.), *"Conflict-Free" Socio-Economic Systems* (pp. 75–88). Bingley: Emerald Publishing Limited.

Dudin, M. N., Vysotskaya, N. V., Frolova, E. E., Pukhart, A. A., & Galkina, M. V. (2017a). Improving Professional Competence of the Staff as a Strategic Factor for Sustainable Development of Companies. *Journal of Business and Retail Management Research, 12*(1), 133–142.

Dudin, M. N., Ivashchenko, N. P., Frolova, E. E., Selezneva, N. A., & Galkina, M. V. (2017b). Professional Competences of Personnel as a Factor of Forming Intellectual Capital of Business Entities. *International Journal of Economic Research, 14, 15*, 429–440.

Gabov, A. V. (Ed.) and Others. (2017). *Legal Entities in the Russian Civil Law. Vol. 2. Types of Legal Entities in Russian Legislation*. Monograph. Moscow: INFRA-M, 352 p.

King IV. Report on Corporate Governance for South Africa. (2016). The Institute of Directors in Southern Africa NPC. Retrieved from http://c.ymcdn.com/sites/iodsa.site-ym.com/resource/collection/684B68A7-B768-465C-8214-E3A007F15A5A/IoDSA_King_IV_Report_=_WebVersion.pdf.

Ownership of JSE-Listed Companies. Research Report for National Treasury. September 2017. Retrieved from https://www.gov.za/xh/node/773869.

Padayachee, V. (2013). Corporate Governance in South Africa: From 'Old Boys Club' to 'Ubuntu'? Transformation: Critical Perspectives on Southern Africa. *No, 81/82*, 260–290.

du Plessis, J. J. (2009). Reflections and Perspectives on the South African Close Corporation as Business Vehicle for SMEs. *New Zealand Business Law Quarterly, 15*, 250–275.

South African Company Law for the 21th Century. Guidelines for Corporate Law Reform. May 2004. Government Gazette. No. 26493.

Swart, C. W. J. C., & Lombard, M. (2017). Representation of Companies Under the Companies Act 71 of 2008. *Journal of Contemporary Roman-Dutch Law, 80*, 666–682.

The Survey of Corporate Governance Practice in Russia: The Comparative Analysis by the Results of 2004–2014. Russian Directors Institute. Retrieved from http://rid.ru/wp-content/uploads/2016/05/2015_Исследование_РИД-2004-2014_итог.pdf.

Verbicky, V. K. (2015). *From Ideal to Real. What Is Really Necessary for Companies to Application in Practice from Corporate Governance Best Practices*. Moscow: Alpina Publisher. 216 p.

Zelentsov, A. B., Dolinskaya, V. V., Frolova, E. E., Kucherenko, P. A., & Dudin, M. N. (2017). Comparative Analysis of Regulatory Instruments and the Trend Towards the Harmonization of Proprietary Regulation in the Civil Law of Member States of BRICS. *Journal of Advanced Research in Law and Economics, 8*(5), 1641–1649.

2

Hi-Tech Development of Modern Africa: Opportunities and Barriers

Bruno S. Sergi and Elena G. Popkova

1 Introduction

Technological progress plays an important role in functioning and development of socio-economic systems, determining their opportunities of improvement of the internal environment and improvement of position in the external environment. In the conditions of the digital economy, usage of opportunities of technological progress envisages hi-tech development of socio-economic systems.

Internal manifestations of this development are connected to growth of effectiveness of satisfying the public needs. Thus, for example, digital medicine allows raising the standards of provision of medical services and increasing the duration of healthy life; digital education provides mass

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accessibility and high quality of educational services, as well as increase of human capital in the economy; digital agriculture allows increasing the efficiency of production of food products and solving the problem of famine, and so on. In the countries of modern Africa, these problems are very urgent—so their hi-tech development is not just preferable, as in most other regions of the world, but is critically necessary for implementing the global goals in the sphere of sustainable development.

External manifestations of hi-tech development of economic systems consist in expansion of their opportunities for export, import substitution, and provision of the national economic security (in the aspect of reduction of dependence on import) due to increase of the competitiveness of domestic entrepreneurship. Also, the opportunities for international economic integration within the African region of the global economy and beyond it are expanded—this allows for foreign economic cooperation by the most stable and profitable conditions.

Expansion of foreign economic activities is one of the strategic priorities of modern African countries that strive to strengthen their positions in the system of international economic relations and pass from the status of recipients of financial support to the status of progressive economic systems that deal with venture investments and develop international entrepreneurship. Thus, the problem of provision of hi-tech development of modern Africa is actualized. This work aims at studying the opportunities and barriers on the path of this development and at determining the perspectives of overcoming them.

2 Materials and Method

The fundamental and applied issues of hi-tech development of modern socio-economic systems in the context of the digital economy, the knowledge economy, and the Fourth industrial revolution are studied in the works of Haabazoka (2019a, b), Petrenko et al. (2018), Popkova (2019), Popkova and Sergi (2018, 2019, 2020), Ragulina (2019), Ragulina et al. (2019a, b), Sergi et al. (2019a, b, c, d, e, f), Sergi (2003, 2019), Wamboye et al. (2015b), and Wlodarczak (2012). The specifics of development of socio-economic systems of modern African countries are reflected in the

works Tiruneh et al. (2017), Wamboye and Sergi (2019), Wamboye et al. (2013, 2014, 2015a, 2016).

The overview of the literature on the topic of the chapter shows that the large number of works on the topic of hi-tech development and development of the economy of African countries determines a strong theoretical basis of the research. At the same time, the problem of hi-tech development of African countries is poorly studied and requires further elaboration.

3 Results

The objects of the research are top 10 countries of African countries as to the share of hi-tech export in the structure of industrial export in 2018, for which the statistical data are available and according to the list of African countries by the World Bank (2019c). Let us determine the contribution of various indicators of hi-tech development of socio-economic systems of African countries in the share of their hi-tech export in the structure of industrial export and in the share of mid-tech and hi-tech production in the structure of industry (Table 2.1).

As shown in Table 2.1, the highest share of hi-tech export in the structure of industrial export (88.52%) and the largest share of mid-tech and hi-tech production in the structure of industry (9.44%) are observed in Seychelles. The values of the factors of hi-tech development in this country are rather high, though not the highest in the selection of African countries. Direct average of the share of hi-tech export in the structure of industrial export constituted 13.01%, but variation is very high (196.25%). Average share of mid-tech and hi-tech production in the structure of industry constituted 2.79%, but variation is also very high (269.23%).

Average accessibility of online state services is assessed at 0.55 (low value, variation is moderate: 29.80%). Average protection of intellectual property constitutes 4.04 points (low value, variation is low: 13.89%). Average share of Internet users among African countries in 2018 constituted 28.21% (low value, variation is high: 50.78%). Average level of digital literacy (population's digital skills are assessed at 3.63 points (low

Table 2.1 Factors and results of hi-tech development of African countries in 2018

Country	High-technology exports, % of manufactured exports y_1	Medium- and High-Tech Manufacturing, value added share in total manufacturing value added y_2	1.12 E-Participation Index 0–1 (best) x_1	1.16 Intellectual property protection 1–7 (best) x_2	3.05 Internet users % pop x_3	6.05 Digital skills among population 1–7 (best) x_4	9.03 Venture capital availability 1–7 (best) x_5
Seychelles	88.52	9.44	0.65	4.10	56.50	4.40	2.70
Ethiopia	17.24	0.16	0.57	3.80	15.40	3.50	3.20
Rwanda	12.28	0.07	0.76	4.70	20.00	3.90	3.40
Mozambique	5.64	0.11	0.44	3.10	17.50	2.80	2.00
South Africa	4.64	0.24	0.85	4.40	54.00	3.50	3.00
Burkina Faso	4.39	0.47	0.62	4.10	14.00	3.20	1.70
Cameroon	4.23	0.08	0.33	4.30	25.00	3.80	2.40
Zambia	1.97	0.21	0.40	3.70	25.50	3.70	1.90
Namibia	1.23	0.07	0.39	4.70	31.00	3.40	2.90
Nigeria	1.90	0.33	0.48	3.10	25.70	3.30	1.70
Senegal	1.10	0.22	0.51	4.40	25.70	4.40	2.60
Direct average	13.01	1.04	0.55	4.04	28.21	3.63	2.50
Standard deviation	25.54	2.79	0.16	0.56	14.32	0.49	0.60
Coefficient of variation, %	196.25	269.23	29.80	13.89	50.78	13.40	24.20

Source: Compiled and calculated by the authors based on The World Bank (2019a, b) and World Economic Forum (2019)

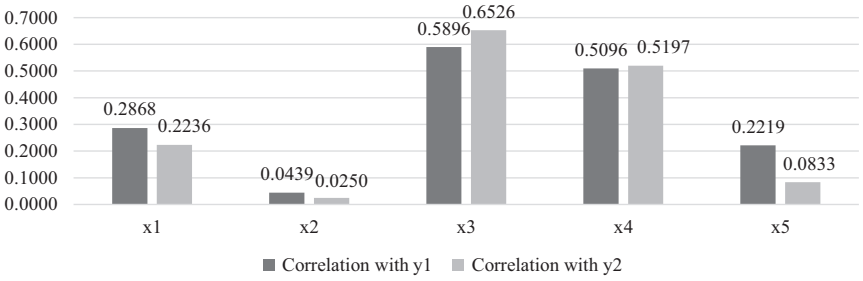

Fig. 2.1 Coefficients of determination (R^2) of influence of the factors on the results of hi-tech development in countries of Africa in 2018. (Source: Calculated and compiled by the authors)

value, variation is moderate: 13.40%). Average accessibility of venture investments—2.50 points (low value, variation is moderate: 24.20%). The results of correlation analysis are shown in Fig. 2.1.

As shown in Fig. 2.1, correlation of the share of hi-tech export in the structure of industrial export (y_1) and the share of mid-tech and hi-tech production in the structure of industry (y_2) with accessibility of online state services (x_1) is moderate—28.68% and 22.36%, accordingly—which shows neutral influence of this factor on hi-tech development of modern African countries. Correlation between y_1 and y_2 and protection of intellectual property (x_2) is low—4.39% and 2.50%, accordingly—which shows negative influence of this factor on hi-tech development of modern African countries.

Correlation between y_1 and y_2 and the share of Internet users (x_3) is high—58.96% and 65.26%, accordingly, which shows positive influence of this factor on hi-tech development of modern African countries. Correlation between y_1 and y_2 and the level of digital literacy (x_4) is high—50.96% and 51.97%, accordingly, which shows positive influence of this factor on hi-tech development of modern African countries. Correlation between y_1 and y_2 and accessibility of venture investments (x_5) is moderate—22.19% and 8.33%, accordingly, which shows neutral influence of this factor on hi-tech development of modern African countries.

Based on the obtained results, we performed SWOT analysis of hi-tech development of countries of Africa in 2018 (Table 2.2).

Table 2.2 SWOT analysis of hi-tech development of countries of Africa

Strengths • High level of development of digital society (population's mass digital skills).	**W**eaknesses • lack of protection of intellectual property; • deficit of venture investments; • underdevelopment of e-government; • low level of development of digital infrastructure.
Opportunities • improvement of institutes; • improvement of investment climate; • development of the e-government system; • development of digital infrastructure.	**T**hreats • negative influence of globalization (foreign competition): inflow of final digital technologies into economies of African countries, which hinders the development of their own hi-tech entrepreneurship; • lack of state's initiative for digital modernization of economy.

Source: Developed and compiled by the authors

As shown in Table 2.2, the conditions for hi-tech development of modern African countries are not favorable. The only strength (precondition of hi-tech development) is high level of development of digital society (population's mass digital skills). The weaknesses (barriers on the path of hi-tech development) are lack of protection of intellectual property, deficit of venture investments, underdevelopment of e-government, and low level of development of digital infrastructure (low accessibility of Internet).

The opportunities and perspective of hi-tech development of countries of modern Africa include improvement of the institutes (for protection of intellectual property), improvement of investment climate, development of the e-government system, and development of digital infrastructure. The threats to hi-tech development of modern African countries include negative influence of globalization (foreign competition): inflow of final digital technologies into economies of African countries, which hinders the development of their own hi-tech entrepreneurship, and lack of the state's initiative for digital modernization of economy.

4 Conclusion

Thus, it has been determined that modern Africa requires accelerated hi-tech development, as growth of global competition in the sphere of high technologies leads to increase of threats to this development, which include appearance of more foreign rivals with final technologies and attractive goods in the national markets, which undermines the possibilities of development of domestic hi-tech production in countries of Africa.

At present, due to state's low interest in hi-tech development in African countries, the conditions for it are not favorable: there are no necessary infrastructure (Internet access) and institutes (protection of intellectual property is not provided). The state does not provide an example of usage of opportunities of technological progress for society and entrepreneurship through development of e-government; the inflow of venture investments into economies of African countries is complicated due to low investment attractiveness of their economies.

At the same time, society is interested in hi-tech development of African countries' economies—this is proved by population's mass digital skills. That's why if the state's barriers are overcome, the African countries' economies will be able to achieve quick hi-tech development in the near future. From the scientific and economic point of view, hi-tech development of modern Africa is a "market gap", which could and should be overcome through targeted state regulation. This will ensure successful inclusion of African countries in global competition in the hi-tech sphere, which will create advantages in the form of expansion of opportunities of African countries for international integration, increase of population's living standards, and successful achievement of the global goals in the sphere of sustainable development.

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References

Haabazoka, L. (2019a). A Study of the Effects of Technological Innovations on the Performance of Commercial Banks in Developing Countries – A Case of the Zambian Banking Industry. *Lecture Notes in Networks and Systems, 57*, 1246–1260.

Haabazoka, L. (2019b). Project Finance for Africa's Construction Sector: Can Stabilization Funds Work? *Lecture Notes in Networks and Systems, 57*, 32–60.

Petrenko, E., Pritvorova, T., & Dzhazykbaeva, B. (2018). Sustainable Development Processes: Service Sector in Post-industrial Economy. *Journal of Security and Sustainability Issues, 7*(4), 781–791. https://doi.org/10.9770/jssi.2018.7.4(14).

Popkova, E. G. (2019). Preconditions of Formation and Development of Industry 4.0 in the Conditions of Knowledge Economy. *Studies in Systems, Decision and Control, 169*(1), 65–72.

Popkova, E. G., & Sergi, B. S. (2018). Will Industry 4.0 and Other Innovations Impact Russia's Development? In B. S. Sergi (Ed.), *Exploring the Future of Russia's Economy and Markets: Towards Sustainable Economic Development* (pp. 51–68). Bingley, UK: Emerald Publishing Limited.

Popkova, E. G., & Sergi, B. S. (Eds.). (2019). *Digital Economy: Complexity and Variety vs. Rationality*. Cham: Springer International Publishing.

Popkova, E. G., & Sergi, B. S. (2020). Human Capital and AI in Industry 4.0. Convergence and Divergence in Social Entrepreneurship in Russia. *Journal of Intellectual Capital*.

Ragulina, Y. V. (2019). Priorities of Development of Industry 4.0 in Modern Economic Systems with Different Progress in Formation of Knowledge Economy. *Studies in Systems, Decision and Control, 169*, 167–174.

Ragulina, Y. V., Alekseev, A. N., Strizhkina, I. V., & Tumanov, A. I. (2019a). Methodology of Criterial Evaluation of Consequences of the Industrial Revolution of the 21st Century. *Studies in Systems, Decision and Control, 169*, 235–244.

Ragulina, Y. V., Semenova, E. I., Avkopashvili, P. T., Dmitrieva, E. A., & Cherepukhin, T. Y. (2019b). Top-Priority Directions of Implementing New Internet Technologies on the Territories of Rapid Economic Development. *Advances in Intelligent Systems and Computing, 726*, 182–188.

Sergi, B. S. (2003). *Economic Dynamics in Transitional Economies: The Four-P Governments, the EU Enlargement, and the Bruxelles Consensus*. New York: Routledge.

Sergi, B. S. (Ed.). (2019). *Tech, Smart Cities, and Regional Development in Contemporary Russia*. Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Bogoviz, A. V., & Litvinova, T. N. (2019a). *Understanding Industry 4.0: AI, the Internet of Things, and the Future of Work*. Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Bogoviz, A. V., & Ragulina, J. V. (2019b). Costs and Profits of Technological Growth in Russia. In B. S. Sergi (Ed.), *Tech, Smart Cities, and Regional Development in Contemporary Russia* (pp. 41–54). Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Bogoviz, A. V., & Ragulina, J. V. (2019c). Entrepreneurship and Economic Growth: The Experience of Developed and Developing Countries. In B. S. Sergi & C. C. Scanlon (Eds.), *Entrepreneurship and Development in the 21st Century* (pp. 3–32). Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Borzenko, K. V., & Przhedetskaya, N. V. (2019d). Public-Private Partnerships as a Mechanism of Financing of Sustainable Development. In M. Ziolo & B. S. Sergi (Eds.), *Financing Sustainable Development: Key Challenges and Prospects* (pp. 313–339). Cham: Palgrave Macmillan.

Sergi, B. S., Popkova, E. G., Sozinova, A. A., & Fetisova, O. V. (2019e). Modeling Russian Industrial, Tech, and Financial Cooperation with the Asia-Pacific Region. In B. S. Sergi (Ed.), *Tech, Smart Cities, and Regional Development in Contemporary Russia* (pp. 195–223). Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Vovchenko, N., & Ponomareva, M. (2019f). Central Asia and China: Financial Development Through Cooperation with Russia. In W. A. Barnett & B. S. Sergi (Eds.), *Asia-Pacific Contemporary Finance and Development (International Symposia in Economic Theory and Econometrics Vol. 26)* (pp. 141–164). Bingley, UK: Emerald Publishing Limited.

The World Bank. (2019a). High-technology Exports (% of Manufactured Exports). Retrieved September 3, 2019, from https://data.worldbank.org/indicator/TX.VAL.TECH.MF.ZS?most_recent_value_desc=true&view=chart.

The World Bank. (2019b). Medium- and High-Tech Manufacturing Value Added Share in Total Manufacturing Value Added. Retrieved September 3, 2019, from https://tcdata360.worldbank.org/indicators/hbe238413?country=BRA&indicator=3794&viz=line_chart&years=1990,2014.

The World Bank. (2019c). The World Bank in Africa: Countries. Retrieved September 3, 2019, from https://www.worldbank.org/en/region/afr.

Tiruneh, E. A., Wamboye, E., & Sergi, B. S. (2017). Does Productivity in Africa Benefit from Advanced Countries' R&D? *Technology Analysis & Strategic Management, 29*(7), 804–816.

Wamboye, E. F., & Sergi, B. S. (2019, June). Exploring the Nature, Motives, and Implications of Foreign Capital in Africa. *World Development Perspectives, 14*.

Wamboye, E., Adekola, A., & Sergi, B. S. (2013). Economic Growth and the Role of Foreign Aid in Selected African Countries. *Development, 56*(2), 155–171.

Wamboye, E., Adekola, A., & Sergi, B. S. (2014). Foreign Aid, Legal Origin, Economic Growth and Africa's Least Developed Countries. *Progress in Development Studies, 14*(4), 335–357.

Wamboye, E., Tochkov, K., & Sergi, B. S. (2015a). Technology Adoption and Growth in Sub-Saharan African Countries. *Comparative Economic Studies, 57*(1), 136–167.

Wamboye, E. F., Adekola, A. F., & Sergi, B. S. (2015b). Sectoral Effects on Female Absolute and Relative Employment in Selected Least Developed Countries. *Gender, Technology and Development, 19*(1), 1–42.

Wamboye, E., Adekola, A., & Sergi, B. (2016). ICTs and Labour Productivity Growth in Sub-Saharan Africa. *International Labour Review, 155*(2), 231–252.

Wlodarczak, D. (2012). Smart Growth and Urban Economic Development: Connecting Economic Development and Land-Use Planning Using the Example of High-Tech Firms. *Environment and Planning A, 44*(5), 1255–1269.

World Economic Forum. (2019). Retrieved September 3, 2019, from http://www3.weforum.org/docs/GCR2018/05FullReport/TheGlobalCompetitivenessReport2018.pdf.

3

Information Society, Telecommunication Infrastructure, and Digital Entrepreneurship in Modern Africa

Elena G. Popkova and Julia V. Ragulina

1 Introduction

Modern Africa requires digital modernization, and after that—until 2030—the transition to Industry 4.0. This is due to the fact that, firstly, the issue of implementing the global goals in the sphere of sustainable development in Africa is very urgent. Its manifestations include deficit of food, low efficiency in all spheres of economy, including education and healthcare, and, as a result, critically low population's living standards (Zambia, one of the largest and most typical countries of Africa, was rated 170th as to the level of GDP per capita in 2018; South Africa—the leading African country—was ranked 120th) (World Bank 2019).

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The situation is complicated by the crisis of African entrepreneurship, which causes the deficit of jobs and limited increase of incomes for wide groups of population. This leads to intense migration from countries of Africa. Digital technologies allow for complex solution of this problem, stimulating the development of entrepreneurship, growth of labor efficiency in all spheres, stimulation of employment, and increase of living standards and quality of life.

Secondly, despite the more favorable environment, as compared to most countries from other regions of the world, Africa's population is less happy. This is caused by small life span, low level of education, limited opportunities for realization of human potential, and high social inequality. As a result, in 2018 Zambia was ranked 109th among countries of the world in the rating Happy Planet Index, and South Africa was ranked 56th (New Economics Foundation 2019).

Thirdly, digital modernization of economic systems of African countries will accelerate their economic growth and will allow them participating in the global competitive struggle in hi-tech markets. African digital entrepreneurship will have high global competitiveness and will be able to create new markets with manifestation of high innovative activity, expand export, and perform import substitution. This will allow achieving the reduction of African countries' dependence on external support (primarily, financial) and will reduce disproportion in development of the global economy, which will become more well-balanced, and, as a result, more stable and sustainable.

However, the above advantages are not gained, as now (2019) most countries of Africa preserve the pre-digital technological mode. In this chapter, we seek the goal of determining the readiness of African countries for digital modernization and further transition to Industry 4.0 through determining the level of development of the information society, telecommunication infrastructure, and digital entrepreneurship and of outlining the perspectives of provision and increase of readiness in case of its absence or insufficiency.

2 Materials and Method

The theory and methodology of evaluation of economic systems' readiness to digital modernization of economy and transition to Industry 4.0 are studied in the works Haabazoka (2019a, b), Petrenko et al. (2018),

Popkova (2019), Popkova and Sergi (2019), Popkova and Sergi (2020), Popkova and Sergi (2018), Ragulina (2019), Ragulina et al. (2019a), Ragulina et al. (2019b), Sergi et al. (2019a), Sergi et al. (2019b), Sergi et al. (2019c), Sergi et al. (2019d), Sergi et al. (2019e), Sergi et al. (2019f), Sergi et al. (2019g), Sergi (2019), Sergi (2003), and Wamboye et al. (2015b), The current level, new tendencies, and perspectives of development of African countries are discussed in the works Tiruneh et al. (2017), Wamboye and Sergi (2019), Wamboye et al. (2016), Wamboye et al. (2013), Wamboye et al. (2014), and Wamboye et al. (2015a). At the same time, the systemic view on the problem of provision of modern African countries' readiness to digital modernization of economy and transition to Industry 4.0 through the prism of development of the information society, telecommunication infrastructure, and digital entrepreneurship is not formed by the economic science.

The methodology of the research is based on factor analysis. It is used for determining the contribution of each preliminary selected factor (19 factors in total) into provision of readiness of African countries for the economy's digital modernization and transition to Industry 4.0. The factors are divided into three logical blocks: IS (information society), TI (telecommunication infrastructure), and DE (digital entrepreneurship).

The target landmark (model) is South Africa, as the only country of Africa that implements digital modernization (and is present in the IMD global digital competitiveness ranking). Zambia is selected as a typical country of Africa, which preserves the pre-digital technological mode. For each country we calculate the index of readiness to digital modernization of economy and transition to Industry 4.0 ($I_{I4.0(Zam)}$—for Zambia and $I_{I4.0(SAR)}$—for South Africa) according to the following formula:

$$I_{14.0} = \sum_i = 1,\ldots 19\left(f_i\right)/19, \tag{3.1}$$

where $I_{I4.0}$—index of readiness of the economic system for digital modernization of economy and transition to Industry 4.0, shares of 1;

f_i—value of the factor of readiness of the economic system for digital modernization of economy and transition to Industry 4.0, shares of 1.

As is seen from Formula (3.1), the offered index is calculated by finding the direct average of the values of all 19 factors. The initial values of the factors (The global competitiveness index 4.0 components) are transformed into shares of 1 by finding the ratio of their initial values to maximum possible values. Then, contribution of each factor into provision of readiness of the economic system for digital modernization of economy and transition to Industry 4.0 is determined with the help of the following formula:

$$\Delta I_{\mathrm{I4.0}}\left(f_i\right) = \mathrm{I}_{\mathrm{I4.0}}\left(f_i\right) - \mathrm{I}_{\mathrm{I4.0(Zam)}}, \tag{3.2}$$

where $\Delta \mathrm{I}_{\mathrm{I4.0}}(f_i)$—contribution of factor i into provision of readiness of the economic system for digital modernization of economy and transition to Industry 4.0, shares of 1.

$\mathrm{I}_{\mathrm{I4.0}}(f)$—readiness of Zambia for digital modernization of economy and transition to Industry 4.0 under the condition of the value of factor i that is equal to the one of South Africa—that is, we put in Formula (3.1) the value of factor i of South Africa and values of other factors of Zambia;

$\mathrm{I}_{\mathrm{I4.0(Zam)}}$—readiness of Zambia for digital modernization of economy and transition to Industry 4.0.

As a result, the share of each factor in the structure of total contribution of all factors into provision of higher readiness of South Africa for digital modernization of economy and transition to Industry 4.0 as compared to Zambia is calculated by finding the per cent ratio of the contribution of each factor to difference between $\mathrm{I}_{\mathrm{I4.0(SAP)}}$ and $\mathrm{I}_{\mathrm{I4.0(Zam)}}$.

3 Results

The statistical data and the results of the performed preparation for further factor analysis are shown in Table 3.1.

Example of the performed calculations. Social capital (1.05) in Zambia in 2018 was assessed by the experts of the World Economic Forum at 55.40 points out of 100. That's why the value of this factor is calculated in the following way: $f_i = 55.40/100 = 0.554$. Similar to the given example, the values of other factors in Zambia and South Africa were calculated. This allows calculating indices $\mathrm{I}_{\mathrm{I4.0}}$ for Zambia and South Africa:

Table 3.1 Statistics and analysis of information society, telecommunication infrastructure, and digital entrepreneurship in Zambia and South Africa in 2018

Block	The global competitiveness index 4.0 component (indicator), m.u.[a]	Max[b]	South Africa i.v.[c]	South Africa f_i, shares of 1	Zambia i.v.[c]	Zambia f_i, shares of 1
IS	1.05 Social capital, 0–100 (high)	100	55.40	0.5540	54.30	0.5430
	1.12 E-Participation Index, 0–1 (best)	1	0.85	0.8500	0.40	0.4000
	1.19 Conflict of interest regulation, 0–10 (best)	10	8.00	0.8000	5.70	0.5700
	6.05 Digital skills among population, 1–7 (best)	7	3.50	0.5000	3.70	0.5286
	12.09 Buyer sophistication, 1–7 (best)	7	3.80	0.5429	2.70	0.3857
	On average	–	–	0.6494	–	0.4855
TI	1.16 Intellectual property protection, 1–7 (best)	7	4.40	0.6286	3.70	0.5286
	2.09 Electrification rate, % pop.	100	86.30	0.8630	33.70	0.3370
	3.01 Mobile-cellular telephone subscriptions /100 pop.	124.9 (Korea Rep.)	162.00	1.2970	78.60	0.6293
	3.02 Mobile-broadband subscriptions /100 pop	112.8 (Korea Rep.)	70.00	0.6206	45.20	0.4007
	3.03 Fixed-broadband Internet subscriptions /100 pop.	41.6 (Korea Rep.)	3.00	0.0721	0.20	0.0048
	3.04 Fiber Internet subscriptions /100 pop.	32.0 (Korea Rep.)	0.20	0.0063	0.00	0.0000
	3.05 Internet users, % pop.	100	54.00	0.5400	25.50	0.2550
	On average	–	–	0.5754	–	0.3079

(*continued*)

Table 3.1 (continued)

Block	The global competitiveness index 4.0 component (indicator), m.u.[a]	Max[b]	South Africa i.v.[c]	South Africa f_i, shares of 1	Zambia i.v.[c]	Zambia f_i, shares of 1
DE	6.06 Ease of finding skilled employees, 1–7 (best)	7	4.00	0.5714	4.60	0.6571
	7.02 Extent of market dominance, 1–7 (best)	7	3.80	0.5429	3.30	0.4714
	11.05 Attitudes toward entrepreneurial risk, 1–7 (best)	7	4.30	0.6143	4.00	0.5714
	11.06 Willingness to delegate authority, 1–7 (best)	7	4.80	0.6857	4.50	0.6429
	11.07 Growth of innovative companies, 1–7 (best)	7	4.20	0.6000	3.80	0.5429
	11.08 Companies embracing disruptive ideas, 1–7 (best)	7	3.90	0.5571	3.10	0.4429
	12.01 Diversity of workforce, 1–7 (best)	7	4.70	0.6714	4.40	0.6286
	On average	–	–	0.6061	–	0.5653

Source: Calculated and compiled by the authors based on World Economic Forum (2019) and The World Bank (2019a, 2019b, 2019c)

[a]m.u.—measuring units

[b]Max—maximum allowable value of the indicator

[c]i.v.—initial value

$$I_{I4.0(Zam)} = \frac{\left[\begin{array}{l}(0.5540+0.8500+0.8000+0.5000+0.5429)\\+(0.6286+0.8630+1.2970+0.6206\\+0.0721+0.0063)\\+(0.5400)+(0.5714+0.5429+0.6143\\+0.6857+0.6000+0.5571+0.6714)\end{array}\right]}{19} = 0.4495.$$

$$I_{I4.0(SAR)} = \frac{\left[\begin{array}{l}(0.5430+0.4000+0.5700+0.5286+0.3857)\\+(0.5286+0.3370+0.6293+0.4007\\+0.0048+0.0000+0.2550)\\+(0.6571+0.4714+0.5714+0.6429\\+0.5429+0.4429+0.6286)\end{array}\right]}{19} = 0.6062.$$

Based on the data from Table 3.1, we performed factor analysis (Table 3.2).

Example of the performed calculations. The contribution of social capital (1.05) into provision of the readiness of South Africa for digital modernization of economy and transition to Industry 4.0 in 2018 is determined in the following way:

$$I_{I4.0}(f_i) = \frac{\left[\begin{array}{l}(0.5430+0.8500+0.8000+0.5000+0.5429)\\+(0.6286+0.8630+1.2970+0.6206\\+0.0721+0.0063+0.5400)\\+(0.5714+0.5429+0.6143+0.6857\\+0.6000+0.5571+0.6714)\end{array}\right]}{19} = 0.45.$$

$$\Delta I_{I4.0}(f_i) = 0.45 - 0.4495 = 0.0006.$$

The total contribution of all factors constituted 0.1567. That's why the share of contribution of social capital is 0.0006 × 100%/0.1567 = 0.37%. The current level of development and significance (necessary growth—by the example of South Africa) of all three blocks of Zambia's readiness for digital modernization of economy and transition to Industry 4.0 is shown in Fig. 3.1.

As shown in Fig. 3.1, digital entrepreneurship is most developed in Zambia (41%), but its contribution into provision of readiness for

Table 3.2 Factor analysis of the readiness of South Africa for digital modernization of economy and transition to Industry 4.0

Block	The global competitiveness index 4.0 component (indicator), m.u.	$I_{I4.0}(f_i)$	$\Delta I_{I4.0}(f_i)$, shares of 1	$\Delta I_{I4.0}(f_i)$, %
IS	1.05 Social capital, 0–100 (high)	0.4500	0.0006	0.37
	1.12 E-Participation Index, 0–1 (best)	0.4732	0.0237	15.11
	1.19 Conflict of interest regulation, 0–10 (best)	0.4616	0.0121	7.73
	6.05 Digital skills among population, 1–7 (best)	0.4480	−0.0015	−0.96
	12.09 Buyer sophistication, 1–7 (best)	0.4577	0.0083	5.28
	In total	–	0.0431	27.5273
TI	1.16 Intellectual property protection, 1–7 (best)	0.4547	0.0053	3.36
	2.09 Electrification rate, % pop.	0.4772	0.0277	17.67
	3.01 Mobile-cellular telephone subscriptions /100 pop.	0.4846	0.0351	22.43
	3.02 Mobile-broadband subscriptions /100 pop.	0.4610	0.0116	7.38
	3.03 Fixed-broadband Internet subscriptions /100 pop.	0.4530	0.0035	2.26
	3.04 Fiber Internet subscriptions /100 pop.	0.4498	0.0003	0.21
	3.05 Internet users, % pop.	0.4645	0.0150	9.57
	In total	–	0.0985	62.8808
DE	6.06 Ease of finding skilled employees, 1–7 (best)	0.4450	−0.0045	−2.88
	7.02 Extent of market dominance, 1–7 (best)	0.4532	0.0038	2.40
	11.05 Attitudes toward entrepreneurial risk, 1–7 (best)	0.4517	0.0023	1.44
	11.06 Willingness to delegate authority, 1–7 (best)	0.4517	0.0023	1.44
	11.07 Growth of innovative companies, 1–7 (best)	0.4525	0.0030	1.92
	11.08 Companies embracing disruptive ideas, 1–7 (best)	0.4555	0.0060	3.84
	12.01 Diversity of workforce, 1–7 (best)	0.4517	0.0023	1.44
	In total	–	0.0150	9.5964

Source: Calculated and compiled by the authors

digital modernization of economy and transition to Industry 4.0 constitutes only 10%. The 2nd position belongs to information society (36%), which is also insignificant for provision of readiness for digital

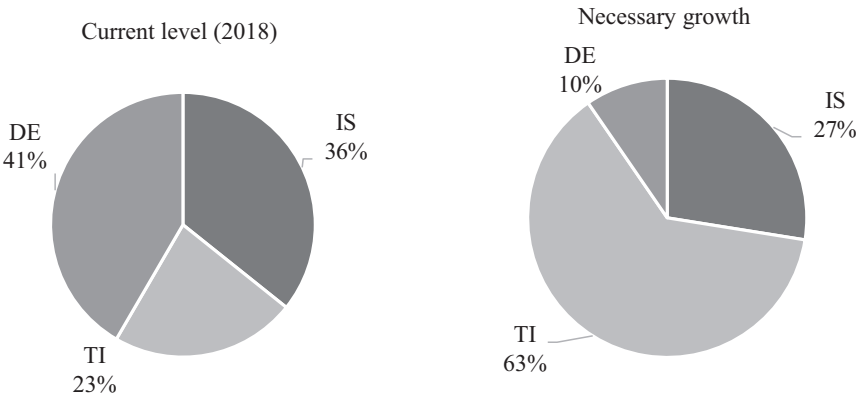

Fig. 3.1 The current level of development and significance of the blocks of Zambia's readiness for digital modernization of economy and transition to Industry 4.0. (Source: Calculated and compiled by the authors)

modernization of economy and transition to Industry 4.0 (27%). The least developed block in modern Zambia is telecommunication infrastructure (23%), which is most important for provision of readiness for digital modernization of economy and transition to Industry 4.0 (63%).

4 Conclusion

It is possible to conclude that South Africa formed the digital economy, as, in comparison with Zambia, South Africa shows larger readiness for digital modernization of economy and transition to Industry 4.0. Zambia's preparation for digital modernization of economy and transition to Industry 4.0 is not optimal (not well-balanced). The most significant block—telecommunication infrastructure—is least developed. That's why for optimization of Zambia's preparation for digital modernization of economy and transition to Industry 4.0, it is necessary to pay more attention to development of telecommunication infrastructure. Also, it is recommended to develop other blocks—information society and digital entrepreneurship.

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References

Haabazoka, L. (2019a). A Study of the Effects of Technological Innovations on the Performance of Commercial Banks in Developing Countries – A Case of the Zambian Banking Industry. *Lecture Notes in Networks and Systems, 57*, 1246–1260.

Haabazoka, L. (2019b). Project Finance for Africa's Construction Sector: Can Stabilization Funds Work? *Lecture Notes in Networks and Systems, 57*, 32–60.

New Economics Foundation. (2019). Happy Planet Index. Retrieved September 5, 2019, from http://happyplanetindex.org/.

Petrenko, E., Pritvorova, T., & Dzhazykbaeva, B. (2018). Sustainable Developmet Processes: Service Sector in Post-industrial Economy. *Journal of Security and Sustainability Issues, 7*(4), 781–791. https://doi.org/10.9770/jssi.2018.7.4(14).

Popkova, E. G. (2019). Preconditions of Formation and Development of Industry 4.0 in the Conditions of Knowledge Economy. *Studies in Systems, Decision and Control, 169*(1), 65–72.

Popkova, E. G., & Sergi, B. S. (2020). Human Capital and AI in Industry 4.0. Convergence and Divergence in Social Entrepreneurship in Russia. *Journal of Intellectual Capital*.

Popkova, E. G., & Sergi, B. S. (2018). Will Industry 4.0 and Other Innovations Impact Russia's Development? In B. S. Sergi (Ed.), *Exploring the Future of Russia's Economy and Markets: Towards Sustainable Economic Development* (pp. 51–68). Bingley, UK: Emerald Publishing Limited.

Popkova, E. G., & Sergi, B. S. (Eds.). (2019). *Digital Economy: Complexity and Variety vs. Rationality*. Cham: Springer International Publishing.

Ragulina, Y. V. (2019). Priorities of Development of Industry 4.0 in Modern Economic Systems with Different Progress in Formation of Knowledge Economy. *Studies in Systems, Decision and Control, 169*, 167–174.

Ragulina, Y. V., Alekseev, A. N., Strizhkina, I. V., & Tumanov, A. I. (2019a). Methodology of Criterial Evaluation of Consequences of the Industrial Revolution of the 21st Century. *Studies in Systems, Decision and Control, 169*, 235–244.

Ragulina, Y. V., Semenova, E. I., Avkopashvili, P. T., Dmitrieva, E. A., & Cherepukhin, T. Y. (2019b). Top-Priority Directions of Implementing New Internet Technologies on the Territories of Rapid Economic Development. *Advances in Intelligent Systems and Computing, 726*, 182–188.

Sergi, B. S. (2003). *Economic Dynamics in Transitional Economies: The Four-P Governments, the EU Enlargement, and the Bruxelles Consensus*. New York: Routledge.

Sergi, B. S. (Ed.). (2019). *Tech, Smart Cities, and Regional Development in Contemporary Russia*. Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Bogoviz, A. V., & Litvinova, T. N. (2019a). *Understanding Industry 4.0: AI, the Internet of Things, and the Future of Work*. Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Bogoviz, A. V., & Ragulina, J. V. (2019b). Costs and Profits of Technological Growth in Russia. In B. S. Sergi (Ed.), *Tech, Smart Cities, and Regional Development in Contemporary Russia* (pp. 41–54). Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Bogoviz, A. V., & Ragulina, J. V. (2019c). Entrepreneurship and Economic Growth: The Experience of Developed and Developing Countries. In B. S. Sergi & C. C. Scanlon (Eds.), *Entrepreneurship and Development in the 21st Century* (pp. 3–32). Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Borzenko, K. V., & Przhedetskaya, N. V. (2019d). Public-Private Partnerships as a Mechanism of Financing of Sustainable Development. In M. Ziolo & B. S. Sergi (Eds.), *Financing Sustainable Development: Key Challenges and Prospects (pp. 313-339)*. Palgrave Macmillan.

Sergi, B. S., Popkova, E. G., Sozinova, A. A., & Fetisova, O. V. (2019e). Modeling Russian Industrial, Tech, and Financial Cooperation with the Asia-Pacific Region. In B. S. Sergi (Ed.), *Tech, Smart Cities, and Regional Development in Contemporary Russia* (pp. 195–223). Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Vovchenko, N., & Ponomareva, M. (2019f). Central Asia and China: Financial Development Through Cooperation with Russia. In W. A. Barnett & B. S. Sergi (Eds.), *Asia-Pacific Contemporary Finance and Development (International Symposia in Economic Theory and Econometrics Vol. 26)* (pp. 141–164). Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Borzenko, K. V., & Przhedetskaya, N. V. (2019g). Public-Private Partnerships as a Mechanism of Financing Sustainable Development. In M. Ziolo & B. S. Sergi (Eds.), *Financing Sustainable Development: Key Challenges and Prospects* (pp. 313–339). Cham: Palgrave Macmillan.

The World Bank. (2019a). High-Technology Exports (% of Manufactured Exports). Retrieved September 3, 2019, from https://data.worldbank.org/indicator/TX.VAL.TECH.MF.ZS?most_recent_value_desc=true&view=chart.

The World Bank. (2019b). Medium- and High-Tech Manufacturing Value Added Share in Total Manufacturing Value Added. Retrieved September 3, 2019, from https://tcdata360.worldbank.org/indicators/hbe238413?country=BRA&indicator=3794&viz=line_chart&years=1990,2014.

The World Bank. (2019c). The World Bank in Africa: Countries. Retrieved September 3, 2019, from https://www.worldbank.org/en/region/afr.

Tiruneh, E. A., Wamboye, E., & Sergi, B. S. (2017). Does Productivity in Africa Benefit from Advanced Countries' R&D? *Technology Analysis & Strategic Management, 29*(7), 804–816.

Wamboye, E. F., & Sergi, B. S. (2019, June). Exploring the Nature, Motives, and Implications of Foreign Capital in Africa. *World Development Perspectives, 14*.

Wamboye, E., Adekola, A., & Sergi, B. (2016). ICTs and Labour Productivity Growth in Sub-Saharan Africa. *International Labour Review, 155*(2), 231–252.

Wamboye, E., Adekola, A., & Sergi, B. S. (2013). Economic Growth and the Role of Foreign Aid in Selected African Countries. *Development, 56*(2), 155–171.

Wamboye, E., Adekola, A., & Sergi, B. S. (2014). Foreign Aid, Legal Origin, Economic Growth and Africa's Least Developed Countries. *Progress in Development Studies, 14*(4), 335–357.

Wamboye, E., Tochkov, K., & Sergi, B. S. (2015a). Technology Adoption and Growth in Sub-Saharan African Countries. *Comparative Economic Studies, 57*(1), 136–167.

Wamboye, E. F., Adekola, A. F., & Sergi, B. S. (2015b). Sectoral Effects on Female Absolute and Relative Employment in Selected Least Developed Countries. *Gender, Technology and Development, 19*(1), 1–42.

World Economic Forum. (2019). The Global Competitiveness Report 2018. Retrieved September 5, 2019, from http://www3.weforum.org/docs/GCR2018/05FullReport/TheGlobalCompetitivenessReport2018.pdf.

World Bank. (2019). GDP Per Capita (Current US$). Retrieved September 5, 2019, from https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?most_recent_value_desc=true&view=chart.

4

The Impact of Obsolescence on Public-Private Partnership Projects in South Africa

Brighton Mukuvari and Nthatisi Khatleli

1 Introduction

Governments around the world rank infrastructure policy among their greatest concerns. The modernisation of infrastructure is seen as being critical to future economic competitiveness and crucial to accommodating expanding populations due to urbanisation. Adequate physical infrastructure is a key element of a sound investment climate. Kateja (2012) states that, historically, provision of infrastructure has been entrusted on government monopolies. However, with the increasing gap between infrastructure needs and resource availability, governments around the world can no longer meet the demand. According to Barrows et al. (2012), the cost to deliver healthcare in both developed and developing nations has been rising exponentially. To narrow the infrastructure deficit, governments have increasingly turned to PPPs, which in the

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past used to be rare and limited to a handful of countries and infrastructure sectors (Kateja 2012).

Public-Private Partnerships (PPPs) have over the years become the norm for infrastructure development in many countries, as they have emerged as a preferred mode of financing infrastructure (Kateja 2012). PPPs are a long-term, contractually regulated co-operation between the public and private sector for the efficient fulfilment of public tasks in combining the necessary resources such as operational funds, capital and personnel of the partners and distributing existing project risks according to the risk management competence of the project partners. South Africa has been using this model to install critical infrastructure facilities, among them hospitals. However public hospitals have to be effectively competitive in an environment where the private health sector is very strong such as is the case in South Africa. The main challenge is that some of the most critical and expensive equipment could become obsolete within a very short space of time, rendering the sometimes specific investment very uncompetitive. The aim of this study is to understand the treatment and appreciation of obsolescence in the health sector PPPs. So the objectives in that vein were to assess the current appreciation of obsolescence as a relevant technical concept, to compare the awareness, treatment and appreciation with the international best practices. It was also deemed important to investigate the current challenges caused by obsolescence and identify remedies that could be provided to ameliorate its deleterious impacts on service delivery.

2 Literature Review

Obsolescence is a state of becoming old fashioned and no longer useful. The obsolete facility is not necessarily broken, worn out or otherwise dysfunctional (Lemer and Iselin 1993). Rather the facility simply does not measure up to current needs. Thomsen and Van de Flier (2011) went further and stated that obsolescence can have a wide range of causes, the available literature shows a confusing variety of categorisations like physical, economic, financial, functional, locational, environmental, political, market, style and control obsolescence. However Butt et al. (2010)

provided a diverse line of reasoning when they stated that factors that cause obsolescence are not only conventional such as aging, wear and tear, but rather contemporary factors including energy consumption efficiency, environmental pressures such as reduction of carbon or greenhouse gas emissions, legislations or regulations, change of use, clean and waste water management, water quality and resources, land use, land contamination, soil quality, changing occupier or end user demands, sustainable waste management, ecological concerns, health and safety, and climate change. Figure 4.1 illustrates conceptually, the progression of a facility's performance during its service life (following completion of construction). Through the passage of time the overall performance of a facility starts to diminish slowly due to factors like wear and tear, aging and functional change. After the minimum acceptable performance, the facility is deemed to be obsolete.

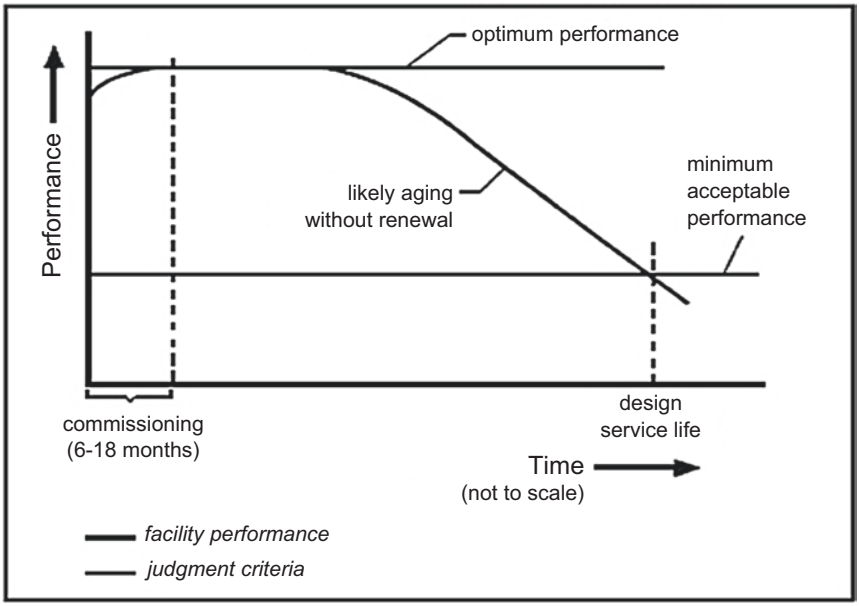

Fig. 4.1 Facility/Equipment performance during economic lifespan. (Source: Iselin and Lemer (1993))

2.1 Types of Obsolescence

According to Butt et al. (2010), irrespective of whether obsolescence is in value or function or both, internal obsolescence in a component or built asset is due to factors that exist within the component or built asset.

2.1.1 Functional Obsolescence

De La Mora and Reilly (2012) define functional obsolescence as being caused by the property's inability to perform the function for which it was originally designed or intended for. This type of obsolescence has two components which are:

- The functional component
- The technological component

However, Salway (1986) seems to differ and he defined functional obsolescence as the product of technological changes in occupiers' requirements impinging upon both layout and facilities offered implying that functional obsolescence is not caused by the functional component only. According to Voss (2012), there are five types of Functional Obsolescence:

- Curable functional obsolescence caused by a deficiency requiring an addition (installation) of a new item.
- Curable functional obsolescence caused by a deficiency requiring the substitution (replacement) of an existing item.
- Curable functional obsolescence caused by a component of real property that is not necessary and therefore adds no value to the current of anticipated use (i.e. super adequacy that is economically feasible to cure).
- Incurable functional obsolescence caused by a deficiency.
- Incurable functional obsolescence caused by a super adequacy.

Each of these items contributes to the level and rate of Functional Obsolescence and will ultimately either directly or indirectly lower the utilisation of the subject property.

2.1.2 Physical Deterioration

This is as a result of wear and tear as well as the aging of the facility. De La Mora and Reilly, (2012) stated that the consequence of physical deterioration from a cost approach was that it results in a decrease in value due to the property's physical condition. Examples of physical deterioration are damage from termites or other wood-destroying organisms, cracks in plaster or wallboard, deterioration of roof shingles causing leaks and discolouration of ceilings, cracks in concrete foundations due to uneven settling and a general wearing out mechanical systems in the house due to use over time (Voss 2012).

According to Voss (2012), physical deterioration is either curable or incurable depending on the costs of repairing or replacing the deteriorating items in the structure. If the repair cost is less than or equal to the increase in the structure's value after the repairs, the physical deterioration is curable. Voss (2012) goes on to say that if the cost of repairing exceeds the increase in value consequent upon that repair, then the physical deterioration is incurable. Under incurable physical deterioration it is advisable for the owner of the property to consider demolishing it and building a new structure. The same could be said to repairing or replacing an expensive piece of machinery as the same principles apply. Figure 4.2 depicts a typical deterioration curve for a building; if there is little or no maintenance, the building's useful life is significantly shortened. In order for a building to function optimally to its design parameters, it needs to be regularly refurbished.

2.1.3 External Obsolescence

External Obsolescence means temporary or permanent impairment in value or usefulness of a built asset due to factors outside the system such as change in existing or advent of a new environmental legislation, social forces/pressure groups, arrival of new technology, fluctuation in demand, inflation of a currency and so on.

The other type of obsolescence is Locational Obsolescence which relates to neighbourhood conditions related to the subject's property site. The performance of the infrastructure is affected by the location in which it is found. Voss goes further to state that this type of obsolescence though from a property sector view assumes that the property is located in an inharmonious

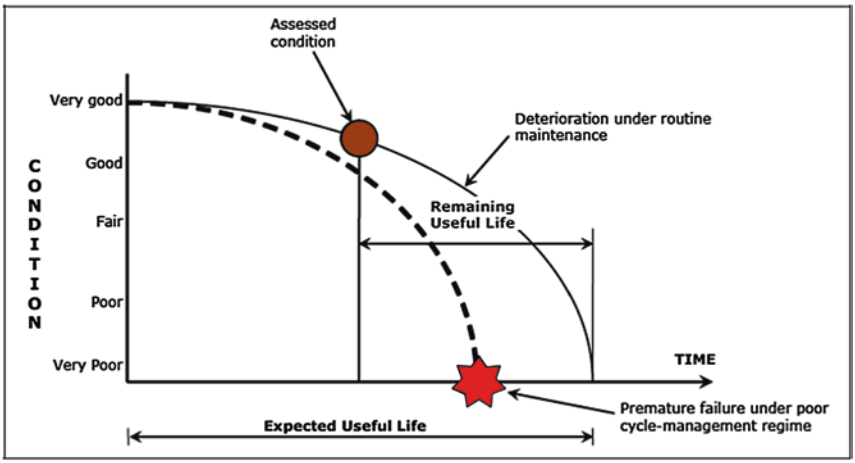

Fig. 4.2 A typical deterioration curve. (Source: Iselin and Lemer (1993))

location such as an industrial area changing to a commercial development. On the other hand, Economic Obsolescence according to Voss (2012) occurs when interest rates increase, at that point supply moves ahead of consumer demand therefore a property may suffer a decline in value due to the market's inability to cover construction costs. Lastly Climate-Induced Obsolescence is caused by extreme weather conditions caused by global warming. Specifically for the United Kingdom, by the year 2050 the country is expected to experience increases in average summer mean temperatures (predicted to rise by the 3.5 degrees Celsius) and frequency of heat waves/very hot days and increases in winter precipitation (of up to 20%) and possibly more severe storms. Finch (1996) suggests that the changing climate will accelerate the rate at which a built asset becomes obsolete requiring greater performance improvements from maintenance and refurbishment options and a foreshortening of maintenance and refurbishment cycles.

2.1.4 Obsolescence in PPPs

According to the European Union, little attention is given to the very high risk of adaptability and flexibility. There is therefore a need for PPP projects to meet the ever-changing needs of hospitals over their lifecycle. These needs are as follows:

1. Flexibility to cover changes in volume and demand
2. Functionality to meet changes

In South Africa, this matter has not been discussed in literature and it is envisaged that this study is going to trigger a very important debate and quest to improve the performance of PPP projects.

3 Methodology

According to Naoum (2013), research strategy can be defined as the way in which the research objectives can be questioned. This research used descriptive research. According to Leedy and Ormrod (2005), the term descriptive research involves identifying the distinctiveness of an observable fact or delving into possible parallels in the midst of two or more phenomena. Descriptive research does not fit neatly into the definition of either quantitative or qualitative research methodologies but instead it can utilise elements of both, often within the same study. Descriptive research can either be quantitative or qualitative, it can involve collections of qualitative information that can be tabulated along a continuum in numerical form, such as scores on a test or the number of times a person chooses to use a certain feature of multimedia program. It can describe categories of information such as gender or patterns of interaction when using technology in a group situation. The research conducted a pilot study consisting of a convenience sample of clients (government departments and municipalities), architects and project managers based in Gauteng. The main advantage of carrying out a pilot study is that it gives an advance warning about where the main research project could fail (Van Teijlingen and Hundley 2001). A total of 15 questionnaires were issued in the pilot study. The 15 respondents consisted of 5 project managers, 5 architects, 5 facilities managers and 5 clients. All the questionnaires were administered via emails. According to Fellows and Liu (1997), the objective of sampling is to provide a practical means of enabling the data collection and processing components of research to be carried out while ensuring the sample provides a good representation of the population as a whole. Snowballing was used to identify the professional consultants that were used on the selected PPP projects. The researcher contacted the consortiums that were/are responsible for executing the project. They would in turn give the researcher the names and contacts of the rest of the professionals. This sampling

technique came in handy as the respondents that were involved in PPP projects in South Africa are still very few.

Questionnaires that had open-ended questions and close-ended as well were issued. Close-ended questions were found to be useful as they assist those respondents with limited knowledge on the subject matter, as it gives response hints and pointers. Interviews were also conducted with six professionals who are still working in PPPs—three from the government and three from private companies. They were selected through a snowballing approach. All these sources of data together with the availed contractual documents were analysed to assist the enquiry. Thematic Analysis was used to analyse interviews and Content Analysis was used to analyse the documents. Statistical manipulations were deployed to make sense of the quantitative data. Thus a good thematic analysis interprets and makes sense of the data (Clarke and Braun 2013). A six-phase guide provided by (Braun and Clarke 2006) was used as a framework for this study and the steps are as follows: (1) become familiar with the data, (2) generate initial codes, (3) search for themes, (4) review themes, (5) define themes and write-up. Inductive Content Analysis was used for analysing the documents. Content analysis is a research method for making replicable and valid inferences from data to their context, with the purpose of providing knowledge, new insights, a representation of facts and a practical guide to action (Krippendorff 1980).

3.1 Inkosi Albert Luthuli Hospital—Case 1

According to the IALH, to attain a new level of excellence of service, the Kwazulu Natal Department of Health (DoH) specified a single source management solution for a newly constructed 846-bed hospital. The multi-billion rand contract which took effect in 2002 ran for 15 years. The IALH further states that the DoH contracted Impilo consortium to ensure that the public receives clinical services that achieve and maintain the highest standards. Impilo were therefore required to perform several functions—chiefly to supply and replace medical equipment and information management and technology systems so that these remain state of the art throughout the contract period. They were also expected to provide integrated facilities management services including maintenance and replacement of fixed plant and equipment; supply and replace non-medical equipment assets;

provide all services necessary to manage the projects and assets in terms of best industry practice; provide and procure consumable and surgical instruments and manage all utilities (electricity, water, etc.).

3.2 Universitas and Pelonomi Hospitals Co-Location—Case 2

There were two academic hospitals in Bloemfontein and the Free State Department of Health (FSDOH) did not have enough funds to refurbish them as they were considered obsolete. The FSDOH contracted a private partner to refurbish the existing hospitals (Universitas and Pelonomi). The private partner was also required to maintain functional facilities at both hospitals for the duration of the contract. The parties signed a sixteen and half year contract in November 2002. When the contract expires, the private partner was required to return to the FSDH which also included the facilities that were upgraded for private use.

4 Data Analysis and Discussion

Across the board people did not appreciate the word 'obsolescence', but they appeared to recognise 'wear and tear' and 'economic lifespan' of the buildings and equipment. This was highlighted during the pilot study and it became clear that the concept has to be defined and explained to respondents in order to get meaningful responses. Even in the second stage of the study following the pilot stage, only 18% of respondents could immediately identify the term without any assistance and 73% understood with a bit of assistance. On the second objective of causes of obsolescence in South African health facilities, several reasons were given as follows: changes in regulations by governments and municipalities; increased competition; changes in market conditions; improved efficiency of infrastructure; greater capacity of new infrastructure; physical deterioration (wear and tear) and social forces/pressure groups.

The research established that to solve the occurrence of obsolescence in PPP, particularly in the health sector, the powers that be need to make the designs flexible goal and demonstrate pro-activeness in operations and

maintenance. This was in line with findings from Lemer and Iselin (1993), where they concluded that buildings need to be flexible enough to allow for changes in the future. Hospitals are the most susceptible to obsolescence as they have to endure changing demographics and disease patterns. In the twenty-first century, flexibility in design has become even more important especially in the area of medical equipment where they are forever advancing in response to chronic disease patterns. This has challenged the parties to PPP contracts to continuously change not only the equipment but also the layout of the hospitals to accommodate equipment whose sizes and design constantly change.

On the issue of the comparability of the South African legislation vis-à-vis the international best practices, the study revealed that South Africa has legislation that is more or less similar to international best practices. In South Africa, CIDB Maintenance and Management standard is used which is comparable to the International Management Plan (PAS 55-1:2008). It is in light of this that the researcher deduced that the problem lay in the implementation of the legislation which is more of the contract management side of hospitals. This was in line with the findings from Bothma and Cloete (2000), though they were referring to hospitals procured through the traditional method, they asserted that there is a 'bad culture' of not maintaining hospitals in South Africa. Bothma and Cloete (2000) went further to state that there was a lack of vision especially of government officials regarding the maintenance of hospitals and its long-term effects. However, interviewees decried a lack of robust monitoring regimen. Although they asserted that the 'situation is not bad at all' as there are penalties for non-performance, there are things that are encountered that perhaps should not be seen at privately run facilities supported by public funds. A lot of this is attributed to the 'underestimating of the foot traffic' at the facilities which leads to some hospitals being overwhelmed.

However, PPPs are managed by private concessions that have their own maintenance systems that are different from government-run hospitals. Lack of maintenance of PPP facilities cannot be as a result of the concession's failure to maintain hospitals as their counterparts in the private sector seem to be providing a high quality of service. The major cause of lack of maintenance could be the issue of crowding which leads to intense utilisation of PPP facilities. This reason is in line with the findings from the State of Victoria (2005) though that study specifically refers to medical equipment.

5 Conclusion

The study revealed that the majority of the professional and government employees are not immediately familiar with obsolescence as a contractual concept. It was also revealed that there is a need for design flexibility in PPP hospitals as changes are to be expected in the future. There is also a need to make contracts flexible in order to accommodate increased foot traffic at the facility as this is likely to improve the patient turnaround times. It was also observed that when properly maintained and in good working order, PPP health facilities are not adversely affected by locational obsolescence. South Africa has to be commended for having legislation in place that could be compared with the international best practices. However, it is important that there is very strong monitoring of the equipment technical side of the contract to ensure that the tax payers get value for money. The issue of obsolescence has to be articulated properly and communicated to the design teams and government officials so that it is understood across the board and properly planned for and managed efficiently.

6 Recommendations

It is recommended that the adaptable building concept is disseminated to all practitioners involved with PPPs. An Adaptable building is a building whose design and construction takes into consideration how it can be altered to lengthen its lifecycle. The government should look at the experiences of completed PPPs to enhance value for money to the general populace when it comes to obsolescence management.

References

Barrows, D., MacDonald, H. I., Supapol, B. A., Dalton-Jez, O., & Harvey-Rioux, S. (2012). Public-Private Partnerships in Canadian Health Care – A Case Study of the Brampton Civic Hospital. *Journal on Budgeting, 12*(1), 1–14.

Bothma, B., & Cloete, C. E. (2000). A Facilities Management System for the Maintenance of Government Hospitals in South Africa. *Acta Structilia, 7*, 1–21.

Braun, V., & Clarke, V. (2006). Using Thematic Analysis in Psychology. *Qualitative Research in Psychology, 3*, 77–101.

Butt, T., Umeadi, B., & Jones, K. (2010). Sustainable Development and Climate Change Induced Obsolescence in the Built Environment. *International Sustainable Development Research Conference, 30 May–1 June*. Hong Kong, China.

Clarke, V., & Braun, V. (2013). *Teaching Thematic Analysis: Overcoming Challenges and Developing Strategies for Effective Learning*. Bristol: University of West of England.

De La Mora, A. A., & Reilly, R. F. (2012). Confirming the Cost Approach Intangible Asset Value Indication. *Insights*, 35–44.

Fellows, R. F., & Liu, A. M. (1997). *Research Methods for Construction*. Hoboken, NJ: John Wiley & Sons.

Finch, E. (1996). A Sea-Change in Facilities Management. In A. Keith (Ed.), *Facilities Management, Theory and Practice*. London: Routledge.

Kateja, A. (2012). Building Infrastructure: Private Participation in Emerging Economies. *Procedia – Social and Behavioral Sciences, 37*, 368–378.

Krippendorff, K. (1980). *Content Analysis: An Introduction to Its Methodology*. Newbury Park: Sage Publications.

Leedy, P., & Ormrod, J. (2005). *Practical Research: Planning and Design*. Upper Saddle River, NJ: Prentice Hall.

Lemer, A. C., & Iselin, D. G. (1993). *The Fourth Dimension in Building: Strategies for Minimizing Obsolescence*. Washington, DC: National Academy Press.

Naoum, S. (2013). *Dissertation Research and Writing for Construction Students*. New York: Routledge.

Salway, F. (1986). *Depreciation of Commercial Property*. Reading: Calus.

Thomsen, A., & Van de Flier, K. (2011). Obsolescence and the End of Life Phase of Buildings. *Management and Innovation for a Sustainable Built Environment 20–23 June 2011*. Amsterdam.

Van Teijlingen, E. R., & Hundley, V. (2001). The Importance of Pilot Studies. *Social Research Update, 35*.

Victoria, S. o. (2005). *Auditor-General's Report on the Finances of the State of Victoria*. Melbourne: Auditor General Victoria.

Voss, K. (2012). *Functional Obsolescence: A General Overview*. ABA/IPT Advanced Property Tax Seminar. New Orleans, LO: Teamconsulting.

5

The Strategic Benefits of Innovation Adoption in Construction Consultancy Firms: The Role of Quantity Surveyors

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1 Introduction

Innovation helps organizations to overcome turbulent external environment, and therefore the key factor for business survival especially in dynamic markets (Baker and Sinkula 2002; Darroch and McNaughton 2002; Jimenez-Jimenez and Sanz-Valle 2011). Yusof et al. (2010) suggested that, for innovation to be an effective strategy that sufficiently sustains organization within the challenging environment, it should not be treated as a one-time event. Cooper (1998) added to it that firms must

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continuously be innovative to sustain competitive advantage. It has been noticed that a lot of the firms in the construction industry, especially Quantity Surveying firms face the problem of low performance, low levels of profitability, limited investment and poor organizational capabilities (Reichstein et al. 2005). Further studies explain that the major means of breaking free from this problem is by innovation (Reichstein et al. 2005). As a consequence of this, the Quantity Surveying firms have to develop the stamina to challenge the needless and unwanted (outdated) existing practices and implement innovative practices (Olatunji et al. 2010). In spite of this, the Ghanaian firms are reluctant in implementing innovation (Adow et al. 2013). Adow et al. identified that Quantity Surveying firms are being reluctant to implement innovation, but failed to further identify what can drive innovation in Ghanaian Quantity Surveying firms. Construction industry consultants generally referred to as knowledge-based professionals are (person or organization) employed to provide expert analysis and advice that will enhance decision-making; provide specialized and one-of service(s); and, perform task(s) that are not ordinarily available within the departments or agencies of the Clients (Victorian Government Purchasing Board 2004; Ijigah et al. 2012). Construction industry consultants are usually approached and commissioned by clients to provide services relating to the conceptualization, planning as well as the execution of the construction projects (Ibironke 2004). Yusof et al. (2010) emphasized the need for construction organizations' innovation in the face of the continuously increasing technological capabilities, changing clients' requirements, tighter control over environmental regulations and quality standard, rising construction costs, increased competition and other challenges. Masidah and Khairuddin (2005) opined that the Quantity Surveying firms identified, that some of the professional services they render might be needless and

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unwanted by the client, and the only way the Quantity Surveying profession can be attractive is to meet the expected standard of the client. As a consequence of this, the Quantity Surveying firms have to develop the stamina to challenge the needless and unwanted (outdated) existing practices and implement innovative practices (Olatunji et al. 2010).

To date, scant research had been conducted in the area of innovation adoption by consultancy firms (Masidah and Khairuddin 2005). In spite of this, the Ghanaian QS firms are reluctant in implementing innovation (Adow et al. 2013). Consequently, there is insufficient literature on the benefits of adopting innovative practices in construction consultancy firms. Quantity Surveying firms need to adopt innovation in their practices so that they can be competitive in the execution of their services. The objective of this study was to explore strategic benefits of innovation adoption in Ghanaian Quantity Surveying firms. The findings of the paper are also to boost the understanding of undertaking innovations in the construction consultancy firms.

2 Literature Review

2.1 Concept of Innovation

Barrett et al. (2008) explained innovation in construction as 'the act of introducing and using new ideas, technologies, products and/or processes aimed at solving problems, viewing things differently, improving efficiency and effectiveness, or enhancing standards of living'. Innovation is an idea, practice, or project that is perceived as new by an individual or another unit of adoption (Shahin et al. 2014). Innovation is a complex and multidimensional process that has received the attention of researchers in all fields due to its contribution to economic growth, competitiveness and quality of life (Ozorhon et al. 2010). The process of generating new ideas is not the same as applying them in practice and calls for dealing with different critical incident, problems and tasks that require innovative thinking and response so as to overcome any difficulties that might arise (Berdrow and Evers 2010). Construction is a very diverse sector and there is not one single way in which innovation occurs (Ozorhon et al. 2010). Innovation has a vital function to play in leveraging the

competitiveness of firms within the construction industry; in particular, architectural and engineering design (AED) firms (Panuwatwanich and Stewart 2012). The notion of sustainable competitive advantage is increasingly interwoven with the ability of nations and firms to successfully create, manage and exploit appropriate innovation (Barrett and Sexton 2006). It is then important to also focus on the stages of innovation adoption.

2.2 Stages of Innovation Adoption

Stages of innovation which is also known as sequence or chain have been done and classified differently by different researchers in the industry. Wolfe (1994) suggested ten stages including idea conception, awareness, matching, appraisal, persuasion, adoption decision, implementation, confirmation, re-utilization and infusion. Rogers (2010) came out with a six-phase labyrinth of innovation, where the flow of successful innovation comprises need, creation, invention, innovation, diffusion and adoption. Rogers (2010) again was able to offer five stages, namely, knowledge, persuasion, decision, implementation and confirmation. Hansen and Birkinshaw (2007) suggested that innovation as a sequential, three-phase process that involves idea generation, idea development and the diffusion of developed concepts that includes six critical tasks, namely, internal sourcing, cross-unit sourcing, external sourcing, selection, development and companywide spread of the idea. Based on these stages, Ozorhon et al. (2010) suggested that the beginning stage is to form ideas that can happen inside a unit, across units in a company or outside the firm; the second stage is to convert or select ideas for funding and developing them into products or practices, and the last stage is to diffuse those products and practices. Roper et al. (2008) similarly modelled Innovative Value Chain as a repetitive process that has three main links such as 'knowledge sourcing' to assemble knowledge necessary for innovation, 'knowledge transformation' to translate knowledge into physical innovation and finally 'knowledge exploitation' to improve the enterprise performance. This goes to explain that the innovation value chain depicts the stages of innovation that quantity surveying firms can adopt in order to achieve

higher productivity and customer satisfaction. Ozorhon et al. (2010) said that it is possible to use the fundamentals of the Innovation Value Chain structure and investigate the innovation process and at the project level as well as the firm level.

2.3 Benefits of Adopting Innovative Practices in Quantity Surveying Firms

Many researches have been done on the benefits of innovation adoption. This paper explored the available benefits of innovating in consultancy firms through literature review. The identified benefits were noted to be strategic in adopting innovation in consultancy firms because they exert a decisive influence on an organization's likelihood of future success of firms (Siano et al. 2009). According to Adow et al. (2013), the benefits of innovation adoption include an increase in the competitive edge of the market and a reduction in the staff strength needed for the execution of a project. The most significant impact of innovation adoption is improving the company's image, advancing the services and product rendered by the firm, improving and enhancing client satisfaction and improving the current processes adopted by the firm, as shown in Table 5.1 (Ozorhon et al. 2010). Blayse and Manley (2004) furthered the research on benefits of innovation by Ozorhon et al. (2010) and suggested that the more the Quantity Surveying firms become creative and innovative, the higher their chances and opportunities of winning more projects and also advancing the financial results of these projects. Ozorhon et al. (2010) too continued the research by saying that, the other benefits that firms get from innovation adoption includes increase in organizational effectiveness, penetration of market and growth, introduction of new services and processes, increase in technical capability, growth in revenue due to new services, short-term and long-term profitability, advancement of organizational structure, and enhancement of human skills and resources. Ozorhon et al. (2010) add that, the most important outcome or impact of innovation is to be a better company image. Roper et al. (2008) also

Table 5.1 Benefits of innovation adoption

No.	Benefits
1	Improvement of services
2	Improvement of product quality
3	Increase in technical capability
4	New services
5	New processes
6	Revenue growth due to new products and services
7	Improvement of organizational structure
8	Intellectual property (patent, trademarks, design)
9	Improvement of human resources
10	Short- and long-term profitability
11	Market penetration and growth
12	New product
13	Increase in organizational effectiveness
14	Improvement of process
15	Improvement of client satisfaction
16	Better company image

Source: Ozorhon et al. (2010)

proposed that reputation is the most valuable asset for a construction organization or firm and is effective in sustaining long-term competitive advantage.

3 Research Methodology

A quantitative research approach was adopted and primary data were collected from registered quantity surveying firms in the two major cities in Ghana where major construction and consultancy services take place. Literature was extensively reviewed to increase understanding of the topic and to accurately determine the data to be collected for the research (Walliman 2011). A population and sampling size of 43 Good standing Registered QS firms were targeted, and census sampling technique and a questionnaire were used to collect data from top management from each registered quantity surveying firms. A five-point Likert scale was adopted in this study to measure the response of each respondent. Scaling style

was adopted because the data was primarily ordinal. Responded questionnaires were retrieved from the population of the registered Quantity Surveying firms in Accra and Kumasi at a response rate of 67.44%. The response rate became valid and adequate after comparing with 53.7%, believed to be valid and adequate for response rate by Owusu and Badu (2009). This was supported by Ahadzie (2007) when he had 45% as a valid and adequate response rate. The collected data from the questionnaire were coded and analysed using the simple statistical tools; the Statistical Package for Social Sciences (SPSS) version 20 or current version. Tables were used for Interpretation of data to get the valid meaning to the responses. Means score Ranking Analysis was used to rank the dependent variables obtained to establish how they are prioritized by the Ghanaian Registered Quantity Surveying (QS) Firms. Kendall's Coefficient of Concordance was then used to reveal the level of agreement between the variables.

4 Findings and Discussions

In order to make the data collected authentic and credible, it was deemed important to analyse critically the background of the respondent. One key importance of this section is to establish the trustworthiness or otherwise, and generate confidence in the data collected.

The purpose of the gender was to show the number of males and females who were able to respond to the questionnaires sent by the Quantity Surveying firms. This is illustrated in Table 5.2. The results in Table 5.2 indicate that, out of 29 respondents, 79.3% were males and 20.7% were females. This means that more males responded than the females in the firm. This could be as a result of the high number of males in the construction industry. Identifying the positions in the firms will make sure the targeted respondent actually answered the questionnaires. The validity of the information will depend on the information retrieved from this part. The result in Table 5.2 indicates that out of 29 responses, 13.8% were managers, 13.8% were senior executives, 10.3% were executive directors and 62.1% were from other top management whose positions were not indicated in the questionnaire but upon the power of

Table 5.2 Background analysis of respondents

Variables		Frequency	Percentage, %	Cumulative percentage, %
Gender	Male	23	79.3	96.2
	Female	6	20.7	100.0
	Total	29	100.0	
Positions in the Firm	Manager	4	13.8	13.8
	Senior Executive	4	13.8	27.6
	Executive Director	3	10.3	37.9
	Other	18	62.1	100.0
	Total	29	100.0	
Status of the Firm	Sole proprietorship	1	3.4	3.4
	Private Limited company	16	55.2	58.6
	Partnership	2	6.9	65.5
	Other	10	34.5	100.0
	Total	29	100.0	
Years of the existence of the Firm	Less than 5 years	2	6.9	6.9
	5–10 Years	7	24.1	31.0
	11–15 Years	8	27.6	58.6
	16–20 years	1	3.4	62.1
	Above 20 years	11	37.9	100.0
	Total	29	100.0	
Years of Experience in the Firm	Less than 5 years	18	62.1	62.1
	5–10 years	7	24.1	86.2
	11–15 years	4	13.8	100.0
	16–20 years	0	0	
	Above 20 years	0	0	
	Total	29	100.0	
Types of services of the Firm	Building Services	11	38.0	38.0
	Civil Engineering services	1	3.4	41.4
	Both Building and Civil Engineering Services	16	55.2	96.6
	Research and Development	1	3.4	100.0
	Total	29	100	
Type of Client	Private	4	13.8	13.8
	Public/Government	11	37.9	51.7
	Both Private and Government	14	48.3	100.0
	Total	29	100	

delegation were allowed to respond. According to the analysis, most of the top management was delegated to respond to the questionnaires.

The relevance of the status of the firm is to make us aware how the firm is operating and its stands. It also depicts the ownership of the firm. The ownership type of the firm determines how it will operate and how it relates to clients, employees and other firms (Badu and Owusu-Manu 2011). This can also make the result of the information received authentic and reliable.

The results in Table 5.3 also indicate that out of 29 responses on the status of the firm, 3.4% is a sole proprietorship, 55.2% are a private limited company, 6.9% are Partnership and 34.5% are others which were indicated that they are managed by the government. This concludes that the majority of the Quantity Surveying firms in Accra and Kumasi is a private limited company. The number of years of existence of the Firm will have a great impact on the authenticity and credibility of the information given out. Table 5.3 shows that, out of 29 responses from firms,

Table 5.3 Benefits of innovation adoption using the mean score ranking

Strategic benefits	Mean	Standard deviation	Rank
Improvement of client satisfaction	3.93	1.033	1st
Market penetration and growth	3.79	0.902	2nd
Increase in technical capability	3.76	0.872	3rd
Improvement of human resources	3.72	0.922	4th
Improvement of process	3.69	0.891	5th
New processes	3.69	0.891	6th
Increase in organizational effectiveness	3.69	0.967	7th
Improvement of product quality	3.69	1.039	8th
Improvement of services	3.69	1.072	9th
Revenue growth due to new products and services	3.66	0.974	10th
Better company image	3.59	0.983	11th
New services	3.55	0.948	12th
Intellectual property (patent, trademarks, design)	3.48	0.829	13th
Short-term and long-term profitability	3.48	0.911	14th
New product	3.45	0.985	15th
Improvement of organizational structure	3.34	0.936	16th

6.9% are less than 5 years, 24.1% are 5 to 10 years, 27.6% are 11 to 15 years, 3.4% are 16 to 20 years and 37.9% are above 20 years. This concludes that majority of the responses were from firms which have above 20 years of existence, thereby making the information more authentic, credible and reliable whilst 16 to 20 years of experience had the least responses. The number of years in a firm also has a great impact on the credibility and reliability of the information given out. It also shows the experience of the respondent in the firm. Table 5.3 shows that, out of 29 responses collected from the firms, 62.1% have experienced less than 5 years, 24.1% have 5 to 10 years of experience and 13.8% have 10 to 15 years. None of the respondents has experienced greater than 15 years, thereby 16 to 20 years and above 20 years recording 0%. The table then concludes that the majority of the respondents have less than 5 years of experience, thereby showing how reliable the information is.

The type of service also has a great impact on the reliability of the information collected. The results in Table 5.3 shows that, out of 29 responses from the firms pertaining to the type of services, 37.9% are building services, 3.4% are civil engineering services, 55.2% are both building and civil engineering services and 3.4% are Research and Development. Analysis of the data concludes that the Majority of the services from the respondents are both Building and Civil engineering services whilst research and development is the least service. This makes the information reliable when in comparison with building works and civil works. This is also a very important factor when considering the reliability and credibility of the data collected from the respondents. The results in Table 5.3 show that, out of 29 responses collected from the firms, 13.8% had private client, 37.9% had a government client and 48.3% had both private and government as a client. The result goes further to conclude that the majority of the firms that responded to the question have private and government as a client whilst the least percentage is from only the private client.

5 Discussion on the Strategic Benefits of Innovation Adoption

The chapter established statistical evidence based on the result using the Means score ranking analysis by the use of SPSS tool, as well as determining the level of agreement on the strategic benefits variables.

Table 5.3 shows the various variables that fall under the strategic benefits of innovation adoption in Ghanaian Quantity Surveying firms. These variables are ranked based on the means score analysis including improvement of services (3.69), improvement of product quality (3.69), increase in technical capability (3.76), new processes (3.69), revenue growth due to new product and services (3.66), improvement of human resources (3.72), market penetration and growth (3.79), increase in organizational effectiveness (3.69), improvement of process (3.69), improvement of client satisfaction (3.93), new services (3.55), improvement of organizational structure (3.34), intellectual property (patent, trademarks, design) (3.48), short-term and long-term profitability (3.48), new product (3.45) and better company image (3.59). Improvement of client satisfaction (3.93) was ranked the highest among all the strategic benefit variables of innovation adoption and improvement of organizational structure (3.34) having the least ranking. Furthermore, this concludes that improvement of client satisfaction (1st) is the most significant strategic benefit in innovation adoption that the Ghanaian Quantity surveying firms look up to. The result is supported by Masidah and Khairuddin (2005) when they suggested that Quantity Surveying can be made attractive by meeting the expected standard of the client. With the same variable which was used by Ozorhon et al. (2010), they concluded that better company image is the most significant benefit of innovation adoption. Roper et al. (2008) agreed with him by saying that, for a construction firm, reputation is the most valuable asset. Ozorhon et al. (2010) came out with intellectual property as the lowest significant to the respondents. The low significance of intellectual property reinforces the point made by Rogers (2010) and Reichstein et al. (2008), who suggested that construction companies tend to invest less in Research & Development and rarely create new patents. Ozorhon et al. (2010) again added that

Table 5.4 Test of Concordance using Kendall's coefficient of concordance

Population, *N*	29
Kendall's W[a]	0.769
Chi-Square	318.128
Df	10
Asymp. Sig.	0.000

[a]Kendall's Coefficient of Concordance

'measurements that relate to outcomes based on traditional science-based indicators of innovation do not reflect the focus of activity of contractors and consequently will give a poor indication of actual innovative activity'. With this research study, the result was inconsistent with the literature review because the environment and the population were different. The respondent chose the improvement of client satisfaction as the most important benefit because the client is their target and improvement of organizational structure as the least significant. This then proved Ozorhon et al. (2010) adding improvement of client satisfaction as benefits of innovation adoption.

Table 5.4 shows the level of agreement on the variables of strategic benefits of innovation adoption in Ghanaian Quantity Surveying firms. Kendall's coefficient of concordance for the test is 0.769, which showed that there is a level of positive strong agreement by the respondents on the variables for the strategic benefits of innovation adoption. The findings portrayed that the variables in the table are statistically significant because the table has $p(\text{Sig}) < 0.05$ with Kendall's coefficient of concordance of 0.769. It also shows that respondents agree with each other to a reasonable extent. This then contributed to the fact that all the variables are agreed fairly to be strategic benefits of adopting innovation in consultancy firms.

6 Outcome

The findings of this research are significant to the construction consultancy firms and can be extended to other professionals in the construction industry. This study will aid the Quantity Surveying firms to identify

and to also increase their levels of competitiveness since the ability to innovate can give rise to the likelihood of the firms to gain a competitive advantage over their industrial rivals. Hansen and Birkinshaw (2007) supported this by saying that innovation is considered as one of the essential ingredients of competitive advantage given that it is an intangible component that is difficult for competitors to replicate. This chapter revealed that the improvement of client satisfaction is the main strategic benefits of adopting innovation in construction consulting firms. Masidah and Khairuddin (2005) agreed that the work of Quantity Surveyors can be made attractive by meeting the expected standard of the client. The discovery by this chapter was that, the construction industry needs to concentrate on the needs to tackle the aspect of innovation performance which will then help to improve the aim of satisfying client in the construction industry, thereby the findings of the research being valuable to innovation policy makers, stakeholders and other professional bodies in the construction industry. Theoretically, the study sought to provide a theoretical understanding of innovation adoption in construction consultancy firms by making it aware that clients satisfaction is the ultimate objective for adopting innovation. It is also trusted that the result will act as a literature review for further studies in the construction industry. With the contribution of making client satisfaction as the ultimate aim, this chapter then adds to the theoretical understanding of innovation adoption in construction consultancy firms.

7 Conclusion

The findings of this chapter have pointed out the underlining strategic benefits of adopting innovation in the construction industry by the consultancy firms, including improvement of services, improvement of product quality, increase in technical capability, new processes, revenue growth due to new product and services, improvement of human resources, market penetration and growth, increase in organizational effectiveness, improvement of process, improvement of client satisfaction, new services, improvement of organizational structure, intellectual property (patent, trademarks, design), short-term and long-term profitability, new product

and better company image. Improvement of client satisfaction was attained via extensive literature review on the innovation adoption. It was then established that the improvement of client satisfaction is to be the aim of adopting innovation in construction consultancy firms. This chapter, therefore, contributes strongly to innovations in the construction industry. The study adopted a quantitative technique; henceforth, there is a need to adopt the qualitative technique to reduce the errors found in the use of the quantitative technique. The data collected were limited to the registered Ghanaian Quantity Surveying firms with a census sample of 67.44% response rate from the registered Ghanaian Quantity Surveying firms. In spite of these few limitations, the study results have not been compromised in any way and hence worthy of use. The results of this research could be used as a basis for further research in the construction industry. It is recommended that research with relevant issues regarding innovation policy in the construction industry can also be looked into.

References

Adow, O., Allotey, S. E., & Arthur-Aidoo, B. M. (2013). The Impact of Innovation of the Construction Industry in Ghana. *Civil and Environmental Research, 3*(*12*), 120–126.

Ahadzie, D. K. (2007). *A Model for Predicting the Performance of Project Managers in Mass House Building Projects in Ghana*. Doctoral dissertation, University of Wolverhampton.

Badu, E., & Owusu-Manu, D. (2011). An overview of construction activities in Kumasi. *The Future of the Tree-Towards Development and Growth*, 1st, 270–289.

Baker, W. E., & Sinkula, J. M. (2002). Market orientation, learning orientation and product innovation: delving into the organization's black box. *Journal of Market-focused Management, 5*(1), 5–23.

Barrett, P., & Sexton, M. (2006). Innovation in small, project-based construction firms. *British Journal of Management, 17*(4), 331–346.

Barrett, P., Sexton, M. & Lee, A. (2008). *Innovation in Small Construction Firms*. https://books.google.com/books; http://www.reading.ac.uk/AcaDepts/kc/wkc1/source/bon/2000/Barrett.pdf, Routledge.

Berdrow, I., & Evers, F. T. (2010). Bases of Competence: An Instrument for Self and Institutional Assessment. *Assessment & Evaluation in Higher Education, 35*(4), 419–434.

Blayse, A. M., & Manley, K. (2004). Key Influences on Construction Innovation. *Construction Innovation, 4*(3), 143–154.

Cooper, C. L. (1998). The Changing Nature of Work [1]. *Community, Work & Family, 1*(3), 313–317.

Darroch, J., & McNaughton, R. (2002). Examining the Link between Knowledge Management practices and types of Innovation, *Journal of Intellectual Capital, 3*(3), 210–222. https://doi.org/10.1108/14691930210435570.

Hansen, M. T., & Birkinshaw, J. (2007). The Innovation Value Chain. *Harvard Business Review, 85*(6), 121.

Ibironke, O. T. (2004). *Contract Law and Arbitration for Construction Works*. BirninKebbi, Nigeria: Adewale Press.

Ijigah, E. A., Oloruntoba, K., & Mohd, H. R. (2012). Towards Accomplishing Millennium Development Goals (MDGs) In Abuja FCT Nigeria: The Project Management Consultants Roles. *International Journal of Research in Management & Technology, 2*, 414–424.

Jiménez-Jiménez, D., & Sanz-Valle, R. (2011). Innovation, Organizational Learning, and Performance. *Journal of Business Research, 64*(4), 408–417.

Masidah, A. M., & Khairuddin, A. R. (2005). The Expectation of Clients, Architects and Engineers on the Roles and Functions of Quantity Surveyors in Relation to Cost Control of Building Projects. *Proceedings, Quantity Surveyors' (Biennial) Convention* (pp. 19–29), University of Malaya, Malaysia.

Olatunji, O. A., Sher, W., & Gu, N. (2010). Building Information Modelling and Quantity Surveying Practice. *Emirates Journal for Engineering Research, 15*(1), 67–70.

Owusu, M. D., & Badu, E. (2009). Determinants of Contractors' Capital Investment Finance Strategy in Ghana. *Journal of Financial Management of Property and Construction, 14*(1), 21–33.

Ozorhon, B., Abbott, C., Aouad, G., & Powell, J. (2010). Innovation in Construction: A Project Life Cycle Approach, *SCRI Research Report*, SCRI, UK, pp. 13–14.

Panuwatwanich, K., & Stewart, R. A. (2012). Evaluating Innovation Diffusion Readiness Among Architectural and Engineering Design Firms: Empirical Evidence from Australia. *Automation in Construction, 27*, 50–59.

Reichstein, M., Kätterer, T., Andrén, O., Ciais, P., Schulze, E. D., Cramer, W., et al. (2005). Does the Temperature Sensitivity of Decomposition Varies with Soil Organic Matter Quality? *Bio Geosciences Discussions, 2*(4), 737–747.

Reichstein, T., Salter, A. J. & Gann, D. M. (2008). Break on through: Sources and determinants of product and process innovation among UK construction firms. *Industry and Innovation, 15*(6), 601–625.

Rogers, E. M. (2010). (4th ed), *Diffusion of Innovations*, https://www.simonandschuster.com/books/Diffusion-of-Innovations-4th-Edition/Everett-MRogers/9781451602470, Simon and Schuster.

Roper, S., Du, J., & Love, J. H. (2008). Modelling the Innovation Value Chain. *Research Policy, 37*(6–7), 961–977.

Shahin, A., Abzari, M., & Abasaltian, A. (2014). Developing a Conceptual Framework for Knowledge Sharing Behavior by Considering Emotional, Social and Cognitive Intelligence Competencies. *Kuwait Chapter of Arabian Journal of Business and Management Review, 33*(2579), 1–12.

Siano, P., Ochoa, L. F., Harrison, G. P., & Piccolo, A. (2009). Assessing the Strategic Benefits of Distributed Generation Ownership for DNOs. *IET Generation, Transmission & Distribution, 3*(3), 225–236.

Victorian Government Purchasing Board. (2004). *Parliament of Victoria*, https://www.parliament.vic.gov.au/file_uploads/Vic_Government_Purchasing_Board_RKGJstL2.PDF, Accessed: February 2017.

Walliman, N. (2011). *Your Research Project: Designing and Planning your Work*. Sage Publications, United Kingdom.

Wolfe, R. A. (1994). Organizational Innovation: Review, Critique and Suggested Research Directions. *Journal of Management Studies, 31*(3), 405–431.

Yusof, N. B., Shafei, M. W. M., Ilias, S., & Anidin, N. Z. (2010). Factors Influencing Firms Readiness Towards Innovation in House Building Industry; A Multi-dimensional construct. *International Journal of Organizational Innovation, 2*(3), 74–86.

6

Factors Affecting Effective Infrastructure Service Delivery in Zambia's Local Authorities: A Case of Eastern Province

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1 Introduction

Local government is the most important sphere of central government as it is at the coalface of service delivery and the closest to the people. Thus, the public relies significantly on local government to deliver services even though the delivery still remains a challenge in most African countries (Koma and Tshiyoyo 2011). Egberi and Madubueze (2014) agree that in most countries,

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especially in the developing countries, delivery of primary education and healthcare services continue to be a major challenge to responsible and responsive local governments. According to the Organisation for Economic Co-operation and Development (OECD) (2010), cities across the world face the most severe challenges of service delivery due to fast growing populations. Inadequate public services have been holding back the productivity of Sub-Saharan Africa and impose major costs on business. It is widely acknowledged that, infrastructure deficit is one of the key factors that prevent the Sub-Saharan African region from realising its full potential for economic growth, international trade and poverty reduction (Adetola et al. 2011).

The Government of the Republic of Zambia's (GRZ) development agenda is articulated in both the Sixth National Development Plan (SNDP) and the National Vision 2030 (ZDA 2014). The aim is to ensure availability of reliable and affordable public infrastructure services for sustained economic development (SNDP 2011). Zambia is a low-middle income country with a population of 14.6 million (CIA 2015) and a growth rate of 3% per annum (CSO 2012) whose increasing population has placed growing pressure on local government structures to scale up the delivery of basic services for both residents and businesses, hence a sustained commitment to infrastructure development is the main focus. When delivery of public services is constrained or becomes ineffective, it affects the quality of life of the people and the nation's development agenda (Gathungu and Owanda 2012).

In Zambia, LAs and the government are implementing a number of infrastructure projects ranging from roads, health facilities (hospitals and clinics), water and sanitation, markets, bus station and housing. These are aimed at ensuring improved and better service delivery which ultimately will mean better health, education, transportation, accommodation, trading places and so forth (SNDP 2011).

The Zambia Development Agency (ZDA) (2014) agrees that infrastructure service delivery remains a major challenge to growth, economic diversification and human development in Zambia. This statement recognises the presence of challenges being faced in infrastructure service delivery. Further, basic determinants of better health to citizens, such as access to decent housing, clean water and sanitation are still in a critical state according to the Zambia Demographic and Health Survey (ZDHS) (2015).

Additionally, most LAs are non-functional and have largely been ineffective and inefficient in meeting their core mandate. The provision of social infrastructure services is a critical factor for economic growth and service delivery, but the public sector has traditionally financed and operated infrastructure projects using resources from taxes and various levies which clearly have not been adequate. Currently, the technical quantity of infrastructure can easily be tabulated. However, it cannot easily be established whether it is adequate or sustainable for the provision of infrastructure development to the people. Adetola et al. (2011) postulate that in many cases, the government and LAs could be issuing half-measure solutions to challenges faced by the general public mainly due to insufficient financing, poor project and technical specifications, poor practices against generic engineering norms, insufficient planning and budgeting processes as well as monitoring and evaluation processes.

The study aimed at determining the extent to which infrastructure assets have been created by evaluating service delivery capabilities to enhance the economy, efficiency and effectiveness in service delivery under the LAs in Eastern Province. One of the outcomes of the study is to develop the service delivery framework that addresses the challenges faced by the LAs in order to improve and strengthen responsibility and accountability through service delivery stakeholder involvement. This study was conducted on both donor and government funding to finance the implementation of various infrastructure projects in the LA in Eastern Province.

2 Research Methodology

The research adopted a purely qualitative study design and techniques to answer the research questions. The study used case studies in selected LAs to examine the elements of the service delivery evaluation. The case studies were crucial in understanding the project quality and quantity delivered such as the physical quality of constructed buildings, roads, bridges and drainage facilities. These quality checks were benchmarked by the architectural and engineering designs, project specifications against best practices obtained in generic civil and building engineering practices.

Purposive sampling was used because the study required respondents who were adequately vested with social service provision and had knowledge in the engineering aspect of construction with regard to infrastructure service provision.

In each case study location, a series of in-depth interviews, brainstorming questions and use of questionnaire were used as data collection tools. The number of interviews varied depending on the availability of and presence of key personnel in the respective local authority in form of descriptions. Structured interviews were administered on specific individuals within the fields of procurement, finance, engineering, planning and administration. The information gathered through the interviews and discussions was used to validate the responses and findings of the survey tool. Literature review of published materials in the area of public service delivery and local government was undertaken. This mainly involved desk study that helped in guiding and developing the discussions and survey tools used in the research. Data collected was analysed through critical thinking using qualitative analysis.

It was recognised that the extent to which a single respondent could accurately report on the organisation's ability to handle funded projects taking into consideration the infrastructure project's technical knowledge levels may be questioned. The study was designed to invite frank responses and suggestions. Therefore, the outcome of the study is developing the service delivery framework that addresses the challenges faced by the LAs in order to improve and strengthen responsibility and accountability through service delivery stakeholder involvement.

3 Findings

The respondents of the LAs included directors of planning, district planning officers, directors of engineering services, directors of works, and directors of finance, council treasurers, procurement officers and directors of administration. A total of 58 employees were considered for this study and only 52 were available for interviews from the 9 LAs in Eastern Province. The response rate was 90% and thus acceptable.

3.1 Infrastructure Service Provision

During the course of this study, numerous infrastructure projects were underway in all the districts of Eastern Province as shown in Table 6.1.

Concerning quality of workmanship on these projects, it was learnt in Chipata district that those projects spearheaded by central government and international cooperating partners tend to be of good quality while

Table 6.1 Projects being undertaken in Eastern Province

Name of council	Project being undertaken	Source of funding
Chipata	Construction of urban roads, CDF projects, e.g. community schools, bridges and boreholes, Construction of Chipata District Hospital	Government
Katete	Construction of a dam, Building schools under CDF, Construction of teachers' houses, Drilling of community boreholes	Government/ KfW & UNICEF
Sinda	Establishment of an abattoir, Construction of Civic Center administration block/District administration block, Establishment of police station, Erection of housing units for civil servants, Construction of Sinda Day Secondary School	Government
Petauke	Construction of mothers' shelter at Chikuse, Building of Recreation Hall, CDF projects including feeder roads, boreholes, bridges	Government
Nyimba	Building of a library, Prison ablution block, Rehabilitation of bus station, Establishment of Nyimba District Hospital, Houses for civil servants	Government
Lundazi	10km Urban roads, 3x(27km) feeder roads, Lundazi District Hospital, Lundazi Trades College, Rehabilitation of Mwase Dam	Government
Mambwe	Rehabilitation of council guest house, Construction of houses for civil servants, Rehabilitation of dysfunctional boreholes	Government & KfW
Chadiza	Upgrading of 18 km urban roads, Construction of bridges, Rehabilitation of boreholes	Government
Vubwi	Hospital (Vubwi District Hospital), Post Office, Civic center (administration block), House for District Commissioner, Ablution block for Civic Center	Government

Source: Made by the authors

those under Community Development Funds (CDF) were generally of poor quality. Katete submitted that the quality of projects was average and echoing that CDF projects were the worst in terms of quality. For Sinda, Katete and Nyimba respectively, the different respondents said "Good." The findings revealed that the quality on feeder roads and hospital construction in Lundazi was good; nonetheless, urban roads were slow and poorly done. Lundazi further submitted that CDF projects were too many yet little money was allocated, for instance, at the time of this study, Lundazi had 269 on-going projects in 3 constituencies but only ZMW4.3m was allocated. In Mambwe, the study learnt that the quality of workmanship was excellent. In Vubwi, it was found out that the undertaken projects were of good quality, but that implementation was slow.

3.2 LAs' Ability to Technically Review Project Documents

The study revealed that councils in Eastern Province had varied capacities to technically review project documents as showed by Table 6.2.

3.3 Possession of Key Project Reports

Almost all the councils in Eastern Province were at the time of this study without key project reports in their possession namely Preliminary Design Reports, Detailed Design Reports and As-Built Reports. Only Petauke district council had all the detailed design and some of the preliminary design reports.

3.4 Extent of Design Changes Between Reports and Actual Projects Executed

With regard to the extent to which the actual implementation of projects differs from initial plans in design reports in Eastern Province, the study observed significant deviations among the districts as showed by Fig. 6.1. Lundazi District Council submitted extreme major changes while Vubwi maintained no changes between planned and actual projects.

Table 6.2 Councils capacity to technically review project documents

Project document	Name of council and strength of capacity			
	Very strong	Strong	Medium	Weak
Tender documents	Petauke, Mambwe	Vubwi, Chadiza, Nyimba, Sinda, Chipata, Lundazi, Katete	–	–
Bid documents	Petauke, Mambwe	Chadiza, Nyimba, Sinda, Chipata, Lundazi, Katete	Vubwi	
Technical designs	Petauke, Chipata	Nyimba, Sinda, Mambwe	Vubwi & Chadiza	Lundazi, Katete
Evaluation Reports	Sinda, Petauke Mambwe & Katete	Chadiza Nyimba, Chipata, Lundazi	Vubwi	
Interim Payments Certificate	Nyimba Sinda, Petauke Chipata, Mambwe, Katete	Vubwi & Chadiza	–	Lundazi
Contractors' claims	Vubwi, Sinda, Chipata, Katete	Nyimba Petauke, Mambwe	Chadiza,	Lundazi
Variation claims	Vubwi, Sinda, Chipata, Katete	Nyimba Petauke, Mambwe	Chadiza,	Lundazi
Extension of time claims	Vubwi, Sinda, Katete	Nyimba, Petauke, Chipata, Mambwe	Chadiza	Lundazi
Instruction from Clients' delay	Vubwi, Mambwe, Katete	Chadiza Petauke, Nyimba, Sinda, Chipata	–	Lundazi
Govt. contract copies	Vubwi, Chadiza, Petauke, Mambwe, Katete	Nyimba, Sinda, Chipata, Lundazi	–	–

Source: Made by the authors

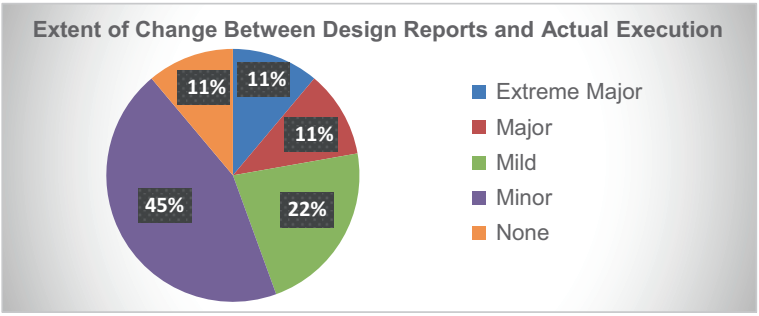

Fig. 6.1 Extent of design changes between design reports and actual execution projects. (Source: Made by the authors)

3.5 Major Factors Influencing Project Implementation

The study revealed that the districts of Eastern Province are influenced mostly by the financial factor (31%) regards how projects are implemented, followed by the political (25%) and personnel factors (23%). The technical factors (21%) were found to be the least in influencing the implementation of the project.

3.6 Major Problems Faced by the LAs in Service Provision

The study found that there were numerous problems in the provision of services categorised as internal and external. Table 6.3 summarises these challenges and the effects.

3.7 Factors That Influence the Selection and Location of a Project

The study revealed that population size of a locality was one of the major factors influencing selection and location of the project. Where there are more people, there is likelihood for a project. Community demand was

Table 6.3 Problems faced by councils in the provision of services

Type of problem	Description of problem	General effects on service delivery
Internal	• Lack of capital investment	• Poor access to services
	• Poor work-culture	• Poor Quality of services
	• Inadequate qualified manpower	• Poor Quality of services
	• Poor council management	• Poor Quality of services
External	• Political interference	• Poor access to services
	• Central government interference and bureaucratic delays	• Inequity or marginalisation of some areas
	• Poor attitude by local people towards wellbeing of districts (Collective action)	• Poor Quality of service

Source: Made by the authors

also found to be a factor for the LA to undertake the project demanded. Other factors include financial resources available for the project and political influence due to imposed projects from the central government.

3.8 Challenges in Infrastructure Service Provision

The study findings indicated numerous challenges in Eastern Province inadequate basic infrastructure to facilitate affordable public service delivery such as clean portable water, sewerage reticulation, power supply, garbage collection and disposal. Table 6.4 indicates the major needs by district as per study findings.

From political interference of the higher levels of government to inadequacy of well-trained and qualified personnel are some of the impediments that have been infringing on local government performance and functions in recent times. The study also disclosed that budget formulation process is spearheaded by the Finance and General Purposes Committee of a given council and does not include ordinary people representation for consultation. Lack of revenue or failure to expand the revenue base was found to compromise the final incomes of LAs resulting in inadequate, ineffective and inefficient responses to public demands or needed investments.

Table 6.4 Major community needs by district

District	Major community needs in the district
Chipata	Water and Sanitation Facilities (the district has piped water and sewer network in urban areas only); Roads; Boreholes; Markets and Bus Stations; Land fill; and Library.
Katete	Roads; Water & Sanitation Facilities (only urban areas have access to piped water with only 10% coverage. The district has no sewer network); Hospital; Markets and Bus Stations Infrastructure; Secondary Schools (there are only 2 in the district—Chisale and Katete Day Sec. School).
Sinda	Housing; Roads; Piped Water (the district has no piped water and no sewer network); Burial Sites; Engineered land fill.
Petauke	Water and Sanitation Amenities (only urban areas have access to piped water with only 100% coverage. The district has no sewer network); Health facilities; Primary Schools; Stadium; Garbage Collection; and Fire Services.
Nyimba	Township Roads; Sewer ponds and network; Stadium/community hall/library, Street lighting; and Trades school.
Lundazi	Water (only urban areas have access to piped water with only 80% coverage. The district has no sewer network); Roads; Housing; Hospital; Garbage collection; Play parks.
Mambwe	Piped Water (only urban areas have access to piped water with only 5% coverage. The district has no sewer network). Most boreholes are yielding salt water; Food Security; Bridge on Msoro Road.
Chadiza	Water and Sanitation Facilities (only urban areas have access to piped water with only 100% coverage. The district has no sewer network); Roads and Bridges; Health Facilities; Sporting Facilities; Markets Infrastructure; Sewer treatment plant/ponds.
Vubwi	Roads; Primary Schools; Bridges; Water—the district has no piped water or sewer network.

Source: Made by the authors

3.9 Factors Affecting Effective Infrastructure Service Delivery

Generally, councils in Eastern Province face numerous problems in the provision of services. These can be categorised as internal and external. Internal problems are those which emanate from within the council while external ones stem from outside the organisation. All nine districts identified lack of capital investment and inadequate qualification of workers as major challenges faced by the Councils. Chipata, Mambwe, Vubwi,

Lundazi and Nyimba identified poor work culture and poor council management as problems in the Councils. Chipata, Lundazi, Katete and Mambwe indicated that political and central government interference were major challenges in the running of Councils, while all Councils identified poor attitude by the locals towards wellbeing of the districts as a challenge.

3.10 Proposed Framework for Infrastructure Service Delivery

One of the outcomes of the study was developing the service delivery framework that addresses the challenges faced by the LAs in order to improve and strengthen responsibility and accountability through service delivery stakeholder involvement. The proposed model suggests involvement of private sector in public infrastructure service delivery to quell over reliance on government funding as indicated in Fig. 6.2. It is important that this model of infrastructure service delivery is transparent to the community and all other stakeholders such as private sector participation.

Private sector involvement allows for the creation of Public-Private-Partnership (PPP) arrangements between public and private sectors on shared objectives for the delivery of public infrastructure and/or public services by the private sector that would otherwise have been provided through public sector financing. The PPP signifies reliance upon the private sector for financing capital investment projects to benefit on revenue streams to be generated by the future facility, and incorporating the use of private skills, expertise and culture in operating public service projects more efficiently, effectively and sustainably (Cankar and Petkovšek 2013).

Major roles faced by the LA in this framework is to determine the service needs of the communities, ensure community participation in decision making, securing government funding for infrastructure projects, minimise the overall cost of delivery, ensure availability of skills and relevant experienced qualified personnel, and meet different service-level target requirements. While crucial objectives of the central government is to provide the necessary political will, timely and adequate financing of

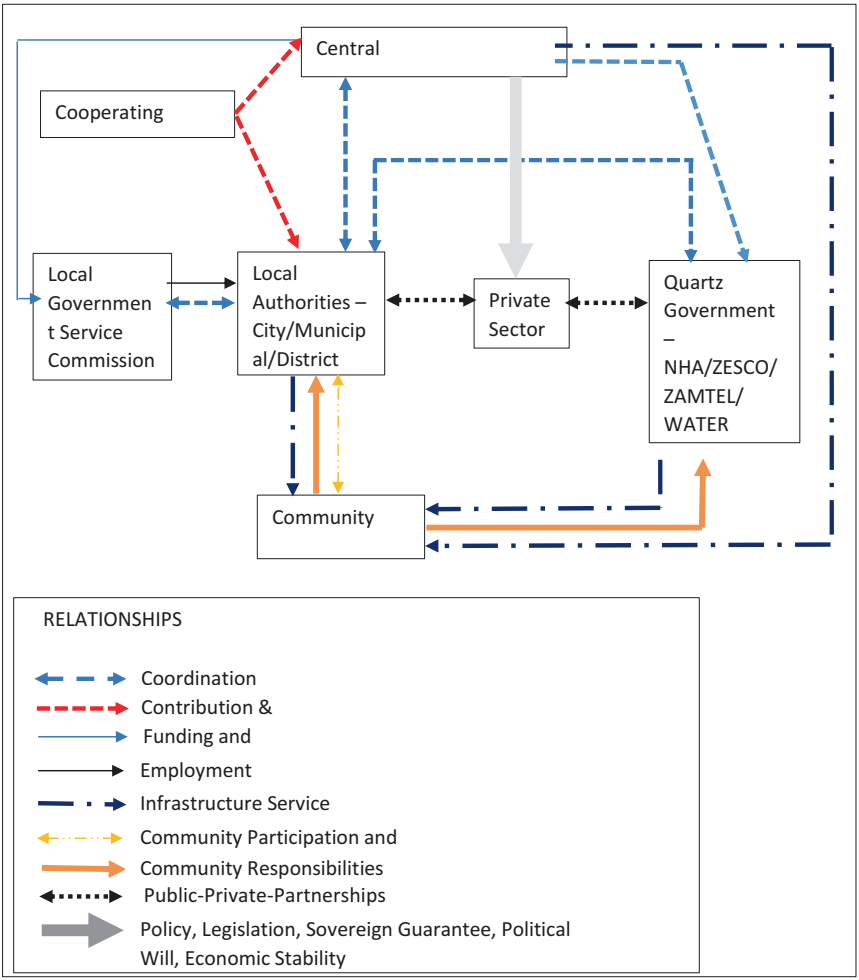

Fig. 6.2 Proposed relationships that exist in the developed service delivery framework. (Source: Made by the authors)

projects and monitoring performance of LAs for continuous process improvement, besides many others. While cooperating partners: provide technical and financial support; delegate programme implementation to central and local government; support sound governance and leadership systems; support Capacity Building Programmes; develop partnerships

with communities and government; support in designing strategies and policies; and provide Budget Support.

4 Discussion

Lack of capital investment was one key internal factor in service delivery. As a general conclusion, public service provision has been and will most probably remain the core issue of the operations in both in rural and urban public service organisations. This view is in fact noted by Chazovachii et al. (2012) who argue that inadequate government grants and poor budget performance contribute to financial constraints that hinder the delivery of services. It is worth emphasising that it is practically impossible for councils in Eastern Province in particular and Zambia in general to perform effectively in view of their weak financial muscle.

There is generally poor work-culture in the councils coupled with delay in the provision of information. Inadequately qualified manpower constitutes another problem. The continual engagement and or involvement of non-professionals in LAs to perform strategic functions does not add any significant value to the system in terms of efficiency and effectiveness (Inyang and Akaegbu 2014). There is also a need to introduce principles of good governance which should be integrated into the training programmes of these individuals (Baron and Ochojski 2015). Particular issues of Council Administration such as the personnel system, organisation structure and the administrative decision-making procedures were beyond the scope of this study. Effective financial administration is imperative in any local government authority. The ways in which elected and appointed officials ensure that financial respect is maintained, for example, in the keeping of accounts, preparation of financial reports and avoiding dishonesty have a direct bearing on a LA's ability and capacity to deliver services.

Central government and political interference and bureaucratic delays; and poor attitude of the local people towards the wellbeing of the city are some of the major exterior difficulties faced in LAs as indicated in the findings. There is a need to comprehend that poor governance of public sector is related to ineffectiveness and inefficiency of service delivery

(Mohamad et al. 2014). In many other words, the bottom line of governance is the ability to respond to the needs, aspirations and yearnings of majority of the citizenry. a mandate which calls for relentless dynamic processes which identifies problems, challenges and development of new creative ideas, and the selection and implementation of new solutions (Cankar and Petkovšek 2013).

The study resolved that at the local level, institutions and participatory development mechanisms are often weak, resulting in poor service delivery. The Second Schedule, Section 61 of the Local Government Act, outlines a total of 63 specific functions which local authorities in Zambia are expected to perform. In practice, however, most if not all the local authorities in Eastern Province, including those in the rest of the country, do not adequately perform these functions. It is worth emphasising that it is practically impossible for councils in Eastern Province in particular and Zambia in general to perform effectively all the devolved functions as stipulated by the Act in view of their weak financial muscle. If they tried, service provision would be marginal, unreliable and dismal, and this actually is the case in the province. Meanwhile, the general public is yearning for accurately and timely administered social services which bear significant and positive effect in their lives.

The findings of the study noted that infrastructure service provision in the province is largely uncoordinated and there is none or inadequate provision of enough funds hence hindering the effective performance by the LAs. While almost all the councils in Eastern Province were found to have a weak revenue base. Other issues noted from the findings of the study are that there was a strong tendency to haphazardly implement projects, and most of the projects did not adhere to tenets of good project management (such as adherence to timeframe, proper budgeting, timely supply of materials to project sites, adequate consultation with the local people who are the ultimate project beneficiaries).

From the foregoing, an infrastructure service delivery framework was proposed to provide for involvement of the private sector in public infrastructure service delivery that is predominantly dependent on central government funding. The framework also highlighted challenges that could be faced by various critical stakeholders in implementing it. The study has proposed the inclusion in the framework of the PPPs to lessen the financing burden the central government is embroiled in thereby

permitting room for the central government to concentrate on other areas of governance and leadership.

5 Conclusion and Recommendations

The study objectives were met and based on the findings it can be concluded that problems affecting LAs in Zambia are not only external but also internal leading to weak institutional and participatory development mechanisms that result in poor service delivery. It can also be concluded that local services such as the supply of drinking water, waste management and basic healthcare which have a huge impact on people's daily lives and wellbeing are not fully provided. Social services such as infrastructure facilities are important so this study concludes that tangibility is both a need and a must in providing quality service.

The paper recommends that for LAs to adequately deliver services to communities, government should consider transferring sufficient funds (intergovernmental transfers) to the councils or let go of some of the sources of revenue which are under the command of central government for the councils to enable them generate enough revenue. The Government of the Republic of Zambia, being the designer of the local government system in the country, must see to it that some of the national revenues are made available to LAs through the process of intergovernmental transfer to fill the gap between national and local needs. The study recommends the inclusion in the framework of the PPPs to lessen the financing burden the central government is embroiled in thereby permitting room for the central government to concentrate on other areas of governance and leadership.

References

Adetola, A., Goulding, J., & Liyanage, C. (2011). Collaborative Engagement Approaches for Delivering Sustainable Infrastructure Projects in the AEC Sector: A Review. *International Journal of Construction Supply Chain Management, 1*(1), 1–24. https://doi.org/10.14424/ijcscm101011-01-24.

Baron, M., & Ochojski, A. (2015). Innovation in Public Services: The Pursuit of Economic Drivers. University of Economics in Katowice. *Journal of Economics and Management, 19*(1). ISSN: 1732-1948.

Cankar, S. S., & Petkovšek, V. (2013). Private and Public Sector Innovation and the Importance of Cross-Sector Collaboration. The Clute Institute. *The Journal of Applied Business Research, 29*(6), 1597–1605.

Central Intelligence Agency (CIA). (2015). *The World Fact Book; Zambia*. Retrieved July 1, 2018, from https://www.cia.gov/library/publications/the-world-factbook/geos/za.html.

Central Statistical Office (CSO). (2012). *Zambia Population Survey*. The Republic of Zambia.

Chazovachii, B., Chitongo, L., Mamhova, T. P., & Ushuku, A. (2012). The Delivery of Social and Infrastructural Services by Rural District Council, Zimbabwe. *International Journal of Politics and Good Governance, 3*(3), 2.

Egberi, A. E., & Madubueze, M. C. (2014). Corruption and Service Delivery in Local Government System in Nigeria: A Content Analysis. *International Journal of Business and Social Science*, Center for Promoting Ideas, USA, Vol. 5, No. 10(1), p. 98.

Gathungu, J. M., & Owanda, W. A. (2012). "Performance Contracting Strategy", Public Sector Reforms and Performance of Public Institutions in the Transport Sector "In Kenya". *International Journal of Arts and Commerce, 1*(3), 243–251.

Inyang, B. J., & Akaegbu, J. B. (2014). Redefining the Role of the Human Resource Professional (HRP) in the Nigerian Public Service for Enhanced Performance. *International Journal of Business Administration, 5*(1), 90–98.

Koma, S. B., & Tshiyoyo, M. M. (2011). Local Government Public Service Delivery in Africa: A Comparative Perspective. *African Journal of Public Affairs, 4*(2), 119.

Mohamad, M. H., Daud, Z., & Yahya, K. K. (2014). Impact on Employees' Good Governance Characteristics, the Role of Transformational Leadership as Determinant Factor. *International Journal of Science, Environment and Technology, 3*(1), 320–338.

Organisation for Economic Co-operation and Development (OECD). (2010). Strategies to Improve Rural Service Delivery. Retrieved July 1, 2018, from http://www.oecd.org/publishing/corrigenda.

Sixth National Development Plan (SNDP) 2011–2015. (2011). Sustained Economic Growth and Poverty Reduction, the Republic of Zambia. Retrieved

July 1, 2018, from http://siteresources.worldbank.org/INTZAMBIA/Resources/SNDP_Final_Draft__20_01_2011.pdf.

Zambia Development Agency (ZDA). (2014). Zambia Infrastructure Sector Profile. Retrieved July 1, 2018, from http://www.zda.org.zm/content/infrastructure.

Zambia Demographic and Health Survey (ZDHA) 2013–14. (2015). Demographic and Health Survey. The Republic of Zambia. Retrieved June 20, 2018, from http://www.zamstats.gov.zm/.

7

Adoption Level of FAO's Valuation Guidelines in Nigeria

Israel Okechukwu Ogbonna and Godfrey Okon Udo

1 Introduction

In 2012, world governments, international NGOs, civil societies and private companies endorsed the Food and Agriculture Organization's Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests (VGRGTLFF) in the Context of National Food Security (Food and Agriculture Organization of the United Nations 2012). According to Article 18 of VGRGTLFF, nation-states, among others, should ensure that valuation systems include non-market valuation to capture social, cultural, religious, spiritual and environmental values, where applicable. Though adoption of the Guidelines is voluntary, nations that adopt them put themselves in higher pedestal as responsible members of the world community. Furthermore, specific benefits accruable from adherence to international valuation standards are reaped globally. It is in this regard that nations must be monitored to see how far they are complying with the recommendations of VGRGTLFF and this work

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is set to do so for Nigeria, by considering an aspect, namely, the level Nigerian valuation system includes non-market valuation which captures social, cultural, religious, spiritual and environmental values.

From the technical point of view, what the recommendations of VGRGTLFF on inclusion of non-market valuation that captures social, cultural, religious, spiritual and environmental values, entails is that for every compensation valuation for land rights, the basis of valuation should be Total Economic Value while the applicable methods of valuation should be non-market valuation approaches such as contingent method, travel cost, benefit transfer, and so on. Therefore, to assess how far Nigeria is implementing VGRGTLFF recommendations on this aspect, the questions should be: To what extent are Nigerian Valuers adopting Total Economic Value as the basis of valuation and to what extent are Nigerian Valuers using non-market valuation approaches such as contingent method, travel cost and benefit transfer? The answer to these questions are captured in the Objective of this study which is to determine the extent to which VGRGTLFF best practices of Compensation Valuation are adopted in Nigerian Valuation practice.

2 Literature Review

Valuation of environmental assets in the form of crops, trees as well as aquatic/fishing rights and infrastructure are recognised in Nigerian law. Section 29 (4c) of the Land Use Act, Cap 202 LFN 1990 of Nigeria, provides that where a right of occupancy over any portion of land is revoked for overriding public interest, compensation would be paid for crops on land apart from any building, installations or improvement thereon, for an amount equal to the value as prescribed and determined by "the appropriate officer"—"the appropriate officer" is defined in Section 50 (1) to mean the Chief Lands Officer of a State and in the case of the Federal Capital Territory, means the Chief Federal Lands officer. As crops are only a part of biodiversity (ecosystem) on land, the import is that when government revokes right of occupancy of the private owner,

the only environmental assets—out of the entire biodiversity on the land—which should be valued for the purpose of compensation are crops and the implication of this Nigerian practice is that Total Economic Value is not adopted as the basis of valuation. The restriction in the scope of biodiversity to be valued in Nigeria however, appears to be relaxed a bit for compulsory acquisitions of land for minerals and mineral oils as there is provision for payment of compensation for, not only crops, but also for "profitable trees".

Non-tangible environmental assets are also not compensated for in Nigeria, except in the area of compensation for damages resulting from oil pollution—see The Oil Pipelines Act 1956 as modified by the 1965 Act as well as The Petroleum Decree, 1969. The methods of assessing this aspect of compensation are however, another problem, as presently, contemporary environmental valuation methods such as contingency method, travel cost method, benefit transfer and so forth, which have the advantage of the ability to capture non-use (passive) values, are not yet entrenched in Nigeria (Otegbulu 2013; Akujuru and Ruddock 2014).

3 Research Method

3.1 Research Design

This work adopted the survey method. Questionnaires were administered in Nigeria on practising Valuers as well as owners of environmental goods whose land rights were compulsorily acquired by the government. The data obtained were analysed using simple percentages and t-test. However, as the best study design usually adopts more than one research method, this study also included content analysis and document review.

3.2 Units of Data

The Primary Data Units and their bases of measurement are shown in Table 7.1.

Table 7.1 Data Units and their bases of measurement: To examine the extent to which VGRGTLFF practices are observed in Nigerian environmental valuation practice

Data Unit	Basis of measurement
Adoption of TEV as basis of valuation	No. of Nigerian practising valuers that have used TEV as basis of valuation in their compensation valuation assignments No. of owners of land rights that their assets were valued using TEV as basis of valuation No. of valuation reports that used TEV as basis of valuation Provisions of the Land Use Act on the basis of valuation
Adoption of non-market methods of valuation	No. of Nigerians practising valuers that have used non-market methods of valuation in their compensation valuation practice No. of owners of environmental goods that their assets were valued with non-market methods of Valuation No. of valuation reports in which non-market methods of valuation were used Provisions of the Land Use Act on methods of compensation valuation

Source: Compiled by the Researchers (2017)

3.3 Research Population and Sampling Design

Three clusters of population were identified and used:

a. Owners of farmlands and forests whose goods have at one time or the other been valued
b. Owners of assets in oil spill damage assessment
c. Practising Valuers in Nigeria

Regarding Owners of farmlands/forests in ordinary Government revocation of occupancy as well as Owners of environmental goods in oil spill damage, this work has limited the survey to one of the Niger Delta States out of ten (Abia, Akwa-lbom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo and Rivers). Rivers State was selected for the research because the Ogoni UNEP Report has made the State the most notorious for

environmental degradation among the Niger Delta States of Nigeria and hence a ready choice for environmental studies among the States in the region. For owners of farmlands/forests, respondents (Population) got by reference to practising valuers, were 1293 claimants and a sample of 306 (23.67% of population) was chosen. Regarding Owners of environmental assets in oil spill damage assessments, the population consists of Rivers State claimants for damages that resulted from May 1, 2010 rupture of Exxon Mobil pipeline in Akwa Ibom State which spilled more than a million gallons into the Niger Delta region States. Respondents (Population) got for this cluster, also by reference to practising valuers, were 1448 claimants and a sample of 314 (21.69% of population) was chosen.

For Practising Valuers, the Population (846) is the total number of Valuation firms operating their Head Offices in parts of the country as per the 2017 Directory of the Nigerian Institution of Estate Surveyors and Valuers (NIESV). A sample of 272 (32.15% of population) was chosen out of this. To ensure that firms from all parts of Nigeria are given equal chance of participating in the survey, the sample 272 firms were distributed among the six geo-political zones of the country based on the proportion of each zone's number of firms in relation to the total population of firms throughout the country. South South—135, South East—75, South West—405, North Central—169, North East—7 and North West—54.

A large proportion of the respondent firms of Valuation Practitioners are from South-West Nigeria. This is accounted for by the fact that one of the cities of the region, Lagos, was at one time the capital city of the country and home to Head Offices of the 846 firms of Valuation Practitioners in Nigeria. The relative high number representing the South-South is attributable to locating at the centre of the lucrative Oil producing City of Port Harcourt, Rivers State. The relative high number from North Central is accounted for by Abuja (the Federal Capital Territory) which also hosts a relatively high number of Head Offices of Nigerian Valuation Firms.

The respondents responded at different rates. Out of the 306 Owners of Environmental goods (Farmlands/Forests) sampled, 215 (70.26% of the sample) responded while out of the 314 Owners of Environmental goods (Assets in Oil Spill Damages) sampled, 196 (62.42% of the

sample) responded. For Practising Valuers, out of the 272 sample, 177 (65.07% of the sample) responded. We consider these response rates as good enough considering the high level of difficulty in tracking down such busy respondents for questionnaire administration.

3.4 Research Variables

The research variables of this work are (1) Adoption of TEV as Basis of Valuation and (2) Adoption of non-market valuation methods of valuation. Their sources are Analysis of Questionnaire on Nigerian Practising Valuers; Analysis of Questionnaire on Owners of Environmental goods; Content Analysis of some Valuation Reports; as well as a Review of the Provisions of the Land Use Act on Compensation Valuation.

3.5 Techniques of Data Analysis

Field data were analysed with simple percentages and t-test. Furthermore, Content analysis of some Valuation Reports and document review were used to validate the research hypothesis.

4 Results

All 196 of the respondents used Market Value as the Basis of valuation while none adopted the internationally recommended Total Economic Value. On the method of valuation adopted, 80 (40.8%) used Direct comparison market-based method; 196 (100%) used Depreciated replacement cost market-based method; 196 (100%) used Investment market-based method. No respondent adopted any of the following methods: Contingent non-market-based method, Choice modelling non-market-based method, Travel cost non-market-based method, Benefit transfer non-market-based method and Land Use Act Stipulations.

A Content analysis of some Oil Spill Valuation Reports for nine communities in Rivers State of Nigeria also showed that Market Value was the

basis of valuation and the method of valuation adopted were market-based methods. These are indications that Nigerian Environmental Valuation practice is low in adoption of VGRGTLFF best practices.

For Farmlands/Forests valued for general compensation purpose, there was no need asking the owners about the Basis and Method of Valuation adopted as most of them may not have the information, given that they are not usually given copies of the Valuation Reports by the government-appointed Valuers. However, as the valuations are statutory valuations which are usually carried out based on the stipulations of the Land Use Act, the researchers only had to analyse the said stipulations to come up with the Basis and Methods adopted.

The stipulations are in Ss.29 and 50 of the Act which recognises crops and improvements in terms of plantations of long-lived crops or trees as the only environmental assets that can be valued for and compensated for in revocations of rights of occupancy. By the Act, only a part of biodiversity on the land (the variety of all forms of life on Earth, comprising plants, animals and microorganisms, their genes and their habitats) are taken into cognizance when government revokes right of occupancy. This means that Total Economic Value Basis of Valuation is not adopted in the valuation for general compensation purpose in Nigeria.

Also, the Act stipulates in S.29(3) that the Method of Valuation and value for the recognised items are as prescribed and determined by the "Appropriate Officer"—the "Appropriate Officer" is defined in S.50 to mean the Chief Lands Officer of the State in question and for the Federal Capital Territory, the Federal Chief Lands Officer. One should think that in order to satisfy the Claimants, the various Appropriate Officers will be adopting VGRGTLFF standard basis (Total Economic Value) and non-market methods of valuation such as Contingent method, Choice Modelling method, Travel Cost method and Benefit Transfer method which usually throw up values that are in tandem with the actual value of losses sustained by claimants. Consequently, the researchers feel that a way to know whether the said VGRGTLFF standard basis and methods of valuation are being adopted in compensation valuation of goods in ordinary government revocation of occupancy on land in Nigeria is to test how satisfied the Claimants are with compensation values computed and paid to them. To this end, question was posed to the Claimants on

their satisfaction level with the outcomes of the valuation of their assets. All the 215 responses from owners of goods (farmlands/forests) in ordinary government revocation of rights of occupancy claimed that their properties were highly under-valued.

By this, one can infer that the valuations are not normally based on the VGRGTLFF Total Economic Value basis of valuation and that non-market methods (Contingent method, Choice modelling method, Travel cost method and Benefit transfer method) are not yet being adopted by Valuers in Nigeria. The frequency of their carrying out valuation adopting VGRGTLFF-recognised basis and methods of valuation in their assignments indicates that a very high proportion (95.5%) of the Valuers never carried out valuation, adopting the VGRGTLFF-recognised Total Economic Value (TEV) as basis of valuation. None of the Valuers has adopted the VGRGTLFF-recognised non-market valuation methods (Contingent, Travel Cost, Choice Modelling, Benefit Transfer and Hedonic Pricing) *Always, Very Often* and *Sometimes*. These indications of low adoption of VGRGTLFF best practices in Nigerian environmental valuation practice have satisfied the Objective which is to determine the extent to which VGRGTLFF best practices are adopted in Nigerian Compensation Valuation practice. We also sought to confirm if the adoption level of VGRGTLFF best practices in Nigerian Compensation Valuation practice was low through the one sample t-test and the result is shown in Table 7.2.

Table 7.2 One-sample t-test

	Test value = 5					
					95% confidence interval of the difference	
	t	*df*	Sig. (2-tailed)	Mean difference	Lower	Upper
*L*1	10.077	14	0.300	11.73333	−11.6405	35.1072
*L*2	00.533	14	0.602	2.06667	−6.2518	10.3852
*L*3	10.025	14	0.323	4.13333	−4.5141	12.7808
*L*4	10.691	14	0.113	5.06667	−1.3591	11.4924
*L*5	80.142	14	0.000	129.00000	95.0183	162.9817

Source: Researchers' Statistical Analysis

For this analysis, the following were used: *L*1—Always adopted; *L*2—Very often adopted; *L*3—Sometimes adopted; *L*4—Rarely adopted; *L*5—Never adopted.

The results reveal that the *t*-statistic was ($L1 = t$ 1.077; $p = 0.300$); ($L2 = t.533$; $p = 0.602$); ($L3 = t1.025$; $p = 0.323$); ($L4 = 1.691$; $p = 0.113$) and ($L5 = t8.142$; $p = 0.000$). The values indicate that four of the t-statistics (*L*1–*L*4) were insignificant. Only *L*5 was significant at $t = 8.142$; $p = 0.000$ at 95% confidence interval. Based on these results, we confirmed that there was low-level adoption of VGRGTLFF best practices in Nigerian Compensation Valuation practice.

5 Discussion of Results

The conclusion of this study is that the internationally recognised basis of valuation, namely, Total Economic Value, is not being adopted in Nigeria. This finding corroborates Otegbulu and Koleoso (2009) and Otegbulu (2013) who advocated adoption of Total Economic Value as a panacea to environmental resource valuation and related conflicts in Nigeria. It also agrees with Ukabam (2015) who recommended Environmental Valuation for equitable valuation of real estate damages arising from contamination from mineral and hydrocarbon exploitation, landfills and cellphone towers. As regards methods of valuation, this work found that the Direct comparison method, Depreciated replacement cost method and Investment method are still the preponderant methods of valuation in Nigeria.

The implication of these findings on the basis and methods of Environmental Valuation in Nigeria is that for government land acquisition compensation, the valuation system in Nigeria is not yet capturing social, cultural, religious, spiritual and environmental values in line with the 2012 recommendations of Food and Agriculture Organization's Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests (VGRGTLFF) in the Context of National Food Security. So long as this situation persists, a major hindrance to infrastructure provision in Nigeria, namely, restiveness associated with land rights, will continue.

6 Conclusion and Recommendations

This work has found the adoption of VGRGTLFF in Nigeria's land acquisition compensation valuation practice to be low in terms of non-adoption of Total Economic Value as Basis of Valuation as well as low use of the internationally recognised contemporary methods of Environmental Valuation such as contingent, travel cost, choice modelling, benefit transfer and hedonic pricing. The persistence of this situation would have major consequences to the country and the Nigerian environmental valuation professionals. Therefore, a solution ought to be found to reverse the situation. We recommend training of Nigerian practising valuers on VGRGTLFF valuation standards through Continuing Professional Development (CPD) Programmes as well as curriculum review for inclusion of VGRGTLFF valuation standards in the various Nigerian Valuation Schools.

References

Akujuru, A., & Ruddock, L. (2014). Incorporation of Socio-Cultural Values in Damage Assessment Valuations of Contaminated Lands in the Niger Delta. Retrieved June 3, 2018, from www.mdpi.com/2073-445X/3/3/675/pdf.

Food and Agriculture Organization of the United Nations. (2012). Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security. Retrieved September 24, 2017, from http://www.fao.org/docrep/016/i2801e/i2801e.pdf.

Otegbulu, A. (Ed.). (2013). *Natural Resource Valuation and Damage Assessment in Nigeria: A Case Study of the Niger Delta* (111p). Ibadan: University Press.

Otegbulu, A. C., & Koleoso, H. A. (2009). Total Economic Value Concept: A Panacea to Environmental Resource Valuation and Related Conflicts in Nigeria. In T. G. Nubi, M. M. Omirin, S. Y. Adisa, H. A. Koleoso, & J. U. Osagie (Eds.), *Readings in Environmental Economics and Conflict Resolution* (pp. 364–380). Lagos: Department of Estate Management, University of Lagos.

Ukabam, T. A. (2015). Environmental Valuation: Equitable Approach to Real Estate Damages. *10th Inaugural Lecture*, Yaba College of Technology, September 30.

8

An Empirical Analysis of Transportation Infrastructure Feasibility Study Considerations

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1 Introduction

Transportation infrastructure impacts on the growth of an economy through employment creation and therefore enhances economic development and provision of social services (Chen and Cruz 2012). Achieving

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successful and sustainable operations throughout the life span of transport infrastructure should therefore be the focus in transport project planning and development (Glaister et al. 2010). However, transportation infrastructure is fraught with uncertainties, which if not taken cognizance of at the time of planning, may threaten the sustainability of the projects. According to Merrow (2011) and Mišić and Radujković (2015), the proportion of mega infrastructure project failure, globally, is as high as 66%, with cost overruns of over 50%, and a significant proportion of these projects fail to meet the objectives for which they were constructed in the first instance. This suggests that the factors considered at the initiation and conception of projects influences its performance during the operational stage. Therefore, if huge discrepancies between expected and actual outcomes occur, the magnitude of inherent risks and uncertainties which materialise at the operational stage is unplanned for, and the result can be a project failure. The quality of feasibility studies therefore appears to be a critical factor to the sustainability of transportation infrastructure projects.

However, although studies had been conducted on the factors which should be considered in feasibility studies to ensure good quality outcomes (Hyari and Kandil 2009; Nicolaisen et al. 2012; Flyvbjerg 2014), the relative importance of these factors have not been determined. It is therefore not clear which factors are most critical to the outcome of feasibility studies. Understanding the critical factors will assist in developing a comprehensive feasibility study. The objective of the current study was therefore to establish critical factors that should be considered in feasibility studies.

2 Transportation Infrastructure Feasibility Study Considerations

Feasibility studies include all elements that may impact on a project's performance. These include finance availability and procurement strategies (Glaister et al. 2010), local environment (Rudžianskaitė-Kvaraciejienė et al. 2015), institutional support (Quium 2014) and users' needs (Erlich

2015; Mišić and Radujković 2015). Therefore, good feasibility studies should consider a wide variety of project performance-influencers.

In addition, the people involved may affect feasibility studies and the procedures followed during the feasibility studies. Nicolaisen et al. (2012) and Flyvbjerg (2014) indicated that inadequate or incorrect feasibility assessments are the result of delusions (psychological biases) or honest mistakes and deceptions or strategic manipulations of information by the people involved. On their part, Hyari and Kandil (2009) contend that a lack of understanding of the basic underlying processes involved in feasibility studies results in unreliable outcomes. The procedures followed, which require designating time and effort into conducting feasibility studies, are important because errors could be introduced and some critical aspects may be omitted (Rosenthal et al. 2015).

Based on the above discourse, the factors identified were categorised into data used, procedures followed and criteria factors considered. These were used to collect empirical data for further analysis.

3 Methods

A quantitative approach was adopted to conduct the study. A pilot-tested field questionnaire survey was used to collect data regarding factors considered in feasibility studies, on a five-point Likert scale, with responses ranging from 1=strongly disagree to 5=strongly agree. Prior to data collection, ethical clearance was granted by the university authorities. Consent was also obtained from some of the participants' superiors as and where required. The questionnaire was distributed by hand, as well as online via email and google forms. Out of over 400 questionnaires distributed, a total of 132 questionnaires were returned and used for analysis. The respondents were selected through purposive and snowball sampling techniques. They comprised built environment professionals in the nine provinces of South Africa, who had been involved in transportation infrastructure projects, either at the feasibility stage or during operations or both. Responses were obtained on various types of projects, as projects were the units of analysis.

Table 8.1 Internal consistency reliability results

Constructs		Cronbach's alpha	Mean inter-item correlations	Number of items
Transportation infrastructure feasibility study (TIFS)	Data used	0.72	0.25	8
	Criteria factors considered	0.93	0.39	21
	Methods used	0.89	0.51	9

Source: Made by the authors

Data were analysed to output descriptive scores based on mean, standard deviation, median and interquartile range analyses. Preliminary analysis included assessment of missing data, normality and outliers. The results of the analysis are presented in the succeeding section. Cronbach alpha test was also undertaken to check the internal consistency reliability of the scale. The alpha values ranging from 0.72 to 0.93 indicated good internal consistency reliability (Pallant 2013). Mean inter-item correlations were also reported to further demonstrate internal consistency reliability, with values exceeding 0.20 as recommended by Pallant (2013). The internal consistency reliability results are presented in Table 8.1.

4 Findings

Descriptive analysis was used to establish the predominant transportation infrastructure feasibility study elements. The findings included the data used, criteria factors considered and methods adopted for the feasibility studies. The results displayed were the mean (M), standard deviation (SD), median (MD), 25% and 75% quartiles (Q1 and Q3), and interquartile range (IQR) values from the responses on each of the variables.

4.1 Data Used

Respondents were asked to indicate the extent to which they agreed or disagreed with statements regarding the data used during the feasibility study of the projects they were involved in. Table 8.2 showed that

Table 8.2 Findings on planning data used

Factor	Measures	Mean	SD	Median	Q1	Q3	IQR
Planning data	Traffic data	4.13	0.826	4.00	4.00	5.00	1.00
	Infrastructure development master plans	4.04	0.801	4.00	4.00	5.00	1.00
	Existing design and structural reports, for upgrade projects	3.98	0.818	4.00	4.00	5.00	1.00
	Audit observations and performance reports, for upgrade projects	3.82	0.840	4.00	3.00	4.00	1.00
	Existing financial and tender records	3.68	0.863	4.00	3.00	4.00	1.00
	Public records and manufacturers	3.67	0.905	4.00	3.00	4.00	1.00
	International projects as examples	3.34	1.197	3.00	2.00	4.00	2.00
	Household income survey data	2.82	1.195	3.00	2.00	4.00	2.00

Source: Made by the authors

participants indicated most agreement (including strong agreements) with *traffic data*, which recorded the highest mean (M = 4.13), with SD = 0.826; MD = 4.00 (4.00–5.00). The median value (4.00) indicated that 50% of the respondents were in agreement regarding the statement. The SD values were less than 1, indicating that the responses were closer to the mean. The interquartile range values of between 4.00 and 5.00 (IQR of 1) also supported that responses were not far from the median. These values seemed to suggest that the respondents had similar opinions regarding the statement that traffic data were used in the feasibility studies for the projects.

Infrastructure development master plans followed with M = 4.04; SD = 0.801; and MD = 4.00 (4.00–5.00). Similarly, the SD values less than 1 indicated unified opinions from respondents. The IQR of 1 indicated that the respondents were in agreement regarding the statement as the answers were mostly concentrated around the median.

On the other hand, *international projects as examples* (M = 3.34; SD = 1.197; MD = 3.00 (2.00–4.00) and *household income survey data* (M = 2.82; SD = 1.195; MD = 3.00 (2.00–4.00) ranked the least among

the statements, suggesting that participants indicated most disagreements with these statements. Both the SD and MD values also indicated that the respondents tended to disagree on a wider range, with an IQR of 2 respectively.

4.2 Feasibility Criteria Factors

Respondents were asked to indicate the extent to which they agreed or disagreed with statements regarding factors on which assessments were based (criteria) during the feasibility studies. Table 8.3 indicated that respondents were in agreement with statements regarding *user safety, local conditions, condition of infrastructure, speed and travel time, stakeholders' interests and needs, land use integration, structural capacity of existing infrastructure, for upgrade projects, convenience to users* and *management capacity*. These statements had mean scores of 4.00 and above, indicating that responses were mostly on the "agree" category. Further, all the median values for the above statements were also 4.0 indicating that 50% of the respondents agreed with the statements. Al the IQR values for these nine statements also indicated that the respondents had similar opinions as the answers were within the range of agree (Q1 = 4.00) to strongly agree (Q3 = 5.00).

4.3 Investment Appraisal Methods Used

Table 8.4 presents findings with regard to the methods used in feasibility studies. Respondents were asked to indicate the extent to which they agreed or disagreed with the statements. The table evinced that methods used mostly entailed design and scope requirements (M = 4.21; SD = 0.691; MD = 4 (4–5), environmental impact assessments (M = 4.15; SD = 0.842; MD = 4 (4–5), as well as cost and benefits analysis (M = 4.13; SD = 0.795; MD = 4 (4–5). The least used methods or approaches appeared to be *financing alternatives relative to costs (financial)* (M = 3.61; SD = 1.068; MD = 4 (3–4) and *rate of return on investment* (M = 3.42; SD = 1.185; MD = 3 (3–4). The median value of 3 for the *rate of return*

Table 8.3 Findings on feasibility criteria factors

Factor	Measures	Mean	SD	Median	Q1	Q3	IQR
Feasibility criteria factors	User safety	4.24	0.926	4	4	5	1
	Local conditions	4.15	0.805	4	4	5	1
	Condition of existing infrastructure, for upgrade projects	4.09	0.890	4	4	5	1
	Speed and travel time	4.08	0.913	4	4	5	1
	Stakeholders' interests and needs	4.08	0.768	4	4	5	1
	Land use integration	4.03	0.941	4	4	5	1
	Structural capacity of existing infrastructure, for upgrade projects	4.02	0.877	4	3	5	2
	Convenience to users	4.01	0.878	4	4	5	1
	Management capacity	4.00	0.865	4	4	5	1
	Central Government's support of the project from start to finish	3.98	0.935	4	4	5	1
	Life cycle cost of the system	3.97	0.980	4	3	5	2
	Accessibility to all, including the disabled	3.95	0.864	4	3	5	2
	User comfort during travel	3.92	0.978	4	3	5	2
	Sources of project finance	3.88	0.996	4	3	5	2
	Preservation of cultural heritage	3.85	0.912	4	3	4.75	1.75
	Proximity to user daily needs	3.82	0.998	4	3	4	1
	Travel costs for commuters	3.77	1.138	4	3	5	2
	Existing businesses/vendors	3.77	1.081	4	3	5	2
	Competing transportation modes within the locality	3.54	1.125	4	3	4	1
	Financial self-sustenance of the system	3.48	1.176	4	3	4	1
	Financial input from private investors	3.15	1.308	3	2	4	2

Source: Made by the authors

on investment statement indicated that responses were mostly concentrated on the "neutral" category, and the IQR value of 1 suggested common views among the respondents.

Table 8.4 Findings on investment appraisal methods used

Factor	Measures	Mean	SD	Median	Q1	Q3	IQR
Investment appraisal methods	Design and scope requirements	4.21	0.691	4	4	5	1
	An environmental impact assessment	4.15	0.842	4	4	5	1
	Costs and benefits analysis	4.13	0.795	4	4	5	1
	Site/location characteristics	4.11	0.774	4	4	5	1
	Best scenario outcome	4.02	0.804	4	4	5	1
	Traffic growth analysis	4.01	0.887	4	4	5	1
	Multi-criteria analysis	3.84	0.907	4	3	5	2
	Financing alternatives relative to costs (financial)	3.61	1.068	4	3	4	1
	Rate of return on investment	3.42	1.185	3	3	4	1

Source: Made by the authors

5 Discussion

Findings from the descriptive analysis revealed that available planning data used in the feasibility studies of the sampled projects were mostly traffic counts, infrastructure master plans and international projects for benchmarking. Traffic data obtained from counts and surveys reflect the frequency and distribution, which are the bases of forecasts and determination of infrastructure size (Beria 2007; Serero et al. 2015). Further, reference to infrastructure master plans was considered important for a comprehensive feasibility study. This is because integration of proposed networks with existing ones will be possible as was the case with the Addis Ababa light rail transit in Ethiopia (Nallet 2018). However, household income survey data was not considered important. This was not consistent with an extant view that feasibility studies should reflect income earning opportunities and ability to pay the set travel charges (World Bank 2005; Maunganidze and Del Mistro 2012; Nallet 2018).

With regard to feasibility study criteria factors considered on the sampled projects, the descriptive analyses indicated that safety, local conditions, existing infrastructure condition (for upgrade projects), as well as

speed and travel time were considered the most prevalent factors. Due to the wide array of impacts that may materialise from transportation infrastructure projects, feasibility studies should unambiguously account for and accurately incorporate local conditions and environment, stakeholder interests as well as related factors including traffic fatality rates, value of personal time and safety benefits to users, which manifest either as infrastructure and user costs (Schutte and Brits 2012). On the other hand, financial aspects were deemed to be the least important aspects. This finding was surprising since sufficient financial leverage is needed to implement investments with higher returns and benefits (Crescenzi et al. 2016).

Further, the descriptive analyses revealed that the methods considered in a comprehensive feasibility study entail design and scope requirements, environmental impact assessment and cost-benefit analysis as well as site and locational characteristics (Beria 2007; Cervero 2011; Jones et al. 2014). Conversely, the *rate of return on investment* and *the financial alternatives relative to costs* were not considered important appraisal methods among the respondents. These findings may have resulted because some projects (public and government funded) are provided for the benefit of the community. However, these appraisal approaches are needed to evaluate projects and make decisions on more acceptable and beneficial investments for financial and economic status as was the case with the feasibility study of Metro Rail projects in Madurai in India (Subash et al. 2013).

6 Conclusion

Empirical data were analysed using SPSS to output descriptive scores based on mean, standard deviation, median and interquartile range. The study found that traffic data and infrastructure development master plans were the most sources of data referred to. The criteria factors considered include user safety, local conditions and physical condition of infrastructure. Further, design and scope requirements, environmental impact assessment and cost-benefit analysis were the most appraisal methods employed in feasibility studies.

Further studies are recommended with more robust analytical techniques to validate or refute these findings. Nevertheless, by identifying the factors that are critical in feasibility studies, more comprehensive feasibility studies will be undertaken and delivered in order to make more reliable decisions of proposed transportation infrastructure projects.

References

Beria, P. (2007). Transport Megaprojects in Italy. A Comparative Analysis of Economic Feasibility Studies into EIAs. *European Transport, 36*, 27–46.

Cervero, R. (2011). Beyond Travel Time Savings: An Expanded Framework for Evaluating Urban Transport Projects. World Bank. Retrieved June 16, 2017, from https://pdfs.semanticscholar.org/9617/0c7534cfc44668e69130ec49e9718e5d3cfb.pdf.

Chen, D., & Cruz, P. (2012). Performance of Transport Infrastructure. *Journal of Performance of Constructed Facilities, 26*(2), 136–137.

Crescenzi, R., Di Cataldo, M., & Rodríguez-Pose, A. (2016). Government Quality and the Economic Returns of Transport Infrastructure Investment in European Regions. *Journal of Regional Science*, 1–51. https://doi.org/10.1111/jors.12264.

Erlich, R. (2015). Controversy Runs Deep in Nicaragua's Canal Plan. *Aljazeera America*. February 25. Retrieved April 3, 2016, from http://america.aljazeera.com/opinions/2015/2/nicaragua-launches-worlds-largest-infrastructure-project.html.

Flyvbjerg, B. (2014). What You Should Know About Megaprojects and Why: An Overview. *Project Management Journal, 45*(2), 6–19. Retrieved June 12, 2018, from https://arxiv.org/ftp/arxiv/papers/1409/1409.0003.pdf.

Glaister, S., Allport, R., Brown, R., & Travers, T. (2010). Success and Failure in Urban Transport Infrastructure Projects. KPMG International. Retrieved September 24, 2016, from https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/centre-for-transport-studies/Success-and-Failure-in-Urban-Transport-Infrastructure-Projects.pdf.

Hyari, K., & Kandil, A. (2009). Validity of Feasibility Studies for Infrastructure Contrition Projects. *Jordan Journal of Civil Engineering, 3*(1), 66–79.

Jones, H., Moura, F., & Domingos, T. (2014). Transport Infrastructure Project Evaluation Using Cost-benefit Analysis. *Procedia – Social and Behavioural Sciences, 111*, 400–409.

Maunganidze, L., & Del Mistro, R. (2012). The Role of Bus Rapid Transit in Improving Public Transport Levels of Service, Particularly for the Urban Poor Users of Public Transport: A Case of Cape Town, South Africa. The 31st Southern African Transport Conference (SATC 2012), 9–12 July, Pretoria, South Africa.

Merrow, E. (2011). *Industrial Mega Projects: Concepts, Strategies ad Practices for Success*. Hoboken, NJ: John Wiley and Sons.

Mišić, S., & Radujković, M. (2015). Critical Drivers of Megaprojects Success and Failure. *Procedia Engineering, 122*, 71–80.

Nallet, C. (2018). The Challenge of Urban Mobility: A Case Study of Addis Ababa Light Rail, Ethiopia. Retrieved August 2, 2018, from https://www.ifri.org/sites/default/files/atoms/files/nallet_urban_mobility_addis_ababa_2018.pdf.

Nicolaisen, M. S., Ambrasaite, I., & Salling, K. M. (2012). *Forecasts: Uncertain, Inaccurate and Biased? Proceedings of the Annual Transport Conference*. Denmark: Aalborg University.

Pallant, J. (2013). *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS* (5th ed.). Sydney: Allen and Unwin.

Quium, A. S. M. A. (2014). The Institutional Environment for Sustainable Transport Development. UNESCAP. Retrieved March 20, 2018, from https://www.unescap.org/sites/default/files/Article%204_Institutional%20environment%20for%20sustainable%20transport%20development.pdf.

Rosenthal, A., Verutes, G., McKenzie, E., Arkema, K. K., Bhagabati, N., Bremer, L. L., et al. (2015). Process Matters: A Framework for Conducting Decision-Relevant Assessments of Ecosystem Services. *International Journal of Biodiversity Science, Ecosystem Services and Management, 11*(3), 190–204.

Rudžianskaitė-Kvaraciejienė, R., Apanavičiene, R., & Gelžinis, A. (2015). Monitoring the Effectiveness of PPP Road Infrastructure Projects by Applying Random Forests. *Journal of Civil Engineering and Management, 21*(3), 290–299.

Schutte, I. C., & Brits, A. (2012). Prioritising Transport Infrastructure Projects: Towards a Multi-Criterion Analysis. *Southern African Business Review, 16*(3), 97–117.

Serero, G., Van Jaarsveld, G., De Abreu, V., & Brislin, A. (2015). *Feasibility Study on Traffic Decongestion Strategies at Maseru Bridge Border Post*. The 34th Southern African Transport Conference (SATC 2015), 6–9 July, Pretoria South Africa.

Subash, S. M., Chandrabose, K., Umamaheshwari, U., & Maharajan, T. (2013). Feasibility Study of Metro Transport: Case Study Madurai. *International Journal of Civil Engineering and Technology, 4*(4), 72–83.

World Bank. (2005). A Framework for the Economic Evaluation of Transport Projects. Notes on the Economic Evaluation of Transport Projects. Retrieved December 29, 2018, from http://siteresources.worldbank.org/INTTRANSPORT/Resources/336291-1227561426235/5611053-1231943010251/trn-5EENote2.pdf.

9

Smart Tourism for Enhancing Tourism Experience: Prospects and Challenges for Africa

Randhir Roopchund

1 Introduction

Tourism is one of the biggest and rapidly growing and promising sectors in the world, triggering growth, creating jobs and also helping to reduce global poverty. According to the UN World Tourism Organisation (UNWTO 2017), the tourism sector accounts for 10 per cent of global GDP, 10 per cent of total employment worldwide and 7 per cent of the world's exports equivalent to USD 1.4 trillion. However, the tourism industry is currently dealing with a number of challenges such as climate change, sustainability and digitalisation which will shape the future of the industry. Digitalisation and tourism success are inherently and intrinsically linked (Tralac 2018). The rapid progress in Information and Communication Technology (ICT) is fast developing the tourism sector creating both opportunities and challenges.

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Tourism arrival in Africa has increased by 8 per cent (63 million USD) for the year 2017 and tourism receipts increased by 8 per cent (USD 37 billion dollars). This shows that the tourism sector represents huge opportunities for growth. There are signs of recovery in Northern Africa and very good performances from countries such as Kenya, Cote D'Ivoire, Mauritius and Zimbabwe (UNWTO 2018). Matema (2018) is of the view that limited use of technology by the tourism sector within Africa presents various business technology opportunities for tourism in Africa. He further claims that investing in smart technology innovations is said to be the solution that will raise the African tourism industry to a world-class tourism level. The current use of technology in tourism is mostly within static websites but does now allow for improving customer engagement and interaction (Matema 2018). It should be noted that Africa has more than 1.1 billion Internet users which represents a great potential for growth.

2 Smart Tourism Concept

The Smart Tourism destination (STD) idea is attracting a lot of interest from researchers and may be considered as a significant development in the tourism field (Jovicic 2016). The hypothetical development is still limited and the "destination concept" is complex, evolving, socially-developing and multi-layered, as reflected in the literature (e.g. Pearce 2014; Saarinen 2004; Saraniemi and Kylanen 2011). Smart destinations are largely influenced by some earlier conceptualisations, for example, 'e-Destinations'. E-Destinations stress the usage of ICTs to provide data and to end up an instrumental part of all transactions along the value chain (Buhalis 2003). In smart destinations technology is centrally embedded in all elements thanks to new developments such as the Internet of Things (Koo et al. 2015).

Many countries are under increasing pressure to realise Smart Tourism in order to influence their economic growth and development. In Asia there are more collaborative efforts to drive the Smart Tourism agenda forward. Governments in China and South Korea are supporting initiatives to develop the technological infrastructure that supports Smart

Tourism (Hwang et al. 2015). In Europe many of the Smart Tourism initiatives were born out of Smart City projects and, as a consequence, Smart Tourism destinations are increasingly making an appearance in the European tourism landscape. The focus in Europe is about developing smart end-user applications that support enriched tourism experiences using already existing data combined and processed in new ways and based on innovative approaches (Lamsfus et al. 2015; Boes et al. 2015a, b). In the Mauritian context, the government is encouraging Smart City schemes for building intelligent buildings to improve the sustainability of the economy. There are a number of Smart City projects that have been developed across the island—Medine Smart City, Moka Smart City and that of Beau Plan amongst others. In 2015, the Finance Minister proposed the creation of eight Smart Cities and five "technopoles", with an overall investment of Rs. 120 billion and requiring 7000 acres of land. In Australia, the emphasis has shifted to smart governance and the use of open and big data. Based on the discussion, the transformative power of smart technologies is being universally accepted not only in terms of economic potential but also within the social and experiential dimensions.

2.1 African Smart Tourism

The *East African Magazine* (2016) outlines that Africa may reap many benefits from Smart Tourism. Estelle (2016) who is the co-founder of Jovago.com explains that technology has reduced the costs for the industry. The site is an online platform with over 200,000 bookings and offers customers significant discounts. African tourists are also making increasing use of Trip Advisor to review customer feedback for making their decisions. Jackson (2016) reports that smart and innovation cities such as Hope City in Ghana and Kenya's Konza Technology City herald good potential for hotel developments. "The travel industry is likely to reap the benefits of technology startups with increased domestic, regional and international business travel to a variety of countries in Africa," the report said. Business air arrivals are expected to post a compound annual growth rate (CAGR) of five per cent for South Africa and six per cent for Kenya over 2014–2019, according to Euromonitor International.

The Mauritian government aims to position the country as a leading ICT destination, and to become the model in Africa that supports the new e-global age. There are 600 ICT companies operating in Mauritius in different business activities ranging from software development to business process outsourcing. There are some major players such as Microsoft, IBM and Accenture amongst others. The drive to emerge as an ICT-BPO (Business Process Outsourcing) hub has resulted from a plethora of factors such as the changing global economic environment, changing government policies and the Mauritian bilingual population.

Mauritius is a small island with a population of around 1,280,000. However, we have an Internet penetration rate of 63 per cent (the highest in Africa). Some 720,000 people use different social media such as Facebook, Instagram and Twitter. There are 1.74 million subscribers to mobile services indicating that we have more mobile phones and Sim cards than the actual population size. In addition, around 48 per cent of mobile phone users are active mobile social users. These statistics clearly demonstrate that Mauritius is poised to emerge as a Smart Economy where technology plays a key role in economic growth and development. The government has also adopted an e-government initiative whereby it plans to digitalise different ministries for improving effectiveness and efficiency.

2.2 Zambia as a Smart Tourism Destination

The Zambian government has also embarked on the Smart Zambia project with the signing of an agreement during President Edgar Lungu's visit in China in 2015. The project was agreed with Huawei being the main supplier for the project. The project is named "The National ICT Development Project" and aims to build a national Cloud Data centre, and also the development of an ICT training centre. Huawei provided the Zambian National Data Centre with a reliable solution that included: A Three-Data-Centres-in-Two-Cities (3DC) solution that ensures the security and continuity of government services and data; a Huawei cloud solution with services such as government and enterprise cloud hosting;

and Huawei energy solutions to guarantee safe operation of devices in data centre equipment rooms.

According to Zambia's 7th Five-Year Development Plan, ICT has been identified as an important catalyst for socio-economic development and a driving force for good governance. In order to fulfil this mandate, Zambia needed to create a national programme to train ICT talent. The Zambia government expects that the expansion of educational opportunities for ICT managers and technicians will increase the employment rate nationally and lower the costs of operation for Zambian ICT enterprises. In addition to supplying the technical infrastructure, Huawei has also provided an advanced ICT training solution that includes modern multi-media classrooms and labs, course materials, and on-site training. The resulting high standard for training and certification ensures that a qualified workforce is available for data centre operations and business activities both inside and outside of Zambia. Dr Banda (2018), the Minister of Tourism, claimed that the tourism sector relied a lot on the use of technology for transforming data into value propositions. He also added that ICT can help to bring sustainable economic development to the country. The government is adopting a range of Smart Technology initiatives at all levels of public management of the country.

2.3 Understanding the Prospects of Smart Tourism

Smart Tourism helps tourists get information at any stage of the interaction in the hotel value chain. Tourists are now able to obtain information on the Internet, and tourists can also enjoy an experience of the tourist destinations by applying three-dimensional virtual reality software. In this way, they can get to know about different information about tour destinations, receive electronic coupons and make various reservation confirmations at intelligent terminals.

The new era of ICT has also opened up a wealth of new tools for the tourism industry. Nowadays, tourism destinations face a set of new challenges arising from changes in both consumers and the environment as influenced by the emerging technologies. In order to deal with these challenges, first of all destinations have to recognise the kinds of changes that

have occurred, and then proactively respond (Soteriades 2012). From a tourism perspective, ICT could contributes in terms of generating value-added experiences for tourists, while also improving efficiency and supporting process automation for the related organisations (Werthner 2003 as cited in Gretzel 2011). Thus, the development of the Smart City could also encourage the formation of Smart Tourism Destinations. With technology being embedded within the destinations environment, it can enrich tourists' experiences and enhance destination competitiveness.

2.4 Tourism Applications in Smart Tourism Destinations

Recognizing the economic importance to mitigating the challenges was high on the agenda during the 2017 World Tourism Conference held in Rwanda earlier this year. Many African leaders discussed how to maximize opportunities and also reviewed the needs of the sector to reach its full potential. Different ministers and tourism stakeholders such as tour operators, travel agents, hotels and airlines attended the conference. Different opportunities and challenges were discussed for achieving the tourism objectives.

Table 9.1 shows a number of opportunities for Smart Tourism in Africa. It is important for tourism providers to collaborate to improve the consumer experience to achieve competitive advantage. Buhalis and Wagner (2013) are of the view that destinations should implement those technologies that will achieve higher levels of competitiveness. In addition, earlier references in this article show that the African continent is taking several initiatives to improve the image of Africa as a Smart Tourism destination (Boes et al. 2015a). It is important for Africa to harness its resources to achieve this vision. McCabe et al. (2012) suggest a scenario-based design (SBD) that has proved to be a useful approach to engage diverse tourism stakeholders in collaboration to overcome technological knowledge barriers and to generate new ideas for transforming tourists' experience of the city. A similar technique was applied by Ronay and Egger (2013) to investigate the Near Field Communication (NFC)

Table 9.1 Applications of Smart Tourism

	Applications	Utility (Buhalis 2000)	Dimensions (Smart Tourism) Cohen and Cohen (2012)	Destination components
1	Augmented reality (AR) enables visitors to experience digital recreation of tourism sites and time travel (Chillon 2012)	Interpretation	Smart people	Attractions
2	Vehicle tracking system provides a real-time information of transport network and could be distributed to end-user devices (Arup 2010)	Planning	Smart living	Accessibility
3	Hotel should be able to predict energy demands for building and performing energy audits based on their environment management (Metric Stream 2013)	Sustainability	Smart environment	Amenities
4	A multi-languages application that provides a range of services such as electronic travel guides which also offer numbers of available packages for tourists (Jordan 2011)	Guidance	Smart people, smart mobility	Available packages
5	Tourists are able to register their complaints through a Complaints Management System that is supported by various ICT channels such as SMS or mobile applications which could directly route them to appropriate officials (Metric Stream 2013)	Feedback	Smart living	Ancillaries

Source: The authors

Smart City concept and how plausible future scenarios for implementing such a concept in tourism destinations might look.

The study by Buonincontri and Micera (2016) shows that innovative technologies improve the overall experience of co-creation. They used two European Smart Tourism destinations to provide insights and to assist in decision-making. The authors are of the opinion that the use of

smart technologies may have a positive influence on the co-creation of the tourism experience. Tourists are now able to engage and share their views about their experiences at any point in the value chain through different technological platforms.

Pearce (2015) suggested the integration between concepts to create tourist destination. Pearce (2015) suggests an incorporation of the geographic dimension (space and place), mode of production (structure, behaviour and actors) and dynamic dimension (structure and leadership), in an organised system that comprises the whole that is a tourist destination (Pearce 2015). Richards (2014) defines tourism as a "consumer of spaces", with the idea of "isation"—to transform a space according to the given activity practiced—thus, a place is characterised according to the activities that take place in it. Consequently, to the author, the tourist activity itself creates a destination or tourist space.

3 Research Methodology

The research approach used for the purpose of this study is exploratory, setting the groundwork for understanding the prospects and challenges of Smart Tourism for African economies. Consequently, a qualitative research approach is used as the study does not intend to generalise its findings. The content analysis has been applied by analysing websites, newspaper articles in Africa and government reports to make the case for Smart Tourism. The analysis has been carried out at both at the macro and micro levels so as to obtain sufficient information about the current state of affairs in the African continent. In addition, to make the analysis objective some important indexes such as the ICT index for tourism for some selected countries will be used. The current research also uses case studies at the macro and micro levels to demystify the current trends of Smart Tourism. The choice of the case studies and websites for inferences relates to the following research questions:

a. Does it relate to the concept of Smart Tourism?
b. Does the content help in understanding Smart Tourism in Africa?
c. Is the source of information valid?
d. Does it help to assess the prospects and challenges in Africa?

Content analysis is a method of analysing written, verbal or visual communication messages (Cole 1988). Content analysis is a research method for making replicable and authorised inferences from data to their context, with the purpose of providing knowledge, new facts, a representation of data and a realistic lead to action (Krippendorff 1980).

Content analysis has been described as a family of analytical approaches from "impressionistic, intuitive, interpretive analyses to strict textual analysis" (Rosengren 1981), who further states that the kind of content analysis used depends on the research field of the researcher. Mayring (2000) detaches content analysis from any quantitative allusions by conceiving of it as a systematic, rule-governed and theory-driven analysis of fixed communication.

4 Findings

4.1 Smart Tourism Challenges

There are many challenges to making African countries into Smart Tourism destinations. Though there is a promising growth in African tourism, the emergence of Smart Tourism needs investment in terms of technology, but also the adoption of ICT-oriented tourism at all levels of customer interaction in a hotel. In the first instance, African economies still suffer from a lack of Internet connectivity and poor bandwidth as a barrier for the emergence of Smart Tourism. In addition, the concept of Smart Tourism also relies on the need for Smart Tourists who are willing to interact and use technology for enhancing their own customer experiences. There are other challenges such as the impact of Smart Tourism on traditional economic sectors, the need for tourist guides and cultural tourism.

4.2 The African Challenge: Improving ICT Infrastructure and Connectivity

Unfortunately, despite these promising ICT statistics, African countries still have very low ICT Development Index (IDI) scores. All African

countries have either a medium or low IDI (ITU 2011 International Telecommunication Union) with those in North Africa (Algeria, Morocco and Tunisia) and Southern Africa (South Africa, Mauritius and Botswana) having relatively higher scores. Abdoulkarim and Rugege (2013) report that the highest-ranked African country is in the seventieth position globally out of a total of 155 countries. There is a need to improve the overall ranking by engaging in more ICT for development (ICT4D) projects in Africa. The Secretary-General of the ITU Dr Hamadoun had the following to say about the need for transformation:

> *ICTs are truly transformational. With the power of technology, we can educate every African citizen, right across the continent. With the power of technology, we can open new opportunities and create new well-paid jobs for our people. With the power of technology, we can deliver healthcare services to every African citizen, even in the remotest villages. And with the power of technology we can empower African women and leverage the fantastic energy and passion of young Africans. This is not just a pipe-dream: this is real.*

Although ICT has an important role to play in enabling a better life for all on the African continent, challenges to the realization thereof remain. African countries should work on the improvement of ICT infrastructure and connectivity to harness the potential of Smart Tourism for Africa.

4.3 ICT Literacy in Africa

As the number of tourists is increasing in Africa, it is important that tourism operators enhance their overall competitiveness through the use of technology. However, another challenge to the use of technology for Smart Tourism lies in the lack of ICT readiness. A study by Mahakata et al. (2017) identified several bottlenecks for a successful ICT strategy in tourism, including the lack of skilled and trained people in the field of ICT. The ICT readiness index is about 1.93 for Africa as compared to 6 for Europe and 4 for the world at large. The eTransform Africa report clearly spells out that "the most prevalent challenges across the continent

to fully move forward in these business areas are infrastructure, energy constraints and the ICT skills gap (compared to other parts of the world), which impacts users as well as the pool of available, skilled labour for firms wanting to do business in Africa."

4.4 Policy and Regulations

Mahakata et al. (2017) also point to the lack of appropriate policy regulations for promoting Smart Tourism or adoption of technology by tourism firms. They take the example of the lack of political will in Zimbabwe, as clearly indicated by the absence of ICT regulation/legislation to promote the use of ICT and to deal with legal issues that emanate from ICT. The support of the Mauritian government towards e-government has also boosted the Smart Tourism perspective. For example, the Mauritius Tourism Promotion Authority has worked for the informationisation of services such as applications for permits and many other services. The government also organised an international conference on digitalisation and sustainability to support the Smart Tourism perspective.

4.5 Cashless Payments in Africa

With 94 per cent of retail transactions still in cash, there is a real need to displace cash given the countless benefits for consumers to shift to cashless behaviour. Additionally, cashless behaviour will benefit the retail sector and overall economy. Digital payments are far safer, and although in Africa the need still remains to have some cash available, it is important to develop a wider acceptance network that includes hotels but also tourist hot-spots. It is also important to make appropriate use of data to understand tourists' travelling behaviour, spending behaviour and preferences. Mastercard is leading the way in data analytics, with products and services that combine the power of data and insights. For instance, our Tourism Insight Platform provides data on spending as well as natural

language processing sourced from social media and search engines like Instagram, Google and Amadeus.

4.6 Data Protection and Privacy Concerns

Another important challenge for African tourism operators is to respect the data piracy and protection issues. The success of Smart Tourism relies considerably on the participation of enough tourists with technology enhanced services. Gretzel et al. (2015) are of the view that the digital footprint of a smart tourist is huge and data comes at a cost. Data management and sharing have to be institutionalised, which can be hard within a fragmented industry like tourism that is mostly based on micro-businesses. Tourism enterprises that are already lagging behind in digital developments might fall even farther behind when Smart Tourism is implemented at their destinations. The necessary knowledge/technology transfer and training are currently not discussed in the context of smart tourism.

4.7 Case Studies of Smart Tourism in Africa

4.7.1 Use of Tourists Maps

Map areas can be downloaded to a phone for offline viewing. Tourists can open Google Maps and use a smartphone's GPS as well as the saved maps to view their location. If Google Maps is queried for directions while on a WiFi connection and then goes offline, tourists can continue to follow directions and view the location on the map completely offline.

4.7.2 iCamp Kenya

A mobile solution called iCamp Kenya was implemented to provide campers with a platform to locate camps in Kenya and get reliable camping information such as accommodation prices, highly rated camps, useful camping tips while planning a trip, transport options, directions to

the camp and contact information. Quantitative research methods such as questionnaires were used to test the implemented system and collect primary data. The sample size for this population was 136 Vagabond Travels club members. The findings of the research show that users found the application was fully functional and easy to use. They were able to find their desired camps easily and were satisfied with the useful information that assisted them in planning their camping trip.

4.7.3 Social Media and Marketing in Africa

A destination risks losing opportunities by ignoring the value social media presents, whether the benefit is directly quantifiable or not. Currently, travellers communicate more on social media and spend much of their online time browsing different social networks. If a destination does not take an active front, competitors are bound to reach out to their target market. Gaining the trust of the public is critical to gaining business. In Africa, social media rankings do not have a direct correlation to a flourishing tourism sector, due to the sensitive nature of the tourism industry. Tourism is affected by geographic, social, economic and political factors that are complex and have a direct effect on tourism, making social media a distant variable (O'toole 2016).

4.8 Policy Implications

The research shows that there are a number of opportunities for Africa to tap into Smart Tourism through the use of innovative technologies. A number of Smart Tourism practices in different countries are provided to highlight the potential for application in the tourism sector. However, it is observed that there is some reluctance to adopt innovative tools due to the challenges outlined in the research. Some of the challenges are poor Internet connectivity, lack of collaboration and policy discussions between African member states, and the low level of ICT literacy amongst others. However, these barriers are not overwhelming and could be dealt through the right determination of African leaders. Industry 4.0 is the

current trend of automation in the manufacturing sector using various technologies such Internet of things, cloud computing amongst others. Tourism operators should also use social media tools to engage in co-creation and customer engagement. There should be an ongoing dialogue between the different policy-makers so that the right regulations and laws are enacted. This will also ensure that African tourism operators are geared towards achieving sustainable economic development through the use of green practices and smart technologies. However, it is observed that Smart Tourism has been used mostly in those African countries which are more economically and technologically advanced (South Africa, Kenya and Mauritius). The Zambian government is working with Huawei to provide smart solutions in the tourism sector.

4.9 The Future of Smart Tourism

Digitalisation represents an exciting opportunity for the travel and tourism industry, with the opportunity to tap $1 trillion for the next decade (Deloitte 2018). The use of technological platforms such as Airbnb and Uber have changed the approach to doing business, enabling small entrepreneurs to compete with bigger firms. Travel agencies are now able to tap up-to-date information to provide more customised offerings. The Deloitte report has identified four key themes for the transformation of the tourism industry through digitalisation:

- Living travel experience: With technology it will be possible to get customised offerings and customers may easily share their experiences with other customers. In time, travel will become frictionless, blending seamlessly with other everyday activities.
- Enabling the travel ecosystem: The travel ecosystem will further improve with the possibility of greater collaborative networking and sharing of information. It is expected that the next generation of customers in hotels and airlines will have different consumer buying behaviour.
- Digital enterprise: Digital technologies that revolutionize manufacturing, optimize the real-time use of assets and eventually augment the

industry workforce will transform operations. Innovations such as 3D printing, AI, IoT, VR and digital platforms will enable flexible working and changes to core operational processes.

- Safety and security: There will be increasing emphasis on data security and information management. The tourism sector should improve its cyber security measures and also protect the confidential data of customers in order to maintain trust. It is expected that more digital technologies (e.g. biometrics such as facial recognition, IoT, crowd analytics and video monitoring via AI) will be used to create a ubiquitously secure environment.

5 Limitations of Research

The research paper is conceptual in approach seeking to analyse the potential of Smart Tourism in Africa. One of the main limitations of the research is that the analysis lacks empirical evidence as it is qualitative in approach. Another concern has been the lack of statistics and research papers related to the theme in the African context. The statistics were available mostly for Kenya and South Africa. However, this limitation may be bridged by proper networking with different institutions.

6 Conclusion

It is obvious that tour operators, travel agencies, airlines and other stakeholders in the tourism sector may benefit if the countries are able to emerge as Smart Tourism destinations. The pathway may seem long but it is surely linked to the overarching goal of achieving sustainability. Government and other operators should address the key challenges with a clear roadmap as the global tourism sector is expanding. However, there is need for parallel growth and development in terms of infrastructure, air access policy and also tourism sites to make Smart Tourism a reality. The African countries can also benchmark globally in terms of technology and resources to deal with the challenges. As a final remark, it is said that the "the journey of 1000 miles starts from the first step we make."

References

Abdoulkarim, S., & Rugege, A. (2013). Africa's ICT development challenges and opportunities. Retrieved October 14, 2014, from http://au.int/en/sites/default/files/Final_ITU-ATU_2013ICTWEEK_Presentation_v12.pdf [Google Scholar]

Arup. (2010). *Smart Cities: Transforming the 21st Century City Via the Creative Use of Technology*. Arup.

Banda, C. (2018). Government appreciates ICTs role in Tourism Development, Retrieved from https://www.lusakatimes.com/2018/11/10/government-appreciatesicts-role-in-tourism-development/ (Accessed on 15th Nov 2019).

Boes, K., Borde, L., & Egger, R. (2015a). The Acceptance of NFC Smart Posters in Tourism. In I. Tussyadiah & A. Inversini (Eds.), *Information and Communication Technologies in Tourism 2015* (pp. 435–448). Heidelberg: Springer. Google Scholar.

Boes, K., Buhalis, D., & Inversini, A. (2015b). Conceptualising Smart Tourism Destination Dimensions. In I. Tussyadiah & A. Inversini (Eds.), *Information and Communication Technologies in Tourism 2015* (pp. 391–403). Heidelberg: Springer.

Buhalis, D. (2003). *eTourism: Information Technology for Strategic Tourism Management*. Pearson (Financial Times/Prentice Hall).

Buhalis, D. and Spada, A., (2000). Destination management systems: criteria for success–an exploratory research. *Information Technology & Tourism, 3*(1), 41–58.

Buhalis, D., & Wagner, R. (2013). E-destinations: Global Best Practice in Tourism Technologies and Applications. In *Information and Communication Technologies in Tourism 2013* (pp. 119–130). Berlin; Heidelberg: Springer.

Buonincontri, P., & Micera, R. (2016). The Experience of Co-creation in Smart Tourism Destinations: A Multiple Case Analysis of European Destinations. *Information Technology & Tourism, 16*(3), 285–315.

Chillon, P. S. (2012). *From Vacation Spots to Smart Destinations: Technology and Tourism, QR, Apps and Augmented Reality for Cities*.

Cohen, E., & Cohen, S. A. (2012). Current Sociological Theories and Issues in Tourism. *Annals of Tourism Research, 39*(4), 2177–2202.

Cole, F. L. (1988). Content Analysis: Process and Application. *Clinical Nurse Specialist, 2*(1), 53–57.

Deloitte. (2018). Moving the Global Travel Industry Forward. Retrieved March 19, 2019, from https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Consumer-Business/deloitte-wttc-moving-global-travel-industry-forward.pdf.

East African Magazine. (2016). Retrieved April 20, 2019, from https://www.theeastafrican.co.ke/magazine/434746-434746-d8f1vr/index.html.

Estelle. (2016). Interview: Jovago Leans Local Tourism to Grow in East Africa. Retrieved April 18, 2019, from https://moguldom.com/128092/128092/.

Gretzel, U., & Kang, M. (2011). Measuring ongoing travel information search. In M. J. Gross (Ed.), Proceedings of the 21st annual conference, council for Australian university tourism and hospitality education. Adelaide, SA: University of South Australia.

Gretzel, U., Sigala, M., Xiang, Z., & Koo, C. (2015). Smart Tourism: Foundations and Developments. *Electronic Markets, 25*, 179–188.

Hwang, J., Park, H. Y., & Hunter, W. C. (2015). Constructivism in Smart Tourism Research: Seoul Destination Image. *Asia Pacific Journal of Information Systems, 25*(1), 163–178.

ITU (2011). Measuring the Information Society. Retrieved from https://www.itu.int/net/pressoffice/backgrounders/general/pdf/5.pdf (Accessed on 10th Jan 2019)

Jackson, S. (2016). Prediction, Explanation and Big(ger) Data: A Middle Way to Measuring and Modelling the Perceived Success of a Volunteer Tourism Sustainability Campaign Based on 'Nudging'. *Current Issues in Tourism, 19*, 643–658.

Jordan, B. (2011). Corbin Ball Associates. Retrieved July 18, 2013, from http://www.corbinball.com/articles_technology/index.cfm?fuseaction=cor_av&artID=8591

Jovicic, D. Z. (2016). Key Issues in the Conceptualization of Tourism Destinations. *Tourism Geographies, 18*(4), 445–457.

Koo, C., Gretzel, U., Hunter, W. C., & Chung, N. (2015). The Role of IT in Tourism. *Asia Pacific Journal of Information Systems, 25*(1), 99–104.

Krippendorff, K. (1980). *Content Analysis: An Introduction to Its Methodology*. Newbury Park: Sage.

Lamsfus, C., Martín, D., Alzua-Sorzabal, A., & Torres-Manzanera, E. (2015). Smart Tourism Destinations: An Extended Conception of Smart Cities Focusing on Human Mobility. In I. Tussyadiah & A. Inversini (Eds.), *Information and Communication Technologies in Tourism 2015* (pp. 363–375). Heidelberg: Springer.

Mahakata, S., Tsokota, T., Mugfiga, P., & Chikuta, O. (2017). A Framework for Enhancing Information Sharing and Collaboration Within the Tourism Industry in Zimbabwe. *African Journal of Hospitality, Tourism and Leisure, 6*(3), 1–24.

Matema, M. (2018). Technology Development in the African Tourism Sector. Retrieved March 9, 2019, from https://www.nomadafricamag.com/technology-development-in-african-tourism-sector/.

Mayring, P. (2000) Qualitative Content Analysis. Forum Qual. Soc. Res. Retrived from http://nbnresolving.de/urn:nbn:de:0114-fqs0002204 (Accessed on 10 September 2019).

McCabe, S., Sharples, M., & Foster, C. (2012). Stakeholder Engagement in the Design of Scenarios of Technology-Enhanced Tourism Services. *Tourism Management Perspectives, 4*, 36–44.

Metric Stream. (2013). Smart Cities Solutions. Retrieved July 17, 2013, from http://www.metricstream.com/solutions/smart_cities.htm.

O'Toole, C. (2016). *Africa Travel & Tourism Social Index*. VENDS.

Pearce, G. D. (2014). Toward an Integrative Conceptual Framework of Destinations. *Journal of Travel Research, 53*(2), 141–153.

Pearce, D. G. (2015) Destination management in New Zealand: Structures and functions. *Journal of Destination Marketing & Management, 4*(1), 1–12.

Richards, G. (2014). *Tourism Trends: The Convergence of Culture and Tourism*. Breda, The Netherlands: Academy for Leisure NHTV University of Applied Sciences.

Ronay, E., & Egger, R. (2013). NFC Smart City: Cities of the Future – A Scenario Technique Application. In *Information and Communication Technologies in Tourism 2014* (pp. 565–577). Cham: Springer.

Rosengren, K. E. (1981). Advances in Scandinavia Content Analysis: An Introduction. In *Advances in Content Analysis* (pp. 9–19). Beverly Hills, CA: SAGE.

Saarinen, J. (2004). Destinations in Change. The Transformation Process of Tourist destinations. *Tourist Studies, 4*(2), 161–179.

Saraniemi, S., & Kylanen, M. (2011). Problematizing the Concept of Tourism Destination: An Analysis of Different Theoretical Approaches. *Journal of Travel Research, 50*(2), 133–143.

Soteriades, M. (2012). Tourism Destination Marketing: Approaches Improving Effectiveness and Efficiency. *Journal of Hospitality and Tourism Technology, 3*(2), 107–120.

Tralac. (2018). Mauritius Declaration on Digitalisation and Sustainable Tourism. Retrieved April 18, 2019, from https://www.tralac.org/news/article/13096-mauritius-declaration-on-digitalisation-and-sustainable-tourism.html.

UNWTO. (2017). UNWTO Tourism Highlights. Retrieved March 18, 2019, from https://wedocs.unep.org/bitstream/handle/20.500.11822/19525/UNWTO2015.pdf?sequence=1&isAllowed=y.

UNWTO. (2018). UNWTO Tourism Highlights. Retrieved June 25, 2019, from http://marketintelligence.unwto.org/publication/unwto-tourism-highlights-2018.

Werthner, H. (2003). Intelligent systems in travel and tourism. In IJCAI'03 Proceedings of the 18th international joint conference on Artificial Intelligence, 1620–1625. San Francisco, CA: Morgan Kaufmann Publishers.

Part II

Inclusive Economic Growth

10

Women's Entrepreneurship and Sustainable Livelihoods in Lusaka Urban

Atangambuyu Silungwe and Wilson Silungwe

1 Introduction

This research investigated women's entrepreneurship and sustainable livelihoods among small-scale entrepreneurs in Lusaka Urban. Women's entrepreneurship has been recognised in most polities during the last decade as an important, but unexploited sub-sector that can profoundly contribute to the growth of any economy, according to Fetsch et al. (2015, p. 1). Fetsch, Jackson and Wiens state that there is documented evidence from research that shows that women entrepreneurs potentially can create new jobs for themselves and others.

According to Tandrayen-Ragoobur and Kasseah (2012, pp. 12–40), entrepreneurship is the process of establishing, organising and managing an undertaking or business. The undertaking often carries with itself

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considerable risks; Yetisen and others (2015, pp. 3638–3660) suggest that the concept entrepreneurship has over the years attracted traditional definitions centred around the process of designing, launching and running new businesses, which predictably begin as small business entities offering products or services for sale or hire. Entrepreneurs conceive and start these business entities. Scott and Venkatraman (2000, pp. 217–226), however, attempt to deviate from the traditional definitions of entrepreneurship by suggesting that entrepreneurship actually is the "capacity and willingness to develop, organize, and manage a business venture along with any of its risks in order to make a profit".

According to Croitoru (2012, p. 2068), entrepreneurship has been identified as a major driver of economic growth in most parts of the world. Most economies around the world are creating entrepreneurial economies as part of public policy because there is convincing empirical evidence that suggests that entrepreneurship provides the necessary support to the economy through job creation, wealth creation and producing the necessary products to stimulate trade within and outside the country. Entrepreneurship is considered an important driver for economic development (Kritikos 2014, p. 1).

Although considered a recent phenomenon, women's entrepreneurship forms an important sub-sector within the larger entrepreneurship sector. It is, therefore, imperative to not only embrace women's entrepreneurship as an integral sub-sector within the overall entrepreneurship sector, but also to study the phenomenon. The need to investigate women's entrepreneurship emanates from two main reasons and, according to the OECD (2000, p. 5), they are as follows:

1. Women's entrepreneurship has been recognised during the last decade as an important, but untapped, subsector that has tremendous potential to contribute to economic development within economies around the world.
2. The inadequate literature that covers women's entrepreneurship leads to the conclusion that society and academia (social sciences research) have cast a deaf ear towards women's entrepreneurship as a subsector and a discipline of study, respectively.

This study, therefore, focused on empirically investigating women's entrepreneurship and sustainable livelihoods as a way to meet the literature gap, while gaining an understanding whether women's entrepreneurship leads to sustainable livelihoods.

1.1 Objectives of the Study

The overall objective of this study was to investigate whether women's entrepreneurship in Lusaka Urban are able to attain sustainable livelihoods. The focus was on the small-scale entrepreneurs. In investigating the possible correlation between the two identified variables, the types of entrepreneurial activities, factors motivating the choice for entrepreneurship, challenges women entrepreneurs face and whether these women entrepreneurs attained sustainable livelihoods from their entrepreneurial efforts.

2 Related Works

Several related studies were reviewed during the investigation of women's entrepreneurship and sustainable livelihoods.

2.1 Unveiling of Profiles of Women Entrepreneurs in Mauritius: A Study by Tandrayen-Ragoor and Kasseh

Tandrayen-Ragoor and Kasseh (2012, pp. 12–40) conducted a study under the topic "Unveiling of profiles of women entrepreneurs in Mauritius". The overarching aim of the research was to examine the characteristics of women entrepreneurs and their activities so as to better implement policies aimed at encouraging women entrepreneurship in that country. The goal was to stimulate economic empowerment of families through empowering women because as the women attained economic empowerment through entrepreneurial activities, their families

stood to benefit through sustainable living, which was having a stable family income.

The study concluded by stating that stimulating women entrepreneurship contributed to both economic and social inclusion. The study concluded by challenging governments around the world to create and implement projects to encourage women's entrepreneurship as a pathway out of poverty, as it was discovered in the study that women remain an untapped economic resource that had been under-utilised in most countries because of inherent discriminatory practices leading to gender inequalities. The study made a very strong business case for promoting women's economic development, entrepreneurship and enterprise in developing countries and in particular in a small island developing state like Mauritius.

Tandrayen-Ragoor and Kasseh further concluded that Mauritian women entrepreneurs were more likely to focus mainly on familiar activities and thus transferring into the same sectors of business ownership as what they were doing in the mainstream labour market sector.

2.2 Barriers of Women Entrepreneurs: A Study in Bangalore Urban, India, by Gayathridevi in India

A study conducted by Gayathridevi (2014, pp. 24–30) aimed at identifying and evaluating the various constraints/barriers faced by the women entrepreneurs in the Association of Women Entrepreneurs in Karnataka and Karnataka State Women Development Corporation.

The study found that women faced barriers not only as entrepreneurs but also as women themselves. When compared with their male counterparts, women faced more problems. The problems of women ranged from mobilising resources financial capital, marketing skills, sourcing raw materials, sales, labour, technical competencies, withstanding competition, adoption of new technology, electricity power cuts, lack of family support, lack of training, lack of awareness, lack of government support and so forth.

2.3 Problems Faced by the Rural Women Entrepreneurs in India by Manickavasagam and Others

A study by Manickavasagam and others (2007, p. 432) highlighted the problems faced by the rural women entrepreneurs in India. They further reviewed the steps government was taking in order to develop women entrepreneurship. The study was mainly based on secondary data. The researchers consulted with various published research papers in leading journals such as *The Southern Economist*. General information was collected from different libraries. The researchers consulted some teachers teaching the subject and noted their views on the topic. A few rural women entrepreneurs were interviewed for their views on women entrepreneurship.

Some of the hardships women entrepreneurs encounter in India according to the findings from the study by Manickavasagam and others (2007, p. 432) include lack of female role models, inefficient marketing arrangements, socio-cultural barriers, lack of confidence, problem of financing and negative self-perceptions.

The study revealed that the government did not have special training programmes for women entrepreneurs and no special financial assistance in the rural areas, though some NGOs are engaged in the training of rural women entrepreneurs with different training programmes, but no sufficient financial assistance is provided to them. Women, who have started business, find various challenges such as how best to sell their products as well as knowledge on how to competently run their businesses.

3 Research Design and Methods

The study design adopted was mixed in the sense that both the quantitative and qualitative design were utilised. This was important for the purposes of triangulating and consolidating the findings.

The target population was women entrepreneurs within Lusaka Urban. The following specific trading areas within Lusaka were, therefore,

targeted: Kamwala, Town Centre and Northmead markets where a questionnaire was administered and Woodlands and Chilenje markets where observations were conducted. The three trading areas were chosen because of their proximity to each other, making the work of data collection easy. This population provided the base for sampling respondents for the questionnaires, discussants for the focus group discussions and the targets for observations. The respondents for the semi-structured interviews were selected from the WEDAZ organisations on the basis that they are officials of the organisation directly concerned with the improvement of networks of women entrepreneurs.

A total of 120 women entrepreneurs were conveniently sampled as respondent for the questionnaire from the three markets identified. The choice for 120 respondents was on the basis of the assumption of representativeness especially that the markets do not have well-maintained registers and thus sampling from the register would not be possible. Thus a total of 40 respondents from each market were selected. These were sampled conveniently on the basis of availability.

In addition to the 120 respondents selected to participate in the study, 24 women entrepreneurs were sampled from the few registered and regular members of the Women Entrepreneurs Development Association of Zambia (WEDAZ) to participate in the FGDs. The FGD discussants were sampled according to their availability and also ability to attend the discussions at a central place as this research did not have a budget for transporting discussants. The discussions took place in a comfortable conference facility and were organised in three groups of eight discussants each. The discussants discussed a wide range of issues on the subject of women entrepreneurship and sustainable living in Zambia.

With regard to observations, 50 women were observed during this study. The women were conveniently sampled for this purpose on the basis of availability. This researcher visited the markets and took time to observe the women that were available on the days the markets were visited. The findings of the observations are discussed in the chapter on findings.

Thematic analysis was used to analyse the qualitative data that was transcribed from the video recordings of the FGDs. Thematic analysis focuses on identifiable themes and patterns of living and/or behaviour which is organised into categories (Cooper and Schindler 2008, p. 421).

The data collected from the questionnaires were analysed using SPSS. Descriptive statistics as well as a correlation coefficients were drawn analysing various variables.

4 Presentation and Analysis of the Findings

This study focused on the small-scale women entrepreneurs. The findings are now presented in the following categories.

4.1 Types of Entrepreneurial Activities

The findings from the study show that women entrepreneurs in Lusaka were inclined to trading food items more than any other type of merchandise. Statistics show that 80.8 per cent of the women were involved in the trade of food items, while only 19.2 per cent were trading in non-food items such as cosmetics, medical supplies, household goods and so forth. The findings from the FGDs were not any different. Nineteen out the 24 women (79.1%) indicated that they were trading in food items, while 4 out of 24 women (16.7%) indicated that they were trading in non-food items. Only 1 (4.2%) ran a training facility where she trained women in various home-making skills such as housekeeping, cooking, baking and so forth.

Furthermore, from the observations, it was revealed that a total of 76 per cent (38 out of the 50) of the women observed were trading in food items such as beans, vegetables, fruits, fish, kapenta, mealie meal, sugar, salt, cooking oil, cassava and so forth, while only 10 per cent were trading in non-food items such as cosmetics, medicines and so forth. Additionally, 8 per cent of the women were operating hair salons, while 6 per cent operated business centres where they did photocopying, printing, typing, selling mobile phone talk-time and so forth.

4.2 Factors Motivating Choice for Entrepreneurship

It was learned in the interviews that 40.8 per cent of the women had opted for entrepreneurship primarily due to the desire to make a decent profit that would help them live a better life, while a 59.2 per cent went

into entrepreneurship out of interest in career with the view that it was a good occupation option. They stated that they had passion for entrepreneurship.

This researcher wanted to know if there were any respondents who had engaged in other occupations before embarking in entrepreneurship. From the responses collected, 82.5 per cent stated that they were engaged in other occupations before turning to entrepreneurship. From the 82.5 per cent, 57.6 per cent switched to entrepreneurship because they loved the idea of being entrepreneurs, while 36.3 per cent stated that they opted for entrepreneurship with a view of making more money, than they were earning. Only 6.1 per cent indicated that they opted for entrepreneurship when they lost their employment.

The case of FGDs yielded similar information with regard to the factors that motivated women to opt for entrepreneurship. From the discussions, the women stated that they were prompted into entrepreneurship because of the need to meet material and financial needs that could not be fully met by their salaries alone. According to the statements from the women in the focus group discussions, the drive into entrepreneurship was for purposes of sustaining their lives and those of their family members because of insufficient salaries that they were getting from their regular jobs.

4.3 Challenges Women Face as Entrepreneurs

This study sought to understand the challenges women entrepreneurs currently face in Zambia. The women shared some of the many challenges they face as they engage in their various entrepreneurial activities. Some of challenges faced by women entrepreneurs as revealed in the study include

1. lack of access to start-up capital,
2. lack of business training/skills and experience,
3. bureaucratic business registration systems,
4. negative attitudes by society towards women in business,
5. inhibiting costs of inputs,

6. gender issues in the entrepreneurial sector that has been considered a preserve for men and
7. inadequate financial support from financial and government institutions.

4.4 Sustainable Livelihoods

In order to attain sustainable livelihood, the five capitals of sustainable livelihood must be met. Serrat (2010, p. 30) conceived the Sustainable Livelihood Pentagon to explain the five capitals.

1. Natural capital natural resource stocks (soil, water, air, genetic resources, etc.) and environmental services (hydrological cycle, pollution sinks, etc.).
2. Human capital skills, knowledge, labour (includes good health and physical capability).
3. Economic or financial capital base (cash, credit/debt, savings and other economic assets).
4. Social capital social resources (networks, social claims, social relations, affiliations, associations).
5. Physical capital Infrastructure (buildings, roads), production equipment and technologies).

In order to analyse the state of the economies of the individual women entrepreneurs' homes, data for their average monthly home incomes and expenditures were collected. Statistics show that the average incomes from the enterprises were as follows: in the questionnaire, the response categories ranged from K1000 and below to K5000 and above each month (the money is quoted in Zambian Kwacha). From the responses collected, 31 out of the 120 respondents (25.8%) were earning below K1000 a month from their businesses, while 45 out of the 120 respondents indicated that they earned between K1000 and K2000 each month from their businesses, representing 37.5 per cent of the responses. Six out of 120 (5.0%) were earning between K3000 to K4000 while 9 out of the

120 (7.5%) were earning between K4000 and K5000 per month. A total of 20 out of 120 (16.6%) earned more than K5000 a month from their businesses.

On the other hand, the findings show the following expenditure patterns in the homes: 53.3 per cent (64 out of 120 respondents) spent less than K1000 each month, while 20.8 per cent (25 out of the 120 respondents) spent between K1000 and K2000 per month. Furthermore, 5 out of the 120 respondents (4.2%) spent between K2000 and K3000 per month, while 13 out of the 120 respondents (10.8%) spent between K3000 and K4000 per month. One out of the 120 respondents (0.8%) spent between K4000 and K5000 per month, and a total of 12 out of the 120 respondents (10%) spent above K5000 per month.

A cross-tabulation of income from the business and household expenditure of the business income yielded the following results as an example: 96.8 per cent that earn below K1000 also had their expenditure at less than K1000 a month. One household out of the 31 households (3.2%) earning less than K1000 spent between K1000 and K2000 each month according to the data collected. The response implies that either the respondent did not understand the question or that the business was being heavily supplemented by other sources of income for the family. In both cases, it clear that the households in this category did not satisfy the financial capital on the basis of income of the business and expenditure at home. The findings show that the enterprises were not sustaining the livelihoods of the women as the businesses were not supporting fully.

A total of 26 households out of the 45 households (57.7%) that earned between K1000 and K2000 maintained their expenditure at less K1000 a month. For the households earning between K1000 and K2000, it was learned that they also spent within the range of K1000 to K2000. This category totalled 19 households out of the 45 (42.3%). For the households that earned between K2000 and K3000 totalling nine households, one household (11.1%) spent less than K1000 a month, five (55.6%) spent between K1000 and K2000, while three households (33.3%) had their monthly expenditure ranging between K2000 and K3000. Concerning the K3000 to K4000 monthly income range, one household (16.7%) out of the total six households spent less than K1000 a month,

another one (16.7%) spent between K2000 and K3000, while four households (66.6%) spent between K3000 and K4000 each month.

In the K4000–K5000 monthly income category with a total of nine households, 2 (22.2%) out of 120 respondents indicated that their household expenditure was less than K1000 a month, while six households (66.7%) spent between K3000 and K4000 a month. In addition, one household (11.1%) spent between K4000 and K5000. Twenty (20) households earn above K5000, according to the gathered data. Of the 20 households, 4 households (20%) spent below K1000, 1 household (5%) spent between K2000 and K3000, 3 households (15%) spent between K3000 and K4000, while 12 households (60%) spent over K5000 a month. It was learned from the cross-tabulation table, for instance, that for those who spent up to K1000 each month from their businesses, 30 earned up to K1000, 26 earned up to K2000, 1 earned up to K3000, 1 earned up to K4000, 2 earned up to K5000 and 4 earned more than K5000. This shows that more women were spending closer to what they were earning from their businesses. The lower categories of below K1000, between K1000 and K2000, and K2000 and K3000 totalled 58 women out of 64 (90.6%) while the higher categories of between K3000 and K4000, K4000 and K5000, and above K5000 totalled 6 out of 64 (9.4%).

It can be concluded from the statistics above that on the basis of income from the businesses, if it was the sole source of funds for home consumption, it would not suffice for sustainable living because almost all the households indicated that they had to supplement their income with other sources of income in order to survive. The revenue from the business was not enough. A similar trend is seen as far as other aspects of life such as affording paying school fees, medical bills, buying sufficient clothes and buying sufficient food. The businesses for the women can be considered unsustainable since a good percentage of the women were indicating that they could not afford these essential needs for their homes.

The narratives in the FGDs yielded similar findings. The findings of the FGDs show that the income from the businesses was not sufficient to sustain household expenditure. As far as possession of disposable income by the women to allow them to be bank some cash during a particular month, the statistics show that the majority, 36.7%, considered their income sufficient to allow them to save some money every month, while

63.3 per cent stated that they were unable to save anything. This leads to the conclusion that as far as sufficiency of income to allow for saving of extra income is concerned, women's entrepreneurship was not leading to sustainable living since financial capital, an integral component of the Sustainable Livelihood Pentagon, was not satisfied.

Another test for sustainable livelihoods conducted was the ownership of physical capital. It was established by Serrat (2010, p. 31) that the ownership of physical capital/assets such as houses, land, heavy machinery, business premises and other such assets was evidence of sustainable livelihood because these assets were of a permanent nature and would sustain the owners for a long time. In the questionnaire administered, respondents were asked to state whether they owned the house they lived in, the business premises they operated from and whether they owned a car. The following statistics were gathered: 80 out of 120 respondents (66.7%) indicated that they did not own the house they lived in, instead they rented it while 40 out the 120 respondents stated that they owned the house they lived in, representing 33.3 per cent.

A similar test was conducted on the ownership of the premises at which the women operated their businesses. The responses show that a total of 39 out of the 120 respondents (32.5%) who participated in this study indicated that they owned the premises where they operated their businesses. Eighty-one respondents (67.5%) stated that they did not own the premises. The study further tested the relation between the two variables by cross-tabulating income with the ownership of business premises from where the entrepreneurs operated in order to observe the distributions regarding the two variables.

The findings show that 81 out of 120 respondents (67.5%) did not own the premises from which they operated their shop. This is in contrast to the 39 out of 120 respondents (32.5%) who indicated they owned the shop they operated in. This test yields the result that leads to the conclusion that women's entrepreneurship in Zambia does not lead to sustainable livelihood because most of the women do not own physical capital. Cross-tabulating the two variables, income and ownership of premises, leads to the conclusion that the income of business does not necessarily determine the ownership of the premises.

In further testing for the ownership of physical capital, respondents were asked to indicate whether they owned a car. As Serrat (2010, p. 31) suggests, the ownership of assets is a demonstration of sustainable living. A car is useful for sustainable living as it assists in many areas especially in easing transportation challenges as the women entrepreneurs do their business. The distributions show that: Only 7 out of 120 respondents (5.8%) owned a car. Out of 120 respondents, 113 (94.2%) did not own a car. It is clear that the ownership of physical capital in this instance was not satisfactory, and thus it is easy to see that women entrepreneurship was not leading to sustainable living.

From the findings shown so far, it can be concluded that women entrepreneurship does not lead to sustainable living because most of the women in the study indicated that they did not own physical capital.

Respondents were asked whether they were able to invest their money into other projects and business activities that would advantage the family economically. The responses show that 59 (49.2%) out of 120 respondents stated that they were investing while 61 (50.2%) out of the 120 respondents stated that they were not. Cross-tabulations were conducted to further see the distribution of those who invested as opposed to those who did not in relation to income.

Another aspect of this study investigated sustainable living in relation to the ownership of social capital, which according to Serrat (2010, p. 30) was one of the hallmarks needed for one to enjoy sustainable living. Social capital is ability to relate with family both nuclear and extended family, as well as other social relations. One way in which people relate is through support for each other. This researcher was interested to find out whether there was a correlation between income and ability to support members of the extended family. Statistics show that 81 (67.5%) out of the 120 respondents were able to support their extended family members in one way or the other, while 39 (32.5%) out of the 120 respondents were unable to support their extended family members. These statistics show that most women are able to support their families, in a way demonstrating the ownership of social capital.

As far as the women entrepreneurs' perceptions of profitability of their businesses were concerned, the findings show the following: 83.3 per cent considered their businesses profitable while 16.7 per cent considered

their businesses unprofitable. The responses collected from this test were absurd because the majority of the women were giving the clear responses that their businesses were unprofitable. It became necessary at this juncture to test whether there was a correlation between average monthly income and perceptions of profitability. Cross-tabulation was conducted to see how the income variable matched with perceptions of profitability variable. The objective was to see whether those who earned a little more considered their businesses profitable as compared to those who earned less. In the income bracket of K1000 and below, 24 per cent of the respondents stated that they considered their businesses profitable.

In the income bracket of between K1000 and K2000, 35 (29.1%) out of 120 stated that they considered their businesses profitable, while 9 considered their businesses unprofitable. In the income bracket of between K2000 and K3000, the 9 (7.5%) out of 120 respondents stated that they considered their businesses profitable, while none considered their businesses unprofitable. In the income bracket of between K3000 and K4000, three (2.5%) stated that they considered their businesses profitable, while the other three considered their businesses unprofitable. In the income bracket of between K4000 and K5000, all the nine (7.5%) respondents considered their businesses profitable. In the income bracket of K5000 and above, all the 20 (16.6%) respondents considered their considered their businesses profitable.

4.5 Relating Findings to Reviewed Literature

The case of women entrepreneurs of Mauritius as studied by Tandrayen-Ragoor and Kasseh (2012, pp. 12–40) was that the majority of the women (39.39%) were in the 31–34 age category, while another 40 per cent of the women were in the age bracket of 45–59 years. This in a way contrasts with the Zambian scenario where the women entrepreneurs were younger, predominantly in the 21–30 age category.

When comparing the cases of Mauritius and Zambia as far as marital status was concerned, Mauritius, with 81.6 per cent of the women in small-scale entrepreneurship being married, scores far less than Zambia with 52.2 per cent of the women entrepreneurs who are married. The

education attainments recorded related results between Zambia and Mauritius. Majority of the women in both jurisdictions were in the high school category. What is also clear is that most women in both jurisdictions are did not have college level training, therefore, did not have any specialised profession.

Literature shows that the women entrepreneurs of Mauritius mainly engaged in the garment industry. Statistics show that around 29 per cent of the women entrepreneurs were in garment making, while 21.7 per cent were in handicrafts and jewellery. The other 19.6 per cent were in the manufacturing of food products. The choice of business for most women was in line with their previous work, where the small enterprise of the female entrepreneur was just an extension of their previous activity where she was the employee or in activities which she has some prior knowledge (Ayres-Williams and Brotherton 1999, pp. 107–113).

The findings from the study show that women entrepreneurs in Zambia were inclined to trade businesses, particularly food related items. Statistics show that 80.8 per cent were involved in the trade of food items, while 19.2 per cent were trading in non-food items such as cosmetics, medical supplies, household goods and so forth.

The FGDs yielded similar results with 79.1 per cent of the women indicating that they were trade sector. It could be concluded that factors prevailing in a country or community dictate the choice of entrepreneurial activity that the women engage in. In the case of Mauritius, the majority of women opted for the garment industry because most of the entrepreneurs worked within that industry before, while the women of Zambia opted for trade-related businesses because that sector was easy to engage in and did not need much capital to start.

There are several examples from the reviewed literature that describe the factors that motivated the choice for entrepreneurship among women from different jurisdictions. In the case of the United States of America, for instance, several examples can be sited. It is also clear from the reviewed literature that the women entrepreneurs in the case of America were engaged in different trades which include the service industry such as media and catering (in the case of Martha Stewart) and beauty products (in the case of Mary Kay Ash). In the case of women entrepreneurship in Zambia, factors motivating choice for entrepreneurship included

the desire to make a decent profit that would help them live a better life, while others opted for entrepreneurship out of interest in the career with the view that it was a good occupation option. They stated that they had passion for entrepreneurship.

Other studies within Africa reveal the following challenges that women in Africa face according to Dejene (2007, p. 3), women have higher labour burden as compared to men, women's high illiteracy rate also limits the types of vocational and skills training they can be offered, women entrepreneurs concentrate in less lucrative industries, women in the mainstream labour market are concentrated in the personal services and retail industries, thus transferring into the same sectors of business ownership from the mainstream labour market sector seems like an obvious transition.

The case of Zambia is not too different. Small-scale women entrepreneurs struggle with the lack of access to start-up capital, lack of business training/skills and experience, bureaucratic business registration systems and negative attitudes by society towards women in business. Other peripheral challenges faced by women entrepreneurs include inhibiting costs of inputs, gender issues in the entrepreneurial sector that has been considered a preserve for men, lack of financial support from financial and government institutions.

A study conducted by Kabir and others (2012, pp. 265–280) dealt with the impact of small-scale agricultural entrepreneurship on livelihood of rural poor women of Bangladesh and the role of NGOs to develop women's living standards in that country and control over the resources. The study concluded by confirming that that most of the entrepreneurs in rural Bangladesh had improved their socio-economic conditions through small-scale entrepreneurship. Entrepreneurship in the livestock sector was significantly associated with financial, physical and social capital. Vegetables entrepreneurship had significant co-efficient with natural and physical capital. Fisheries entrepreneurship was also significant and positively associated with human capital.

The findings of the study of Bangladesh showed that semi-intensive entrepreneurs have benefited the most. They also show that the role of NGOs, micro credit and training program have great impact on entrepreneurs livelihood patterns and developed living standard. Moreover,

poor livelihood assets, vulnerabilities, and weak transforming structures and process are identified as constraints for the sustainable livelihoods of entrepreneurs and associated groups. It is, therefore, necessary to provide institutional, organisational and government support for sustainable small-scale agricultural entrepreneurship.

From the study done, there is evidence to suggest that women entrepreneurship in Zambia does not lead to sustainable living as most women showed and explained on the challenges they faced and at the same time the failure of their businesses to make better income and more revenue.

5 Recommendations

The study findings provided information regarding the following four:

1. Types of entrepreneurial activities women engage in,
2. Factors that motivate choice for entrepreneurship,
3. Challenges that women entrepreneurs face in Zambia and
4. Women's entrepreneurship and sustainable livelihood.

From the findings of this study, the following recommendations are proposed:

1. As the findings of this study show, a lot should be done to improve women's entrepreneurship in Zambia. For instance, the Government of Zambia must empower micro-financing organisations to be able to extend their financing services to small-scale enterprises especially those operated by women in order to assist them have reasonable capital to invest in their business ventures. It was learned in this study that most women lack capital to be able to boost their businesses.
2. Policy makers such as government must create knowledge centres where women entrepreneurs, as well as men, especially those running small-scale businesses, can go and learn technical skills of entrepreneurship. It was observed in this study that a large group of entrepreneurs lack entrepreneurial skills.

6 Conclusion

This research was investigating women entrepreneurship and sustainable livelihood among small-scale entrepreneurs in Lusaka Urban district. The focus of the study was trading. It is evident from the information collected and presented that women entrepreneurs in Zambia are motivated by certain factors to engage in entrepreneurship as an occupation, that the women face certain challenges that impact negatively on their efforts to succeed as entrepreneurship, but above all that women's entrepreneurship does not lead to sustainable livelihoods in Zambia because of the factors that have been raised. Policies that support women entrepreneurship must be formulated in order to motivate more women to engage in entrepreneurship. These should include deliberate financial support as well as provision technical skills and knowledge in entrepreneurship and enterprise management so that the women can run these business ventures profitably.

References

Ayres-Williams, R., & Brotherton, P. (1999). Five Hot Business Fields for Women. *Black Enterprise, 9*, 107–113.

Cooper, D. R., & Schindler, P. S. (2008). *Business Research Methods* (10th ed.). Boston, MA: McGraw-Hill.

Croitoru, A. (2012). A Review to a Book. *Journal of Comparative Research in Anthropology and Sociology, 3*(2), 137–148.

Dejene, Y. (2007). *Promoting Women's Economic Empowerment in Africa*. African Economic Conference, Addis Ababa, 15–17 November, 2007.

Fetsch, E., Jackson, C., & Wiens, J. (2015). Women Entrepreneurs Are Key to Accelerating Growth. *Entrepreneurship Policy Digest*. Retrieved December 10, 2017, from http://www.kauffman.org/what-we-do/resources/entrepreneurship-policy.

Gayathridevi, C. L. (2014). Barriers of Women Entrepreneurs: A Study in Bangalore Urban District. *International Journal of Trends in Economics Management & Technology (IJTEMT), 3*(2), 24–30.

Kabir, M. S. (2012). Impact of Small Entrepreneurship on Sustainable Livelihood Assets of Rural Poor Women in Bangladesh. *International Journal of Economics and Finance, 4*(3), 265–280.

Kritikos, A. S. (2014). Entrepreneurs and Their Impact on Jobs and Economic Growth. IZA World of Labor. Retrieved December 10, 2017, from https://pdfs.semanticscholar.org/98ea.

Manickavasagam, V., et al. (2007, May 1). Women Entrepreneurs: An Analysis. *Southern Economist*, 432.

OECD. (2000). *Women Entrepreneurs in SMEs: Realising the Benefits of Globalisation and the Knowledge-Based Economy*. Paris: OECD.

Scott, S., & Venkatraman, S. (2000). The Promise of Entrepreneurship as a Field of Research. *Academy of Management Review, 25*, 217–226.

Serrat, O. 2010. The sustainable livelihoods approach. Washington, DC: Asian Developmenty Bank.

Tandrayen-Ragoor, V., & Kasseh, H. (2012). Unveiling the Profile of Women Entrepreneurs in the Small Island Economy of Mauritius. *Interdisciplinary Journal of Contemporary Research in Business, 4*(4), 12–40.

Yetisen, A., et al. (2015). Entrepreneurship. *Lab Chip, 15*(18), 3638–3660.

11

African Union Outer Space Program: Chances and Challenges

Yao Nikez Adu, Fridon Ananidze, and Svetlana Adu

1 Introduction

The importance of outer space technology today for the world and Africa in particular is paramount in the achievement of the Agenda 2063 on the one hand. On the other hand, it is also important in dealing with of The African continent: climate change, agriculture, health care, information data, security and so on. For this purpose, many African countries are developing their own national outer space programs today. The number of African countries interested in this field is really increasing to an extent that the situation calls on the African Union to adopt measures to coordinate and develop outer space program within the Pan African Organization as stipulated by the Agenda 2063 of the African Union and proposed and confirmed by the Specialized technical committee[1] to the

[1] African Space Policy: Towards Social, Political and Economic Integration: https://au.int/sites/default/files/documents/37433-docafrican_space_policy_isbn_electronic_.pdf.

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Assembly of Heads of state and Governments (Assembly) at their twenty-six ordinary sessions held in Addis Ababa in January 2016.

This scientific work is devoted to the study of the development and institutionalization of the African Union outer space program as well as its chances and the challenges that could impede the realization of such a program.

2 Institutionalization of the African Union Outer Space Program

The legal basis and the institutionalization of the outer space program as any other program are vital for its successful realization. The institutionalizations of the African Union outer space program began with the institutionalization of outer space programs at the national level by the adoption of national acts in this area by individual African countries.

2.1 Historic Background of the African Outer Space Activities

After the way to space was first opened by the Soviet Union on the April12, 1961, by Yuri Gagarin, space activities became a battle (the space race) in many countries such as the USSR, USA, France, Germany, and others. During this period, many African countries were under colonial domination and hence could not afford such technology or development for the lack of qualified engineers, financial difficulties, and political autonomy (Inshakova et al. 2016). However, after the attainment of independence several African countries such as Democratic Republic of Congo, Uganda, Zambia,[2] and others announced their intention to take part and not be left behind in the space race.

Many attempts by different African countries such as South Africa, Ethiopia, Egypt, Morocco, Algeria, Nigeria, Uganda, Ghana, Kenya,[3]

[2] https://www.youtube.com/watch?v=7o9bh3swFeE.

[3] https://www.youtube.com/watch?v=f6DU1phv7oY.

and so on to develop their own outer space program has not produced any concrete results as compared to the high-ranking countries of the world in this field.

In the present time, the African country leading in outer space activity is South African Republic. The South African outer space program has its roots in the nineteenth century as claimed.[4] However, the national outer space program emerged under one roof as a national program in 2008 when the National Space Agency Act[5] was passed by the country. The South African National Space Agency (SANSA) officially started its activities from 2010. Today, the aim of the SANSA is clear: to become one of the leading countries of global outer space managers by achieving National programs that include administration of data, earth observation, space sciences, space operations, and space engineering.[6] Currently, the SANSA has recorded progress in areas like climate management, data information, astronomy, and so on. Today, The SANSA has one of the biggest projects that host the biggest radio telescope in the world called the square kilometer array (SKA).[7]

Another African country which is engaging and developing the outer space program is Nigeria.[8] The Nigerian National Space Research and Development Agency (NASRDA) in comparison with the SANSA is newer. In spite of this, The NASRDA has become one of the most prominent and ambitious body in outer space program in the African continent. NASRDA already plans to send the first African astronaut to space by 2030.[9] Nigeria, just like South Africa, has started to legalize space programs by adopting National Acts such as The National Space Research and Development Agency Act of 2010 that established the NASRDA.

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[4] https://www.sansa.org.za/about/#History.

[5] https://www.sansa.org.za/wp-content/uploads/2018/05/National-Space-Agency-Act.pdf.

[6] SANSA report 2018: https://www.sansa.org.za/wp-content/uploads/2018/10/SANSA-Annual-Report-2017_18.pdf.

[7] By Chris Giles, CNN: https://edition.cnn.com/2017/08/10/africa/africa-space-race/index.html Updated 0948 GMT (1748 HKT) May 16, 2018.

[8] Gugunsky D.A. Legal foundations of implementing the Nigeria's space program//Current problems of the modern international law.

[9] By Chris Giles, CNN: https://edition.cnn.com/2017/08/10/africa/africa-space-race/index.html Updated 0948 GMT (1748 HKT) May 16, 2018.

Today, many African countries have established their own national institutions in the field outer space activities. For instance, as earlier mentioned, the State of South Africa has created the South African Space Agency (SANSA) in 2008 by the National Space Agency Act that came into force two years later. The Act assigned an aim, objectives, principles, and functions to the SANSA. That Act also regulates the appointment and the functions of the members of the Board of the SANSA.[10]

The Nigeria has also created such Institute by the adoption of the Nigerian National Space Research and Development Act that has established the National Space Research and Development Agency (NASRDA).[11] The Act like the South Africa contains not only the main aim of the NASRDA, but also the functions and the Board of the National Institute of the outer space activities.

The Ghanaian national space policy became more ambitious after the successful launch of National educational satellite The Ghanasat-1 to hearth orbit in 2017.[12]

Today not only national legislations on space activities are developed but also the national institutes in this area: Algerian Space Agency (ASAL[13]), Egyptian National Authority for remote Sensing and Space Sciences (NARSS),[14] Morocco Royal Center for Remote Sensing (CRTS),[15] The Ethiopian Space Science and Technology Institute (ESSTI),[16] The Kenya Space Agency Board (KSAB[17]), and so on. As we can see after more than a half century passed after the first conquest of the

[10] https://www.sansa.org.za/wp-content/uploads/2018/05/National-Space-Agency-Act.pdf.

[11] https://nasrda.gov.ng/en/nasrda-act/.

[12] Ghana's first satellite launched to Space: https://moc.gov.gh/ghana%E2%80%99s-first-satellite-launched-space.

[13] Decre tPresidentiel № 2-48 du 16 Janvier 2002 portant creation, organization et fonctionnement de l'ASAL: http://www.asal.dz/files/textes%20reglementaires.pdf.

[14] National Authority for Remote Sensing & Space Sciences: http://www.narss.sci.eg/abouts/view/5/Resources.

[15] Décret n°2-89-520 du 18 joumada I 1410 (18 décembre 1989) complétant le décret n° 2-82-673 du 28 rebia I 403 (13 janvier 1983) relatif à l'organisation de l'administration de la défensenationale et portantcréation du Centre Royal de TélédétectionSpatiale // BULLETIN OFFICIEL N° 4029 DU 19 JOUMADA II 1410 (17 janvier 1990): https://www.crts.gov.ma/sites/default/files/docs/DECRETCRTS.pdf.

[16] The Ethiopian Space Science and Technology Institute (ESSTI): http://etssti.org/home-2/.

[17] The Kenyan Space Agency Board: http://www.mod.go.ke/.

space by human being, the African countries now feel the possibility and the necessity to develop their own outer space activities. Therefore, these outer space activities in Africa in the recent years are not only growing, but also becoming legally instituted by including special national institutions that are mandated to coordinate these programs. This situation calls out to the African Union to implement outer space policy together with these already engaged African countries and others. The aim of the African Union is to try not only to boost the countries engaged in this field but also to coordinate outer space programs of different countries for the African people to maximize benefits that come from space activities. Outer space technology is important in various areas including medicine, climate management, agriculture, telecommunication, data information, and so on, which are extremely important for the African countries and also in terms of job opportunity for the new generations.

2.2 African Union Outer Space Institutes

The most important instrument in the development of any program consists of the creation of a special mechanism or institute that is exclusively answerable to the successful realization of the objects assigned to this program. Such institutes usually not only implement the assigned aims by the respective members but also act to formulize, propose plans, and lay down studies for the development of the program and the corresponding institutes.[18] This kind of successful practice is internationally approved by the practices of the realization of many international as well as national programs.

Hence, one of the most important elements or conditions for the development of an African Union outer space program consists of the creation of such mechanism. Today, one of the main body responsible for the African Union outer space program is the African Union specialized technical committee.[19] The Specialized technical committees are created under articles 14 and 15 of the African Union Constitutive Act of 2000 that came into force in 2002. The Specialized technical committee operates under the African Union Commission's Department. The main

[18] See the treaty bodies.

[19] https://au.int/en/stc.

functions of the Specialized technical committee is to prepare projects and programs, to ensure the supervisions, follow-up and the evaluations of the implementations of decisions, to ensure the coordination and harmonization of projects and programs, to submit reports and recommendations and to carry out any other functions that could be assigned to it by the African Union.[20]

Currently, there are thirteen specialized committees, which include the specialized committee on Education, Science and Technology (STC-EST). The STC-EST is the brainstorm of the African Union in terms of education, science and technology. As assigned to it the STC-EST members have held several meetings in order to make proposals for the creation of a future African Space Agency (AfSA). In 2017 in Cairo, the member of the Committee and for the first time put on the table the question of the possibility of drafting of a Statute of the future AfSA.[21]

As a reminder, in 2013 the Executive Council of the African Union adopted three important resolutions on the need of the African countries to coordinate their efforts for the harnessing of space activities for the benefit of the African countries. On the basis of these decisions, the Assembly in their Decision Assembly/AU/Dec.589(XXVI) of January 2016 in Addis Ababa, the African space policy and strategy in accordance with the African Union Agenda 2063 was adopted in order to develop local capacities in hearth observation, satellite communications, navigation and positioning, space sciences, and astronomy. The Decision calls on the African Union space working group to develop a framework for the implementation of the African policy and strategy and the governance framework that covers the relevant legal requirements and protocols for an operational African space program.[22]

In this view, the Assembly of the head of states and governments during the thirtieth Session in Addis Ababa in January 29, 2018, adopted the Statute of African Space Agency, which came into force in 2019. Hence,

[20] Article 15 of the AU Constitutive Act.

[21] https://au.int/en/newsevents/20171021/second-ordinary-session-specialized-technical-committee-education-science-and.

[22] Statute of the Africa Space Agency: https://au.int/sites/default/files/treaties/36198-treaty-statute_african_space_agency_e.pdf.

the AfSA officially became the most important institution of the African Union in terms of outer space activities.

According to the Statute "AfSA is here by established in accordance with the article 5(2) of the Constitutive Act of the African Union". The same article contains **the aims** of the AfSA. The article stipulates that the AfSA dedicated for promoting, advising and coordinating the development and utilization of the outer space sciences and technologies in Africa and associated regulations for the benefits of Africa and the world and forgoing intra-African and international cooperation. **The objectives** of the AfSA contain in article 4 of the Statute. Accordingly, the AfSA should coordinate and promote the African space policy and strategy and conduct activities that exploit space technologies and applications for the sustainable development and improvement of the welfare of African citizens. For these purposes, AfSA should harness the potential of space science, technology and innovation; strengthen space missions; develop a sustainable and vibrant indigenous market; adopt good cooperate governance and sound practice; maximize the benefits of current and planned space activities, and minimize the resources and efforts; promote African-led space agenda through mutually beneficial partnerships; engage with its users through the establishment of communities and practices for each of the identified users requirements.[23]

In order to achieve these functions assigned to it, the AfSA shall compose of four main organs: The Council, The advisory Committee, The Secretariat and The General Director. The Statute assigns to each organ a concrete function as defined by the African Union assembly. The Council will act as the main body headed by the General Director, who should submit an annual report to the Assembly. The Council shall comprise ten experts elected among peoples qualified in the areas of space activities for a term of four years renewable once. There should be two representatives from each African region: two from Central Africa, two from Eastern Africa, two from Western Africa, two from North Africa and two from South Africa.

By the latest decision of the Assembly of the African Union, the AfSA should be located in Cairo (Egypt).

[23] See the article 4 of the Statute of the AfSA.

One of the main important parts of the African Union outer space program consists of the Pan African Universities that will cover the academic study of space research in Africa. For this purpose, South Africa will serve as the main academic center in this field.[24]

3 Opportunities and Challenges for the African Union Outer Space Program

Africa is a continent with two extremes. On the one hand, the continent is the richest in the world in terms of natural and human resources (), but, on the other hand, and to the contrary, the poorest in terms of economic ratio and management of disasters. Can the African outer space program challenge this contrast?

3.1 Opportunities for the African Outer Space Program

The African Union outer space program has a big chance to become a reality.

1. Africa is the continent that has the most sufficient mineral and natural resources (including metal) for its own development than any other continent (Lundgren et al. 2013) in the world for its own development including outer space technology (Van Der Ploeg, F. 2019).
2. According to experts, Africa is the continent of the future. Despite of it exploitation for many centuries, the continent remains the most important human resources for the future. About 65 percent of the African population is below the age of 35 years.[25] This makes Africa the most youthful continent with the greatest perspective in the world.

[24] See the revised Statute of the Pan African University 2016.

[25] THE RATIONALE: http://africanyouthcommission.org/.

3. After many years of absence in the field of outer space technology, Africa is now involved in space activities as a high-priority program. Therefore, African states are not only adopting relevant legislations in this field, but also establishing national mechanisms (institutes and agencies) in order to achieve their goals.
4. At African level, the African countries mentioned have started cooperating in outer space programs within the African Union. That is very important as it can help to boost the exchange of experiences and avoid duplication in the same area. This cooperation allows minimizing costs and the quick development of the technologies.
5. The new development of nanotechnology can be considered as a revolution in outer space technology. If a decade ago the conception and the construction of the satellites was very expensive and required basic industrial infrastructure, now, nanotechnology allows for the use of microchips and the satellites even can be realized in small mechanic workshops. In this way, the cost of the concept and the construction of a satellite will have been considerably reduced and become cheaper than it was many years ago.
6. There is now a proliferation and an access to the outer space technology all over the world. The African countries in this way can benefit from its Diaspora having knowledge in the field of outer space technology and the established education centers could develop their own national outer space programs and prepare specialists.
7. The new international order allows African countries to achieve really their dreams in the harnessing and development of the outer space technologies. Today, many countries not only have their own technology, but are also able to launch satellites to orbit. For instance, China, India, Iran, Pakistan, and other countries are now able to launch satellite to orbit. Such advantages many years ago were granted only to Russia, USA, and European Space Agency (ESA).[26]
8. Scientific research is an important part of any technology development. The inter-university cooperation also consists of an important factor of the African Union outer space program. The cooperation the Pan African universities created in these aims can bring African uni-

[26] https://www.esa.int/ESA.

versities together in this field. The African universities in their international cooperation can benefit from outer space programs from world ranking universities of Russia, USA, Europe, Japan, India and other in the area of high technology.

9. Now, the number of private actors in this ground is getting growing. Today, many private companies such as Bleu Origin, SpaceX, Bigelow Airspace, Boeing, Airbus, and so on are developing their own technology for outer space research without the control of the States. For instance, there is an important cooperation between the SANSAS and Airbus. The privatization of the outer space activities in this way constitutes an important opportunity for African countries.

3.2 Challenges for the African Union Outer Space Program

Despite the will of African countries to develop outer space programs under the existing dire resources, African Union faces many challenges.

1. Despite the considerable reduction of the cost of outer space technology, the expenses on outer space activities are relatively high. For instance, in 2019, the USA plans to spend about $21.5 billion[27] on the space program (NASA). When at the same time, The European Space Agency (ESA) allocated 572 billion euro.[28] The Russian Space Agency (ROSCOSMOS) for its part plans to allocate over 130 billion rubles (about 2 billion euro).

   At the same time, the annual budget of the African Union for 2019 is about $681 million.[29] Also, that matter poses some concerns when about 72 percent of the African Union budget is provide by partners of the Organization.[30]

[27] https://www.thebalance.com/nasa-budget-current-funding-and-history-3306321.

[28] https://www.esa.int/spaceinimages/Images/2019/01/ESA_Budget_by_domain_2019.

[29] https://au.int/en/budget-and-financial-reports.

[30] https://www.aljazeera.com/news/2019/02/african-union-fulfilling-mandate-190210082945436.html.

2. The competition among the African states is a serious concern. For instance, the competition among leading states in outer space to host the future AfSA (headquarter) has shown how it could be difficult for the future collaboration among African countries in this area.
3. The lack of security in Africa is another concern of the outer space program not only for the engaged states as alone, but African Union as whole: book haram in Nigeria, Arab sprint in Egypt, Political instability in Algeria, and so on. All these features are important because to develop the outer space program Africa will need a real political stability.
4. The lack of highly qualified specialist in the field in Africa is a concern for a quick African outer space program development. Because as it was mentioned before, there have been notable achievements of many African countries in outer space program, thanks to international cooperation with world ranking countries in space technology such as China, Russia, USA, Japan, and so on. That is to say that Africa must invest in the youth in that sector now.
5. The problem of share or transfer of technology is so fare despite the call on of the international community to the developed countries to help developing countries in this area. The leader countries in outer space are so fare ready to share their latest technology in this area with the African countries. The African countries will always need the ranking countries, for instance, to launch their satellites to the orbit. So we can affirm that African countries could benefit only from small technologies from aforesaid countries, and for these reasons they must practice self-reliance.
6. The African population could be obstinate in accepting and embracing the concept of African outer space program because of their immediate urgent social needs especially, because The Outer space program as mentioned earlier remains expensive when populations immediately need social care, education, housing, sanitation, and so on.
7. The lack of common priority in the outer space program could be a challenge for African Union outer space program: the SANSA has the biggest project to host the biggest radio telescope in the world (the square kilometer array) and will cost more than it would cost to develop internet in the whole of Africa within the shortest time. So the contrasting needs of African countries in outer space could have a negative impact on a common program.

4 Conclusion

The African continent, like other developed parts of the world, has increased need of outer space technology to deal with many problems that the continent is facing: climate management, medical care, education enforcement, information data, agriculture, and so on.

Today, many African countries have achieved significant progress in outer space activities by adopting national legislations and establishing national agencies. As a result, many African countries today have their own satellites in different fields: education, agriculture, climate management, information data, and so on.

Unfortunately, all these programs are separately developed at the national level without any coordination among African states and also taking into account the cost of such program to be borne by an African state alone.

Therefore, the African Union efforts to coordinate national outer space policies of African countries within an African Union outer space program is welcomed and should be encouraged. In this regard, the African Union has established the African Space Agency (AfSA) that will not only coordinate the space policies of the African states, but would also develop an African space program for the benefit of African peoples.

References

AU DOC.: DECISIONS, DECLARATIONS AND RESOLUTION: Assembly/AU/Dec.588-604 (XXVI), Assembly/AU/Decl.1-2(XXVI), Assembly/AU/Res.1(XXVI). Retrieved from https://au.int/sites/default/files/decisions/29514-assembly_au_dec_588_-_604_xxvi_e.pdf.

CNN News, By Chris Giles, CNN. Retrieved from https://edition.cnn.com/2017/08/10/africa/africa-space-race/index.html. Updated 0948 GMT (1748 HKT) May 16, 2018.

Décret n°2-89-520 du 18 joumada I 1410 (18 décembre 1989) complétant le décret n° 2-82-673 du 28 rebia I 403 (13 janvier 1983) relatif à l'organisation de l'administration de la défensenationale et portantcréation du Centre Royal de TélédétectionSpatiale // BULLETIN OFFICIEL N° 4029 DU 19 JOUMADA II 1410 (17 janvier 1990). Retrieved from https://www.crts.gov.ma/sites/default/files/docs/DECRETCRTS.pdf.

Decret Presidentiel № 2-48 du 16 Janvier 2002 portant creation, organization et fonctionnement de l'ASAL. Retrieved from http://www.asal.dz/files/textes%20reglementaires.pdf.

Gugunsky, D. A. (2013). International and Legal Foundations of Implementing the Morocco's Space Program. *The Ukrainian Bulletin of International Law, 4*, 158–162.

Gugunsky, D. A. (2014). Legal Foundations of Implementing the Nigeria's Space Program. *Current Problems of the Modern International Law*. M. RUDN, 94–99.

Inshakova, A., Frolov, D., Kazachenok, S., & Maruschak, I. (2016). Institutionalization of Intellectual Property on Resource-Saving Technologies and Materials: A Comparative Institutional Study of USA and Russia. *Journal of Advanced Research in Law and Economics, VII*(6 (20)), 1373–1382.

Lundgren, C., Thomas, A., & York, R. (2013). Boom, Bust, or Prosperity?: Managing Sub-Saharan Africa's Natural Resource Wealth. Washington, D.C.: International Monetary Fund https://www.elibrary.imf.org/page/121?redirect=true.

National Authority for Remote Sensing & Space Sciences. Retrieved from http://www.narss.sci.eg/abouts/view/5/Resources.

National Space Research and Development Agency Act, 2010. Retrieved from http://nass.gov.ng/document/download/5892.

SANSA Report 2018. Retrieved from https://www.sansa.org.za/wp-content/uploads/2018/10/SANSA-Annual-Report-2017_18.pdf.

South African National Space Agency Act, Act No. 36, 2008. Retrieved from https://www.sansa.org.za/wp-content/uploads/2018/05/National-Space-Agency-Act.pdf.

Space Programs Springing Up Across Africa. Retrieved from https://www.youtube.com/watch?v=P1Ddp4-FlmI.

Statute of the African Space Agency. Retrieved from https://au.int/sites/default/files/treaties/36198-treaty-statute_african_space_agency_e.pdf.

The Balance: NASA Budget, Current Funding, History, and Economic Impact. Retrieved from https://www.thebalance.com/nasa-budget-current-funding-and-history-3306321.

The Revised Statute of the Pan African University. Retrieved from https://au.int/sites/default/files/treaties/33127-treaty-0059_-_revised_statute_pan_african_university_e.pdf.

Van Der Ploeg, F. (2019). Africa and Natural Resources: Managing Natural Resources for Sustainable Growth. Retrieved from https://www.economics.ox.ac.uk/images/Documents/OxCarre_Policy_Papers/oxcarrepp200801.pdf.

12

The Malabo Protocol on African Criminal Court: Challenges and Perspectives

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1 Introduction

Nowadays, there is a tendency of regionalization of international criminal law, which is understood as "the process of separation of the criminal law systems of particular groups of States on the basis of international criminal law agreements they concluded" (Naumov et al. 2018: 52). This trend is evident in various regions of the world, including Latin America (Currie and Leon 2018) and Africa.

It is the regionalization of international criminal law in Africa that today becomes the subject of the broad discussions at the international level concerning the adoption in 2014 in Malabo (Guinea) of the Protocol on African Court of Justice and Human Rights. According to this very Protocol, the African Court on Human and Peoples' Rights and the Court of Justice of the African Union will be merged into the single regional

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judicial body, the African Court of Justice and Human Rights, within which an international criminal chamber will be established in order to consider cases involving international and cross-border crimes.[1] Thus, the African Court, in addition to jurisdiction to deal with interstate disputes and disputes relating to the protection of human rights, is vested with criminal jurisdiction. With regard to the existing problems of interaction between African States and the ICC (Bukuru 2018), there are different, sometimes conflicting views on the appropriateness of creating a regional court that will consider cases falling within the jurisdiction of the ICC.

The opponents of the idea of creating such an African Court argue that this was a reaction of the African Union (AU) to the activities of the ICC in Africa (Murungu 2011; Du Plessis et al. 2013). Those authors, who advocate its creation and justify such a necessity, indicate that the idea of creating a regional criminal court in Africa to bring the perpetrators of serious violations of international law to justice existed longtime before the creation of the ICC.

The Malabo Protocol contains a list of crimes, some of which fall under the jurisdiction of the International Criminal Court, which makes it extremely relevant to study the relationship between the activities of the African Court and the ICC. Consequently, this chapter examines the prerequisites for adopting the Malabo Protocol, its distinguishing features, the potential issues that the African Court may face, and suggests possible solutions to them.

2 Methods

The system-structural approach has been applied in order to form an integrated vision of the modern international criminal justice system and to define and compare the meaning and role of the ICC and the African Court of Justice and Human Rights within this system. The historical-legal method is used to analyze the history of the development and

[1] In the present chapter the authors use the term "African Criminal Court" as analogous to the African Court of Justice and Human Rights with a view to stress the specific jurisdiction of this court to deal with international and transnational crimes.

adoption of the Malabo Protocol, paying particular attention to determining the factors that stimulated African States to adopt this document. The comparative legal method was applied when comparing the content of the Malabo Protocol with the relevant provisions of the Rome Statute of the ICC. The method of legal forecasting was used to determine the perspectives of future of functioning of African court in the context of its relations with the ICC.

3 Results

Initially, the African Commission on Human and Peoples' Rights was established within the framework of the African system for the protection of human rights as a quasi-judicial body for monitoring the compliance of States with the African Charter on Human and Peoples' Rights.

Subsequently, in 1998, the Protocol to the African Charter on Human and Peoples' Rights on the Establishment of an African Court on Human and Peoples' Rights was adopted (AU Protocol 1998). This Protocol entered into force on January 25, 2004, after it was ratified by more than fifteen States (Simonova 2014: 360).

In 2003, the Protocol on the Establishment of the Court of Justice of the African Union as the main judicial body of the Union (AU Protocol 2003), which entered into force on January 11, 2009, was adopted. Thus, at the Summit of the Assembly of Heads of State and Government of the AU in Sharm el-Sheikh (Egypt) in 2008, the Protocol on the African Court of Justice and Human Rights (Ssenyonjo 2012) was adopted for the purpose of uniting the Court of Justice of the African Union and the African Court on Human and Peoples' Rights in the single judicial body.

Initially, it was assumed that this Court will have two chambers: one to deal with intergovernmental disputes and various kinds of common affairs, and the other for the settlement of disputes in the field of human rights.

But as a result of the discussion on the creation of the single judicial body in Africa and the corresponding changes throughout the world, in 2014, it was decided to amend the 2008 Protocol on the African Court to grant the new court with the international criminal jurisdiction, that

is, to create the criminal chamber. This Protocol was adopted in 2014 at the Summit of Heads of State and Government of the AU in Malabo (Guinea), in connection with which this treaty is called the Malabo Protocol.

It is difficult to fully agree with scholars, who argue that the creation of the regional criminal court in Africa was the reaction of AU to the ICC activities (Agwu 2014), since this idea was discussed when the African Charter on Human and Peoples' Rights was being drafted as well as during discussions within the African union on possible mechanisms for prosecution of the former President of Chad Hissène Habré for committing international crimes under his rule (1982–1990).

The Assembly of Heads of State and Government of the African Union in January 2006 decided to establish the Committee of Eminent African Jurists (Brody 2015) in order to develop mechanisms for the prosecution of Hissène Habré (Nmehielle 2014).

The Committee was tasked to consider all aspects and consequences of the prosecution of Habré, as well as to propose mechanisms that can be used to carry out criminal prosecution in future in such situations.

Regarding possible mechanisms for bringing Habré to justice, the Committee recommended several options including the possibility of holding Habré accountable by the Republic of Senegal, other States Parties to the Convention against Torture (based on universal jurisdiction), or by creating a special tribunal based in accordance with the provisions of the Constitutive Act of the AU (CEAJ Report 2006).

Regarding ways and means for the settlement of such problems in the future, the Committee of Eminent African Jurists noted the possibility of granting criminal jurisdiction to the African Court on the basis of a project to merge the AU Court of Justice and the African Court on Human and Peoples' Rights (CEAJ Report 2006).

States responded positively to the Committee's proposals by adopting the Malabo Protocol.

As a result, in 2012, an agreement was reached between the African Union and the Republic of Senegal on the creation of the Extraordinary African Chambers in the Senegalese courts to prosecute and to bring to justice Hissène Habré. He was sentenced to life imprisonment in 2016.

This positive experience of bringing a high-ranking official to justice has shown that the creation of criminal judicial institutions on the African continent has visible perspectives.

Consequently, the activities of the ICC in Africa cannot be considered the only decisive reason for the creation of the criminal chamber under the African Court. At the same time, it is likely that the measures taken to prosecute the sitting heads of States and other senior officials from the ICC influenced the acceleration of the process of creating the regional criminal court, but they are not the main reasons for the establishment of such a judicial body.

As for the content of the 2014 Malabo Protocol, it is worth noting that it is a novelty in international law, since at this moment there are no judicial bodies in the world similar to the established by this Protocol.

The Malabo Protocol specifies fourteen types of international and transnational crimes: the crime of genocide, the crime against humanity, war crimes, piracy, terrorism, recruitment, corruption, money laundering, human trafficking, change of government through unconstitutional means, illegal drug trafficking, the trafficking of hazardous waste, illegal exploitation of natural resources, and the crime of aggression (Bukuru 2018). By contrast, the ICC has jurisdiction over only four international crimes, that is, crimes of genocide, war crimes, crimes against humanity, and crimes of aggression (Rome statute 1998).

It is important that the Protocol provides for new elements of the crime of aggression (Article 28M) compared with the relevant provisions of the ICC Rome Statute (Article 8 bis and Article 15). The essential difference between Article 28M of the Malabo Protocol and Article 8 bis of the Rome Statute is that the first document states that acts of aggression can be committed not only by States but also by non-state actors. The Rome Statute refers to acts of non-state actors as acts of aggression only when these non-state actors are under the effective control of a foreign State (Inshakova et al. 2019). Article 28M of the Malabo Protocol states that acts of aggression can be committed both by States and non-state actors, and their connection with a foreign State is not necessary (AU Protocol 2014). Moreover, the Malabo Protocol provides for the criminal responsibility not only for individuals but also for legal entities, not only for aggression but for other crimes (Sirleaf 2017). This is especially

important and relevant in view of the existing difficulties in bringing to responsibility corporations and other legal entities for human rights violations or for possible criminal activities, which is especially relevant in the African context.

In addition, unlike the Statute of the ICC, the Malabo Protocol qualifies the use of nuclear weapons as a war crime (Chernor Jalloh 2017), despite the fact that in 1996 the International Court of Justice, when issuing an advisory opinion on the legality of the use of nuclear weapons, indicated that there is no clear established norm in the international law on the complete prohibition of the use of nuclear weapons (Meleshnikov 2011). As we see, the relevant international legal norm already appears in the Malabo Protocol.[2]

A noticeable difference in the Malabo Protocol from the provision of Article 27 of the Rome Statute of the ICC is the granting of immunity to current heads of States and other senior state officials, which has received much criticism (IJRC 2014).

It seems necessary to further consider the issue of the relationship between the jurisdiction of the ICC and the African Court of Justice as one of the cornerstones in the debate on the feasibility of creating a criminal court in Africa.

Taking into account that the relationship between the International Criminal Court and the national courts is regulated by the Rome Statute, and noting that the ratio of jurisdiction of the African Court and the national legal systems of African countries is governed by the Malabo Protocol, the question of the relationship of jurisdiction between the International Criminal Court and the African Court in the context of the complementarity principle remains unresolved.

As some authors argue, the adoption of the Malabo Protocol is a step in the right direction (Sirleaf 2015). The creation of the regional criminal courts can play an important role in effectively combating international crimes (Bukuru and Solntsev 2019).

[2] It is worth noting that in 2017, the Treaty on the Prohibition of Nuclear Weapons was adopted, which, however, does not qualify the use of nuclear weapons as an international crime. At the same time, no State of the "Nuclear club" took part in its adoption and is party to it.

In support of the regional complementarity of the African Court towards the ICC, it is alleged that the teleological interpretation (taking into account the purposes and object of the treaty) (Talalaev 1985) of the principle of complementarity may include not only national but also regional courts (Jackson 2016). It seems that when considering the admissibility of the case in the ICC, it is important to consider whether any actions were taken, if any, not only in the national courts of the State but also in the regional courts, including the African Court Gerhard (Werle et al. 2014; deGuzman 2017).

Despite the above-mentioned positive prospects for the African Court, some difficulties that this Court may face in the future can be highlighted: funding issues (if States do not provide a sufficient budget to the Court), the ability of individual States to influence the Court's activities, therefore, it is proposed to create the independent body on strengthening the independence of the Court and preventing political influence from States (not just African ones). In connection with the unresolved question of the relationship between the jurisdiction of the ICC and the African Court, an agreement is proposed between the ICC and the African Union to resolve such kind of problems.

4 Conclusion/Recommendations

The creation of the African Court empowered to investigate international and transnational crimes is a positive step in strengthening the international criminal justice system. The African Court is a sui generis regional court. This is confirmed by the fact that the Malabo Protocol, unlike the ICC Statute, provides for additional crimes in respect of which the African Court has jurisdiction, including piracy, terrorism, and illegal exploitation of natural resources. The progressive nature of this Protocol is that it considers the use of nuclear weapons as a war crime. In addition, the African Court will be able to prosecute not only individuals but also legal entities.

In connection with the unresolved question of the relationship between the jurisdiction of the ICC and the African Court, an agreement is proposed to be concluded between the ICC and the African Union to resolve

such problems. This agreement should provide for the application of the principle of complementarity in a way that the consideration of the case by the African court will exclude the consideration of the same case by the ICC and vice versa.

Prospects for the creation of the African Criminal Court should be considered in the context of the importance of achieving the Sustainable Development Goal (SDG) 16 "Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels" (SDGs 2015, goal 16).

Accordingly, in the case of ratification of the Malabo Protocol by the necessary number of States, the exercise of criminal justice by the African Court in parallel with the ICC in accordance with the complementarity principle has great potential to ensure effective criminal prosecution of perpetrators of international and transnational crimes. All of this will has potential to contribute to the achievement of the aforementioned SDG 16.

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References

Agwu, F. A. (2014). The African Court of Justice and Human Rights: The Future of International Criminal Justice in Africa. *Africa Review, 6*(1), 30–43.

AU Protocol. (1998). Protocol to the African Charter on Human and Peoples' Rights on the Establishment of an African Court on Human and Peoples' Rights. Retrieved May 17, 2019, from https://au.int/sites/default/files/treaties/7778-treaty-0019_-_protocol_to_the_african_charter_on_human_and_peoplesrights_on_the_establishment_of_an_african_court_on_human_and_peoples_rights_e.pdf

AU Protocol. (2003). Protocol of the Court of Justice of the African Union. Retrieved May 17, 2019, from https://au.int/sites/default/files/treaties/36395-treaty-0026_-_protocol_of_the_court_of_justice_of_the_african_union_e.pdf

AU Protocol. (2014). Protocol on Amendments to the Protocol on the Statute of the African Court of Justice and Human Rights. Retrieved June 22, 2019,

from https://au.int/sites/default/files/treaties/36398-treaty-0045_-_protocol_on_amendments_to_the_protocol_on_the_statute_of_the_african_court_of_justice_and_human_rights_e-compressed.pdf

Brody, R. (2015). Bringing a Dictator to Justice: The Case of Hissène Habré. *Journal of International Criminal Justice, 13*(2), 209–217.

Bukuru, J. B. (2018). The Evolution of the Interaction between the International Criminal Court and African Countries. *Journal of Russian Law, 1*(253), 146–156.

Bukuru, J.-B., & Solntsev, A. M. (2019). The Issues of Legitimacy of the International Criminal Court in Its Relations with African Countries in the Sphere of Counteracting International Crimes. *Russian Journal of Criminology, 13*(2), 332–339.

CEAJ Report—Committee of Eminent African Jurists on the Case of Hissène Habré. (2006). Report. Retrieved June 22, 2019, from https://www.peacepalacelibrary.nl/ebooks/files/habreCEJA_Repor0506.pdf

Chernor Jalloh, C. (2017). The Nature of the Crimes in the African Criminal Court. *Journal of International Criminal Justice, 15*(4), 799–826.

Currie, R. J., & Leon, J. (2018). COPLA: A Transnational Criminal Court for Latin America & the Caribbean. *Nordic Journal of International Law, 88*(4), 587–613. Retrieved from SSRN: https://ssrn.com/abstract=3106855 or https://doi.org/10.2139/ssrn.3106855.

deGuzman, M. M. (2017). Complementarity at the African Court. In C. Jalloh, K. Clarke, & V. Nmehielle. *The African Court of Justice and Human and Peoples' Rights*. Temple University Legal Studies Research Paper No. 2018-01.

Du Plessis, M., Maluwa, T., & O'Reilly, A. (2013). Africa and the International Criminal Court. *Criminal Justice, 11*(3), 563–570.

IJRC. (2014). African Union Approves Immunity for Government Officials in Amendment to African Court of Justice and Human Rights' Statute. Retrieved June 22, 2019, from https://ijrcenter.org/2014/07/02/african-union-approves-immunity-for-heads-of-state-in-amendment-to-african-court-of-justice-and-human-rights-statute/

Inshakova, A., Chegovadze, L., & Deryugina, T. (2019). Legal Realisation of Information Technology Activities of the Government-Owned Corporations: Automation of Management and Control. *OP Conference Series: Materials Science and Engineering, 483*(1), 012108.

Jackson, M. (2016). Regional Complementarity: The Rome Statute and Public International Law. *Journal of International Criminal Justice, 14*(5), 1061–1072.

Meleshnikov, A. V. (2011). On the Issue of the Admissibility of the Use of Nuclear Weapons (Based on the Advisory Opinion of the UN International Court of Justice). *Vestnik (Bulletin) of NNSU, 4*(1), 265–268.

Murungu, C. B. (2011). Towards a Criminal Chamber in the African Court of Justice and Human Rights. *Journal of International Criminal Justice, 9*(5), 1067–1088.

Naumov, A. V., Kibalnik, A. G., Orlov, V. N., & Volosyuk, P. V. (2018). *International Criminal Law: Textbook for Bachelor and Master Programs*. Moscow: Yurayt.

Nmehielle, V. O. (2014). 'Saddling' the New African Regional Human Rights Court with International Criminal Jurisdiction: Innovative, Obstructive, Expedient? *African Journal of Legal Studies, 7*(1), 7–42.

Rome statute. (1998). Statute of the International Criminal Court. Retrieved June 22, 2019, from http://www.icc-cpi.int/NR/rdonlyres/ADD16852-AEE9-4757-ABE7-9CDC7CF02886/283503/RomeStatutEng1.pdf

SDGs. (2015). *Transforming Our World: The 2030 Agenda for Sustainable Development*. Sustainable Development Goals.

Simonova, N. S. (2014). African Court on Human and Peoples' Rights. Institutes of International Justice: Training Manual, Tolstykh, Moscow, Mezhdunarodnye Otnosheniya.

Sirleaf, M. (2017). The African Justice Cascade and the Malabo Protocol. *International Journal of Transitional Justice, Vol., 11*(1), 71–91.

Sirleaf, M. V. (2015). Regionalism, Regime Complexes, and the Crisis in International Criminal Justice. *Columbia Journal of Transnational Law, 54*, 699–798.

Ssenyonjo, M. (2012). Protocol on the Statute of the African Court of Justice and Human Rights. In *The African Regional Human Rights System* (pp. 535–555). Brill Nijhoff.

Talalaev, A. N. (1985). The Law of International Treaties. *Validity and Application of Agreements*. M.: International relations.

Werle, G., Fernandez, L., & Vormbaum, M. (Eds.). (2014). *Africa and the International Criminal Court* (Vol. 1). Springer.

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Integration in Africa: International Legal Competence of the East African Community in the Economic, Social, and Cultural Sphere

L. N. Njenga

1 Introduction

The basic constituent legal instruments that govern the community include the primary founding document of the community, namely the constituent East African Community (EAC) Treaty of 1999 and the major protocols adopted the East Africa Community Customs Union Protocol of 2005,[1] and the East Africa Community Common Market Protocol of 2010. For the successful implementation of economic integration in the community, member states should not only comply with but also ensure the full implementation of the governing treaties. In a global aspect, specifically the United Nations framework, some rights and freedoms including social, economic, and cultural rights are considered an integral part in respecting basic human rights. This article

[1] Available at http://www.eac.int/documents/category/key-documents.

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analyzes the economic, social, and cultural competence of the East African Community (hereinafter referred to as the EAC) which will result in identifying the key roles of sub-regional organizations in the adherence and promotion of some basic rights. The peculiarity and uniqueness of the EAC lies in the fact that it is the most advanced regional community in Africa, having signed a Common Market Protocol and a Customs Union Protocol. The Common Market Protocol, which entered into force on July 1, 2010, marked history by making the EAC the first regional entity to move to the common market from the Customs Union in just five years from the date of its inception.[2] The article will also reflect the scientific views of various scholars in the field of international integration law and the law of international organizations. It is critical to mention that the uniqueness of modern globalization, which in this case refers to integration in relation to the EAC, lies in the fact that member states and the competent organs herewith agree to eradicate jurisdictional barriers by harmonizing national laws. Despite the provision under the Treaty to allow for variable geometry (Gathii 2011) in matters of economic growth, the diverse approach of the individual EAC member states in implementation capacity continues to negatively affect full implementation and compatibility of the EAC Treaty with national law. Nevertheless the EAC has undoubtedly shown distinctive success by introducing unified legally binding agreements that have influenced growth and development in the economic and cultural sphere. These achievements will be reflected in the article.

2 Method

The deductive method is applied in analyzing the competence of the East African Community in the social, economic, and cultural sphere based on the existing principles enshrined in the Treaty and the two major protocols adopted by the member states. The application of historical, legal and forecasting techniques, as well as the methodology of cognition and

[2] At the 11th annual summit of EAC Heads of State, held on November 20, 2009, whereby the protocol on the establishment of a common market was signed and approved by member states. It however entered into force in July 2010.

generalization in this study is necessary in determining the future of international organizations (in this case, the EAC), given that the latest trends such as Brexit could be detrimental to a bloc if certain challenges are not addressed early enough.

3 Discussion

Since the main purpose of creating a common market is "to expand and deepen cooperation between member states in the economic and social fields,"[3] it means that the community must commit to form the basis for fulfilling its functions and responsibilities in the social, cultural, and economic spheres. The member states of EAC are legally obliged[4] not only to protect the economic, social, and cultural rights of the community,[5] but also to ensure the strengthening and consolidation of long-standing political, economic, social, cultural, and traditional ties and relations among the members of the partner states. This contributes to the growth oriented toward mutual development for the benefit of the citizens of member states, as well as to strengthen, coordinate, and regulate economic and trade relations between member states, therefore, supporting the expansion and integration of economic activities within the EAC.[6] In order for any regional community to achieve its goals, especially in the social and economic spheres, it is necessary to achieve the set objectives. In accordance with Article 8 of the Treaty, EAC partners have committed themselves to coordinate their economic policies through numerous institutions to the extent necessary in achieving their goals, as well as to shy away from any measures that may jeopardize these goals and their implementation, as provided for in the Treaty. Practice has shown that, in addition to the adopted community norms, there are also directives and

[3] See Protocol on the Establishment of the East African Community Common Market, Art. 3(1).

[4] The sources of law in the EAC are the Treaty establishing the East African Community of 1999 (the Treaty), which entered into force on July 7, 2000, upon ratification by member States; acts of the East African Legislative Assembly; decisions of the East African court; protocols; and official directives and decisions of the policy organs of the community.

[5] See Articles 7, 10, 13, and 14 of the EAC Common Market Protocol.

[6] Article 5(3(c) (d)) Treaty Establishing the East African Community.

court decisions that continue to strengthen the existing legal structure for the effective settlement of relations between member states for the implementation of their goals, including promoting economic integration. How have these norms, directives, and regulations shown effectiveness toward social, cultural, and economic growth in the East African Community? It is important to note that the uniqueness of modern globalization, in this case—integration, lies in the fact that member states and the competent authorities agree to eliminate jurisdictional and physical boarder barriers to promote trade. The EAC has undoubtedly demonstrated notable success by introducing legally binding agreements in the economic and cultural sphere. In accordance with Articles 76 and 104 of the Common Market Protocol, provision is made for free movement of goods, persons, labor, services, and capital.

The same applies to the rights to self-development and the rights to residence. On a more general scale, the East African Community has grown rapidly, despite volatile and unstable global economic conditions since 2009.[7] With the exception of only two conflict-affected countries, southern Sudan and Burundi, the effectiveness of the EAC Integration has led to impressive indicators in the social, economic, and cultural spheres with an average annual growth of 6.6 percent in gross domestic product (GDP) observed between 2009 and 2014. Although growth and development in the socio-economic sphere of the community is not the only sphere where the impact of integration has played a big role, according to statistical data on the final report on the status of achievement of the development goals formulated under the Millennium Development Goal Declaration (hereinafter MDG) in the East African Community 2010 (Kakande 2010), indicators showed that the average level of literacy in the community was at 74.4 which was lower than that of the world average—84.1 but was however higher than that in Africa—64.9. Another positive indicator of integration in the EAC is reflected in the literacy level among the youth of the community, which was rated 81.9 percent, as compared with that of the youth in the world at 89.5 percent,

[7] This total coverage includes 14 countries in the region. These are Burundi, Comoros, Democratic Republic of the Congo, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Seychelles, Somalia, South Sudan, Uganda, and United Republic of Tanzania.

Treaty establishing the East African Community Article 5(3(c) (d)).

which is certainly a commendable indicator in the field of education and culture of the EAC.

Economic progress in the East African Community has improved immensely. The community recorded an impressive average economic growth rate of 6.2 percent between 2004 and 2013. Despite these positive developments, the pace of development in culture and education still needs to be improved, because according to the statistics above indicating that the literacy rate among men is higher than among women in the member states, with the exception of Kenya and Rwanda should sound alarm bells for the community.

Long-term economic activities between partner states have contributed to the acceleration of urbanization with Tanzania being the most urbanized country in the region. The process of urbanization in the mentioned country began in the 1940s and 1950s with the growth of urban administrative and commercial centers (Sabot 1979). Urbanization in the East African Community continued long after the colonial period was over. Member states have tried to counter urbanization by promoting rural development and decentralizing public institutions. At the end of the 1960s, centers in rural areas were established in many East African states and in 1972, the policy of building infrastructure, schools, and medical health facilities in rural areas was already adopted for building infrastructure, schools, and health facilities in rural areas (Mbonile 1996a). The efforts to combat urbanization intensified in the 1980s (Mbonile 1996b), and large urban areas, in particular, Dar es Salaam, continued to attract large numbers of migrants.

The structural adjustment programs of the 1980s and 1990s, which led to a rollback of economic issues by the state, reduction of government employees, and privatization of state-owned enterprises, increased the pace of urbanization (Mbonile 1995). Today, rural to urban migration is at its highest. Although the most recent urbanization data is scarce, a report known as "The Situation in East African up until 2012" indicated that 26 percent of Tanzanians lived in urban areas in 2010 compared with 19 percent in 1990. Rwanda was also the fastest urbanized over the same period, when the proportion of its population living in urban areas increased from 5 to 17 percent.

According to findings (EAC 2016b), the level of urbanization in Kenya increased from 18 to 22 percent, and in Uganda from 11 to 13 percent over the same period while Burundi had the lowest urbanization growth in the region—6 percent in 1990 and 11 percent in 2010. This slow growth is explained by the internal conflicts in the country as well as political instability. Compared with other regions of the continent, urbanization rates in the East African region, however, are well below the average of 37 percent for sub-Saharan Africa in 2010. Even with 73 million East Africans who are expected to live in urban areas by 2030, this will continue to be a 30 percent level of urbanization, which is below the projected average of 50 percent for sub-Saharan Africa. The urban population in the region is projected to increase by 70 percent in 2050.

From these simple statistics, it is clear that integration has led to socioeconomic progress in the region. For states, citizens, and enterprises, integration can provide vital economic and political benefits. Moreover, in the awakening of globalization, integration is necessary in the preservation of the economic and political significance of individual member states.

Problems and slowness in the integration process in the EAC are somewhat lacking given the long period of its existence of more than a century (Njenga 2018). However, obstacles and challenges that the EAC faces are no different from the problems faced by other international and regional organizations, such as the European Union (hereinafter referred to as EU). The integration of the EU was not a very smooth process, and this process is far from complete even today. "Despite its long-term benefits, the challenge of properly structuring regional integration and overcoming short-term obstacles and conflicts of interest remains a challenge." Obstacles and issues that EAC member states need to take seriously, for example, include how to effectively create a strong democratic structure at both the national and supranational level, how to create a balance on the influence and interests of individual member states, and also to solve the question of how to ensure equal sharing of costs and profits of integration in accordance with Article 7 (1, e) of the Treaty.

The EAC Treaty provides for the principle of variable geometry, which is the principle that is accorded less economically challenged member states of the bloc some flexibility and some autonomy, that loosens the

firm grip and pressure that may come from more powerful member states, in the contribution and harmonization process within the bloc at slower pace. In this way, some scholars are of the opinion that variable geometry plays a significant role in most African Regional Economic Communities through which principles and rules are adopted by member states to accommodate individual member states that may need it. This principle is vital when it comes to matters whereby regional banks allocate credit and investment.

Some individual member states have taken serious individual initiatives to strengthen ties with the rest of the member states. The recently inaugurated President of the Republic of Kenya, Uhuru Kenyatta, in his inaugural speech stated that the borders of Kenya are open to all member states in order to operate freely, work and look for work, enjoy equal benefits in accordance with national laws, and settle in Kenya.[8] According to the Treaty, citizens of EAC member states do not require a visa to travel within the community, but national laws to a certain extent delay and cause confusion, which leads to refusal of entry.

In the case of *Mbugua Mureithi Wa Nyambura v. A-G of the Republic of Uganda & A-G of the Republic of Kenya*,[9] despite the fact that the court rejected this argument on the grounds that the submitted claim was time-barred in accordance with Article 30 (2) because it was not filed within two months after the start of the event where the applicant had stated that the actions of the employees of Uganda to deport and forcibly remove him from Uganda without due process was an infringement of Articles 6 (d) and 7 (2) and Article 104 (1), concerning free movement of persons. The claimant alleged violations not only of this Treaty but also of the East African Common Market Protocol and the African Charter. He claimed that his detention, interrogation, and seizure of his property without warrant violated the defendant's obligations to act in accordance with the principles of good governance and the rule of law provided for in Articles 6(d) and 7(2) of this Treaty. The court found that it had jurisdiction to deal with alleged violations of the present Treaty, affirming its

[8] Inaugural address of his second term as duly elected President of the Republic of Kenya at the Kasarani sports complex in Nairobi on November 6, 2017.

[9] See EACJ First Instance Division, Ref. No. 11 of 2011 *Mbugua Mureithi Wa Nyambura v. A-G of the Republic of Uganda & A-G of the Republic of Kenya*.

authority to deal with any alleged violations of the Treaty, whether or not the allegations also raised issues relating to human rights violations. The EAC Treaty deals with the rule of law and good governance, but does not explicitly include human rights obligations.

In this regard, the East African Court has an important role to play in resolving disputes over issues that may affect relations with the free movement of persons, which is vital for social and economic growth in the region even though the national laws of individual states may handle the same issue differently. In the efforts to resolve this hiccup member states unveiled Vision 2050 of the EAC whereby member states as a bloc aim at improving the quality of life of the peoples of East Africa by increasing competitiveness, increasing value added production, and expanding trade and investment under the brand "one people, one destiny" (EAC 2016a).

Under the EAC Vision 2050,[10] the EAC member states visions indicate pursuit of priority areas that require to be strengthened in order to promote integration—Burundi, in its assigned visions, by 2025, is to aim at sustainable peace, stability, and the attainment of global development commitments in accordance with the MDGs. Vision 2020 in Rwanda focuses on economic transformation within its borders through integration. Kenya includes a commitment to achieving not only global but also regional goals by 2030. Impediments to these visions however are notably security issues in the community. In order to combat crime on the common border several steps and measures have been put in place but an earlier conference held on June 15–16, 1999, in Nairobi, of police officers in East Africa resulted in a resolution "to ensure the installation of a common radio communication system at designated border posts for prompt reception of information and response." Immediately after the resolution was adopted, the main three East African sort further solutions on the best ways to implement the provisions as outlined in the resolution.

The resolution at that time was adopted by the three member states as Rwanda and Burundi adopted the resolution only after joining the EAC. In general, over the years, various regional economic communities, including the EU, have continued to face many problems and obstacles

[10] Source: Adapted from the 4th EAC development Strategy (2011/2012–2015/2016), Deepening and accelerating integration: one person, one destiny. August 2011, p. 14.

related to the process of regional integration. In the EU, for example, Brexit is the most recent example of such a challenge that proves how complex it is to form efficiency and the legitimacy of regional integration, which can withstand short-term nationalist reflexes, especially during times of economic and political crises and uncertainty.

Within the framework of the EAC, in order to ensure socio-economic stability, it is necessary to pay attention to certain aspects of development, for example, urban planning must respond to the expected growth of megacities in the region. It is necessary to establish a common standardization for future cities in the region in order to ensure the coordinated provision of services to city residents and ensure consistency of standards for the structure and architecture of cities for the future in the region. This generally means that certain global aspects will have to be incorporated and implemented at regional level. These aspects include the implementation of sustainable development goals and especially in economic matters, renewable energy (Inshakova et al. 2016), sustainable cities, gender equality, and the protection of the environment (Abashidze et al. 2019).

As a regional economic community, information and communication technologies (hereinafter referred to as ICT) are undoubtedly an integral part of the integration process of the East African Community. Each of the member states of the community has recently undergone changes in national laws and regulations of the ICT sector. This is due to emerging trends and technology development. ICT is a growing field in East Africa, and there are legal and regulatory issues related to this sector in national legislation that have been put in place. It should be noted that each individual member state is doing what is best for its own country in terms of development.[11] This does not however mean that it could be detrimental to the socio-economic growth of the community, on the contrary. Each member state has the capacity to rely on another in various ways including labor for the more industrious country, ready market, and investment

[11] For example, Kenya has benefited from economic growth as a result of the process of devolution of power that was brought about by constitutional changes following a referendum that was supported by an overwhelming majority. Rwanda has recently opened a specialized technology elementary school, in which students study the modern aspects of technology, including training programs along with technology.

opportunities. The Treaty provides for comfortable paces at which individual member states are developing economically and hence contributing to the bloc with minimal pressure. This is the principle of variable geometry. A well-known scholar James Gathii is of the opinion that whereas this principle of variable geometry may benefit regional organizations whose majority partner states are of a lower economic level, they will benefit from mechanisms that will on the one hand "*minimize distributional losses by creating opportunities such as compensation for losses arising from implementation of region-wide liberalization commitments and policies aimed at the equitable distribution of the institutions and organizations of regional integration to avoid concentration in any one member*" and on the other hand the principle serves to address the issue of uneven distribution of benefits that arise from economic activities of integration, in this case, the EAC.

Although the Treaty clearly sets out the legal obligations that member states have with respect to the promotion and protection of social, economic, political, and cultural rights, more effort is needed, especially to fulfill these obligations. Each member state must ensure that its national laws do not contradict the laws and interests of the community and that each member state adheres to the principles of peace and political stability and takes individual decisions that will benefit the East African regions. In this regard, Kenya, Uganda, and Rwanda signed an agreement on the establishment of a trilateral multiple-entry visa allowing tourists to travel freely within the three member states. This is a tangible effort in the community that develops socio-economic relations of the region through tourism. It is not strange that Burundi, South Sudan, and the United Republic of Tanzania opted out as is also the case with the Schengen agreement member states whereby some states opt to impose either temporary or permanent border restrictions in the interest of protecting national security from external threats like illegal migrants (for more, see European Commission 2013).

In an effort to give priority to the national laws of individual partner states with respect to the EAC Common Market Protocol, the summit decided to sign the Protocol at the 11th ordinary summit, held on November 30, 2009, in order to ensure that the Protocol would not include provisions that give authority to redefine national policies and

legislation, for example—access to land will not be automatic and the Common Market Protocol will only lay the groundwork for access to it, the rest of the land provisions will be governed by national legislation. The downside of limiting, so to speak, the powers of some provisions in the protocol may however hinder some of the fundamental aspects of integration, for example, the use of national identity cards as valid inter-state travel documents being unacceptable as universal in all regions of the EAC. This aspect of giving precedence to national laws over the protocol however may to some extent be considered contrary to the fact that precedence over decisions of national courts on similar matters is given to the decisions of the EACJ on the interpretation and application of the EAC Treaty in accordance with Article 33(2) of the EAC Treaty.

Another aspect of socio-economic competence of the integration process within the EAC is reflected in Article 34 on "Economic rights of workers," which is a draft law on the EAC bill of November 2007, in which "partner States shall strive to fulfill the fundamental rights of all people to social justice and economic development, and in particular to ensure that all people have the rights to and access to employment, pension, pension benefits and an adequate standard of living, so that there is an integrated and coordinated approach to planning and action," which are basic prerequisites for equal progressive growth of the various sectors of the community and between rural and urban areas and also to promote sustainable development and the use of natural resources in a manner that meets the development and environmental needs of present and future generations.

4 Conclusion

The EAC has learned some lessons since the collapse in 1977, mainly due to its inability to correct the imbalances that are necessary for sustainability. In order to understand the positive indicators of the integration of EAC as an economic unit, such questions as: Does competitiveness increase by increasing the volume of production, trade, and investment in the region? The answer to this question was addressed in this article. In addition to this answer, in accordance with Article 39 of the EAC Treaty,

within the framework of social policy harmonization, the partner countries undertake to coordinate and harmonize their social policies in order to promote and protect decent work and improve the living conditions of citizens of member states for the development of the Common Market, customs union, a monitor union, and eventually a political federation. The EAC Common Market Protocol is a turning point in the economic growth of the region, since its main priority is the elimination of tariff and non-tariff barriers to trade, the lifting of restrictions on the movement of labor,[12] services, capital, and people, as well as oversight coordination of economic, financial, and monetary policies—all of which are vital for effective integration in a given organization. The common market is guided by the fundamental and operational principles of the EAC, as provided for in Articles 6 and 7 of the EAC Treaty.[13]

In addition, by ratifying the Common Market Protocol, partner states have undertaken to respect the principles of non-discrimination of nationals of other partner states on the basis of nationality, as well as to ensure equal treatment of nationals of other partner states and transparency in matters relating to other partner states in order to exchange information for the implementation of the Common Market Protocol. Under the EAC Common Market Protocol, member states have agreed to guarantee the free movement of nationals of other member states within their borders. They also agreed to ensure non-discrimination of nationals of other member states by allowing them to enter their territory without a visa, allowing citizens of other member states to remain in their territory and leave their territories without restrictions.

Member states further agreed to guarantee the protection of the rights of citizens of other member states within their territory in accordance with their national law, although citizens are not exempt from prosecution for crimes they may have committed. Member states are at liberty to impose restrictions in order to implement public policy, safety, or public health. After the enlargement of the EU in 2004 and the accession of a large group of Central and Eastern European countries, as well as the Baltic countries, the accession of Bulgaria, Romania, Croatia to the EU,

[12] Ibid. at Art. 4(2), p. 6.

[13] Ibid. at Art. 3(1), p. 6.

a whole number of problems associated with population movement naturally arose. People from Eastern Europe began to move to Western Europe in search of work. Of course, this changed the situation on the labor market, created competition for the local labor force. But this did not lead to any great dramatic consequences but instead led to increased tension. Labor migrants from North Africa and Asia put more pressure on the labor market which gave rise to a whole new migrant crisis.

The movement of labor from Poland and the Baltic countries compensated for the shortage of labor in Western Europe. At present, the national laws of the EAC member state do not fully coincide with each other. For example, in the field of information and communication technologies, Kenya, Rwanda, Uganda, and Tanzania endorsed the national policy of the EAC, but are yet to harmonize it within their own national laws. Rwanda is the only EAC Member State that has developed a comprehensive implementation plan toward this effect. Legislation and regulation are equally heterogeneous, although all member states currently have functional, autonomous regulators, the regulatory framework in ICT of some countries is focused on self-regulation (Tanzania and Uganda), while others provide for more stringent regulation by national regulators (Kenya and Burundi) leading to an inclination that efforts at the regional level are minimal, some of the member states have just recently established an international information and communication technology verification system, which allows to track all incoming international traffic which can consequently limit illegal traffic and, therefore, work to the advantage of the region to ensure transparency. However, more needs to be done to include ICT regulators for policymaking at the regional level to enhance integration in the community.

References

Abashidze, A. K., Solntsev, A. M., Baltutite, I. V., & Ilovayskiy, I. (2019). International Requirements for Integrated National Pollutant Release and Transfer Registers. *Studies in Computational Intelligence, 826*, 341–346.

Blokker, N. M., & Schermers, H. G. (2018). *International Institutional Law* (6th ed.). Brill: Nijhoff.

EAC. (2016a, February). EAC Vision 2050. *Group*, 80. https://doi.org/10.1111/j.1530-9290.2009.00117.x

EAC. (2016b). *East African Community Facts and Figures Report 2016. East African Community*. Retrieved from https://www.eac.int/documents/category/key-documents

European Commission. (2013). *Third Biannual Report on the Functioning of the Schengen Area*.

Gathii, J. T. (2011). *African Regional Trade Agreements as Legal Regimes*. Cambridge: Cambridge University Press.

Inshakova, A., Marchukov, I., & Svestyanov, M. (2016). Common Energy Policy and Mechanisms Aimed at Unification of Legal Regulation Related to Foreign Trade Turnover of BRICS Energy Resources. *Journal of Advanced Research in Law and Economics, VII*(7 (21)), 1691–1699.

Kakande, M. N. (2010). Final Report on the Status of Achievement of MDGs by the East African Community.

Mbonile, J. M. (1995). *Determinants of Migration in Tanzania : The Case of Makete District*. Government of Tanzania.

Mbonile, J. M. (1996a). Rural-Urban Female Migration in Tanzania A Case of Dar Es Salaam City. *Utafiti Journal, 3*(2), 169–184.

Mbonile, J. M. (1996b). Towards Breaking the Vicious Circle of Labour Migradon in Tanzania: A Case of Makete District. *Utafiti Journal, 3*(1), 91–109.

Njenga, L. N. (2018). The Legal Status of the East African Community. *RUDN Journal of Law, 22*(3), 370–384.

Sabot, R. H. (Institute of African Studies). (1979). *Economic Development and Urban Migration: Tanzania 1900–1971*. Oxford University Press.

Sapir, A. (1992). Regional Integration in Europe. *The Economic Journal, 102*(415), 1491–1506.

Part III

Economic Diversification and Integration

14

Framework for Attracting Traffic Back to the Railways in Zambia

Fred Mwila and Erastus M. Mwanaumo

1 Introduction

Railway transport plays an important part in the business of logistics (Agbaeze and Onwuka 2014). This is due to advantages the railways have over other modes of transportation of goods and passengers overland. Whereas in many countries, rail transport is a source of economic development, in Zambia, rail transport has deteriorated due to lack of investments. This has negatively impacted its contribution to the national economy. In 2013, for example, transport, storage and communication contributed a partly 3.6% to the gross domestic product (GDP) (CSO 2014). But this has not always been so. In the 1960s and 1970s, the railways in Zambia transported a lot of traffic (ZRL 2014). In the early 1980s, rail transport accounted for two-thirds of freight movement over

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land and air. In 1979, 1980 and 1981, the railways moved 74.1%, 71.9% and 76.9%, respectively (Due 1983).

Rail transport is an integral part of intermodal transportation of goods and passengers for countries engaged in intra and international trade and movements. Rail has the advantage of transporting bulk traffic which cannot be easily transported by motor vehicles over long distances. The carrying capacity of the railways is also extremely large and elastic (Mehta 2015).

Furthermore, rail transport is more advantageous than its major competitor, the road, in the aspects of fuel efficiency, environmental considerations, traffic congestion and safety. For instance, a study sponsored by the United States Federal Railroad Administration (USFRA) in 1991 showed that on 'average, in ton-miles per gallon of fuel, railways are about 4.5 times as fuel efficient when compared to trucks'. Environmentally, the rail is better than road transport. The rail has a better fuel efficiency and therefore emission of harmful gases from fuel usage is less per unit of output for rail compared to road transport. For example, the Swedish Commission on Economic Instruments in Environmental Policy, in 1990, proposed pollution charges, which concluded that the emission costs for road were more than 270 times than that for rail. Rail transport is also safer than the road which involves more accidents. For example, the State Railway of Thailand (SRT) in 1990 stated that in 'Thailand, road accounts for about 94.5–97.5 percent of all the country's accidents, deaths and injuries, while rail accounts for about 2.5–4.8 percent' (Bevis 1992).

Despite the above advantages, rail transport in Zambia is not only a minor player in the transport sector but its traffic has been declining. Freight traffic hauled by Zambia Railways Limited (ZRL) fell from 1.7 million tonnes in 2002 to 0.6 million in 2012. The same is true for passenger volumes which dropped from 223,347 passengers carried in 2009 to 192,608 passengers in 2012 (ZRL 2014). For Tanzania Zambia Railways (TAZARA), the picture is just as gloomy with freight traffic having dropped from 1.2 million tonnes in 1990 to below 400,000 tonnes in 2013. TAZARA passenger levels also dropped from 998,000 in 1990 to an average of 197,240 passengers per year between 2011 and 2014.

This chapter is aimed at establishing some of the main causes of the poor usage of rail transport in Zambia and suggest a framework for attracting bulk and heavy traffic to the rail. The chapter is part of a larger study on 'a comparative study of access to railways in Zambia with respect to road transport'. The research methods included literature review, structured interviews, questionnaire survey and case study. In this study, the literature on railway transportation with respect to its usage in selected regions in the world in general and Zambia in particular was reviewed. Data was collected through questionnaires and case study of Zambia Railways Limited. The data was analysed using both qualitative and quantitative methods. Qualitatively, data analysis revealed experiences and beliefs of those interviewed and participated in the interviews and questionnaires. On the other hand, quantifiable data from questionnaires was used in rating respondents' views using quantitative analysis.

2 History of Zambian Railway System

Zambia has two main railway lines and companies; Zambia Railways Limited (ZRL) and Tanzania Zambia Railway (TZR). There are also three minor branch lines run by ZRL: Maamba line connecting the coal mines; Mulobezi line between Livingstone and Mulobezi, and the Chipata Muchinji line between Chipata and the Malawi border. See Fig. 14.1.

2.1 Zambia Railways Limited

Zambia Railways Limited was formerly part of Rhodesia Railways. The building of ZRL started at Victoria Falls Bridge in 1903, passed through Kabwe (then Broken Hill), the eventual headquarters in 1906 and was finally connected to Zaire (Democratic Republic of Congo) in 1909 (Due 1983). The line operated as Rhodesia Railways until the dissolution of Federation of Rhodesia and Nyasaland in 1963 when it was operated as a Unitary Railway System with assets being jointly owned by Zambia and Zimbabwe. ZRL was born by an Act of Parliament in 1967. The line

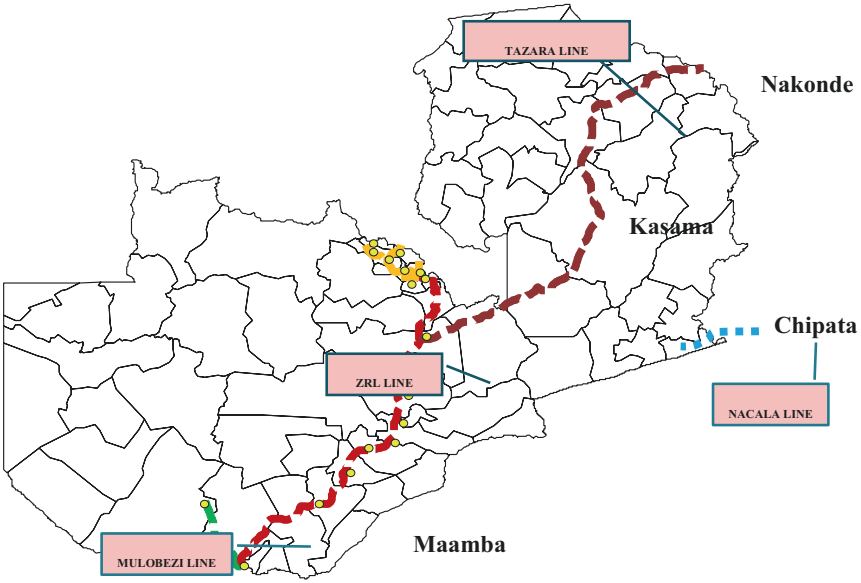

Fig. 14.1 Zambian railway network. (Source: Adapted from ZRL (2014))

is 1266 km long, of which 848 km is the main line from the border with Victoria Falls in Livingstone to Kitwe. It has branch lines in the Copperbelt and Maamba. Commercial, agriculture, trade and industrial activity concentrated along the 'line of rail'. The geographical pattern of economic development was influenced by the railway perhaps more than in any other country (Due 1983).

Zambia Railways Limited in its present form has passed through various managements. In 1978, it was placed under the care of Zambia Mining and Industrial Corporation, ZIMCO. ZRL has been operating as a government owned company since 1982 (ZRL 1990). However, from 2003 to 2012, it was concessioned to Railways Systems of Zambia (RSZ), a private operator.

In the late 1980s, freight movements were averaging about 4.6 million tonnes per annum (ZRL 1990). However, in the subsequent years, there has been a steady decline in both freight and passengers: decline in terms of freight traffic on ZRL which dropped from 1,719,792 tonnes in 2002 to 732,284 tonnes in 2013.

2.2 Tanzania Zambia Railways

TAZARA is jointly owned by the Tanzanian and Zambian governments and operates in both countries. The construction of the railway line was funded by China (Due 1983). It was completed in mid-1975 and started operations in 1976. An important economic consideration was to provide landlocked Zambia with a new access route to the sea. This was to reduce its dependence on existing routes to the south through Rhodesia (now Zimbabwe) and South Africa, which at that time had not attained political independence. In Rhodesia particularly, there was great animosity with Zambia, which needed alternative route to the port. The railway line runs from Dar-es-Salaam to Kapiri Mposhi in Zambia, where it connects with ZRL. It covers a distance of 1860 km and transports both freight and passengers.

After decline in performance of TAZARA in the initial stages of operations, the Tanzanian and Zambian governments invited the Chinese back to help manage the railway in 1983. Passenger traffic on the railway rose from below 500,000 in the early 1980s to 988,000 in 1990 (Monson 2004). In the 1990s, the economic and political environment changed. Namibia got her political independence in 1990. Apartheid in South Africa also ended in 1994. The result was that Zambian goods had more economic outlets to the south and east. Road transport was more accessible and provided stiffer competition. Examples of such competition came from the Trans–Caprivi Highway, the Walvis Bay Corridor to Namibia and the U.S.-sponsored Tan-Zam Highway (Monson 2004). Freight traffic fell from 1.2 million tonnes in 1990 to 630,000 tonnes in 2003, to 533,000 tonnes in 2011 and 480,000 tonnes in 2013.

2.3 Mulobezi Line

The Mulobezi Railway Line runs from Mulobezi to Livingstone in the Southern Province of Zambia. It was constructed to carry timber from the Zambezi Sawmills Company, which produced Rhodesian Teak on the north bank of the Zambezi above Livingstone. The timber is hard and

strong and termite-resistant and found a ready market as railway sleepers, parquet floors and other domestic use. Hence the need for rail to transport the timber. Mulobezi Railway Line was constructed in the early 1930s. The railway line covers a distance of 163 km and links Livingstone in the Southern Province to Mulobezi in the Western Province of Zambia. According to the Zambia Privatisation Agency (2004), Mulobezi Railway Line played a significant economic role since the 1920s as it transported hardwood timber to the copper industries on the Copperbelt in Northern Rhodesia (now Zambia) and in Southern Rhodesia (now Zimbabwe).

At the peak of its operations in the 1970s, the Mulobezi Railway Line ferried about 1,000,000 tonnes of sawn timber and 150,000 tonnes of round timber. This is because Mulobezi area was not serviced by road infrastructure, making the Mulobezi Railway Line the only means of transport for people between Livingstone and Mulobezi. In the early 2000s, Mulobezi Railway Line carried an average of about 18,000 passengers per annum. However, the line suffered years of disrepair to the point of running as slow as 10 km/hr. As a result, both the freight and passenger levels have drastically reduced almost to nothing. In 2005, the line carried about 700 tonnes of freight but in 2013 only 500 tonnes were conveyed. On the hand, 16,500 passengers used the Mulobezi train in 2005 but in 2013 there were only 13,000 passengers (ZRL 2014).

2.4 Chipata-Muchinji (Nacala)

Zambia Railways Limited commenced operations on the Nacala corridor in 2014. Nacala is in Mozambique serviced by Corredor de Desenvolvimento do Norte (CDN), the concessionaire of Mozambique's northern railway line, Central East African Railway (CEAR) of Malawi and the Chipata—Muchinji line which is owned by Zambia Railways up to the border with Malawi. In 2014, Zambia Railways only managed to move a partly 96,000 tonnes of traffic. This further reduced to 75,645 in 2015 (ZRL 2014).

3 The Railways and Economic Development

According to the World Bank (1994), an efficient railway system is indispensable for economic development. In many countries, rail transport has contributed to bringing socio-economic development. Rail transport provide cost-effective, energy saving and environmental friendly form of transportation especially in areas where traffic densities are high (World Bank 1994). When the advantages of the railways are combined with the advantages of other modes of transportation, higher economic levels of traffic can be achieved. This would lead to provision of efficient transport services over relatively long distances (Adesanya 2010). The benefits of this would include opening up rural areas; attracting development along its lines; relieves pressure on the roads; enhances communication infrastructure and creates employment (Agbaeze and Onwuka 2014).

4 Advantages of Rail Transport

According to Mehta (2015), rail transport has a lot of advantages states. Among the major ones are the following:

- very ideal for long distances and transportation of bulky goods;
- train movements can easily be planned and therefore regularised. The service can thus be done with speed and certainty;
- with its cheaper rates, it is ideal for transportation of bulky raw materials;
- it helps in the quick movement of goods in times of emergencies like wars, famines and scarcity;
- it encourages mobility of labour and thereby provides a great scope for employment;
- being the safest form of transport, the chances of accidents are more remote as compared to other modes of transport and
- the carrying capacity is very flexible. You can easily increase by adding more wagons and vice versa.

Furthermore, rail transport is more advantageous than its major competitor, the road, in the aspects of fuel efficiency, environmental considerations, traffic congestion and safety.

5 Challenges Facing Rail Transport in Zambia

The objectives of the main study, of which this chapter is a part, were to establish causal factors of the poor usage of rail transport in Zambia. Literature review, case study of Zambia Railways Limited and questionnaire survey were utilised to collect data. Thereafter, descriptive analysis and inferential statistics were used to analyse the data to come up with the following problems facing the railways in Zambia:

- poor rail infrastructure and equipment;
- poor government rail policies;
- poor management of the railways;
- very low speeds resulting in long transit times;
- limited rail routes;
- costly to operate especially in provision of and maintenance of rail infrastructure and equipment;
- net cost of rail charges/fees are high and
- safety of goods in transit is very low.

The level of contribution of each of these factors to the poor performance of the railways in Zambia is indicated in Fig. 14.2.

5.1 Poor Rail Infrastructure and Equipment

Most governments have invested mainly in road improvements at the expense of railways. These improvements in road infrastructure and equipment led to the road adapting to the emerging traffic demands. The opposite was the case for the railways; slow response to adapt to the new market conditions resulting in traffic decline in rail transport. By 2000,

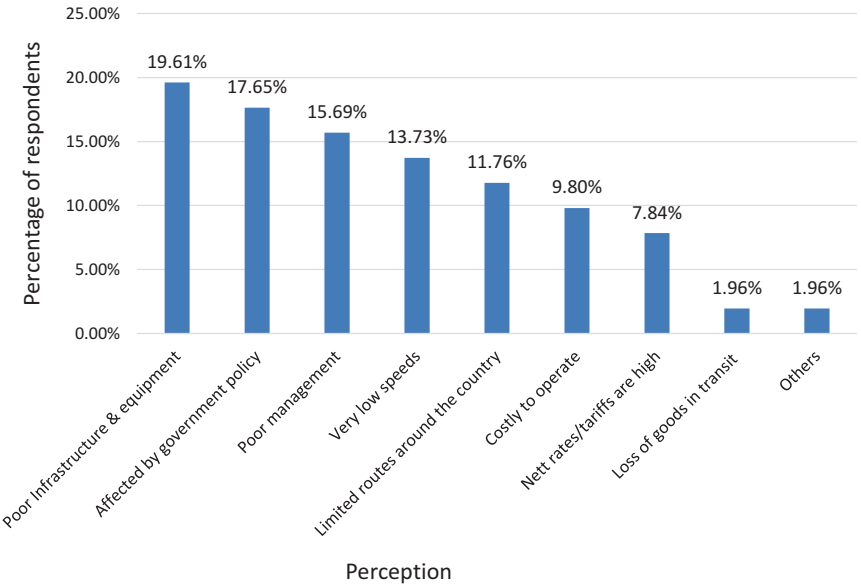

Fig. 14.2 General perception of the railways in Zambia. (Source: Made by the authors)

Zambia (ZRL and TAZARA) like most of the Sub-Saharan African railways was in virtual bankruptcy, requiring permanent cash injection and large investments in infrastructure and rolling stock (Olievschi 2013).

5.2 Poor Government Rail Policies

Government should shift from the perspective of treating competing individual modes, to the approach of integrated multimodal transportation of freight (Abbasi 1996). Government policies concerning the transport sector in terms of loop-sided infrastructure development has only supported the roads. Many new roads have come up in Zambia in the last five years in addition to the rehabilitation and normal maintenance. This has been fully financed by the government while nothing has gone into the railways. The government collects fuel levy from all including the railways whose proceeds are exclusively used for road provision. The

government has failed to put in place adequate legislation to ensure that road damaging cargo are forced to use the rail. The appointment of board of director by the government is almost always based on political affiliations and not professional qualification (Dessler 2014). This in turn filters to the appointments of senior managers as well.

5.3 Poor Management of the Railways

The political appointments are not only limited to the board of directors but also to the chief executive officers and hence the executive management (Dessler 2014). Therefore, most of the managers are not equipped with the business acumen that is necessary to run the railways efficiently and competitively. Lack of investment has also lead to limited rail routes across the country. The only single lane line is concentrated along the 'line of rail'. The inadequacies in investment has further resulted in the other causes of poor accessibility to the rail of very low speeds resulting in long transit times, costly to operate especially in provision of and maintenance of rail infrastructure and equipment, high net cost of rail charges/fees and poor safety of goods in transit (Agbaeze and Onwuka 2014).

5.4 Very Low Speeds Resulting in Long Transit Time

The rail line on the ZRL is very bad. Most rails are worn out and track formation is poor (steep gradients, and sharp and reverse curves, etc.). This leads to frequent derailments and poor turn-around time for rolling stock. Unavailability of spare parts to carry out scheduled and preventive transit has led to poor performing equipment resulting in long transit times. The effect of this on operations is a reduction in the number of operational trains, long transit times for the few running trains and disruption of train services (Olievschi 2013).

5.5 Limited Rail Routes

The Zambian railway transport system has been neglected in terms of investment in new routes. Since 1909 when the now ZRL route reached the Copperbelt, only TAZARA, opened in 1975, has been built as a new line. From that time, there has been no addition to the length of railway network. This has not helped open up rural Zambia to the rest of the country. Since development in Zambia is concentrated along the line of rail, little development is taking place as businesses cannot be attracted. This is in line with Agbaeze and Onwuka (2014) observations.

5.6 Costly to Operate

Poor service delivery by Zambian railway administrations (ZRL and TAZARA) has led to reduction in customer base resulting in low income and inadequate working capital. This lack of necessary resources to maintain the rails, rolling stocks and maintenance facility in reasonable working condition has further produced a serious deterioration of the railway system. This has ultimately led to high costs of operation. However, other operating costs like those which are salary related have remained constant.

5.7 Net Cost/Fares of the Railways are High

Railways costs and therefore charges and the relationship between them are more complicated than the road. The cost structure of rail transport is significantly more complex in comparison to road transport. Fixed, independent, costs of rail transport include vehicle depreciation, vehicle maintenance, salaries of a train's crew, handling fees (loading and unloading) and overhead costs of the carrier (management, other rail employees' salaries, forming of trains, central services, etc.) (Bina et al. 2014). We can also add the maintenance of rail infrastructure. Variable, dependent, costs of rail transport include traction energy (diesel and electricity) and fees for the use of rail transport route (access fees, fees for train's mileage). The inefficiencies stated above makes pricing based on costs even more

difficult. The practice of charging 'what the traffic can bear' may mean charges having very little relationship with the cost incurred. The ultimate result is that the rail is failing to be competitive on the pricing score card.

5.8 Low Safety of Goods

Low speeds and frequent breakdowns in route render the cargo being conveyed by rail susceptible to thefts. There are no effective good tracking systems and updates to the customer on the movements are very bad. This often relegates rail services to second place when compared to road in terms of safety. Railway safety standards are mainly internal within railway administrations who sets their own internal standards—'being player and referee at the same time' (Jorgensen 2012). Railway Safety Regulator must be enhanced to monitor private participation like concessioning in addition to public operators. In order to enhance security, the use of intermodal systems and, in particular, containerised traffic can be of great help (Jorgensen 2012).

6 Way Forward

The challenges stated above have combined to weaken the railway transport system in Zambia which today is a complete underperformer in need of revamping in order to attract more traffic to be competitive. There is a need to have a completely new policy and strategy to make the railways attractive. The policy must aim at having sustainable railway transport system in Zambia by allocating roles to government and operating companies. To achieve this, the government should not only be regulators of railway operations but also owners of rail infrastructure. Long-term strategic plans for the provision, maintenance/rehabilitation and development of the railway infrastructure must be like that of the road sector.

Future concession or Public Private Partnerships (PPP) involvement in the running of railways must have specific deliverables or performance

indices for each party. However, the state must be the owners of railway infrastructure. This will ensure that the government has the obligation of funding the infrastructure. This will also ensure that private operators do not make profits at the expense of infrastructure development. The result will be levelling the playing ground for the road and rail unlike, currently where road transport's infrastructure cost is readily covered by the government. This will allow the users to make the right choice between the two modes of transport.

In order to achieve the above, there is a need for a legal, regulatory and operational framework. The framework must above all ensure government in financing of railway infrastructure like the National Roads Fund. The fuel levy being collected from all fuel users (cars, trucks, locomotives, etc.) could thus be equitably. Finally, instead of the road and the rail always competing, intermodal operations should be encouraged.

This chapter proposes a framework that would improve the competitiveness of the railways by mitigating the challenges highlighted above and taking care of regulation from an economic, safety (including accident investigation) and technical point of view among others.

7 Development of the Framework

Development of the framework for attracting bulky and heavy traffic to the rail was done by taking into consideration the causal factors for poor performance of the railways in Zambia which are: poor rail infrastructure and equipment; poor government rail policies; poor management of the railways; limited rail routes and low safety of goods in transit. The framework presented in Fig. 14.3 comprises the elements that allocate responsibilities to the government and operators/companies for improved railway transport. It also states factors that enable identification and determination of which cargo is optimally conveyed by the rail. Considering the operational framework to adopt in establishing transport mode is very important.

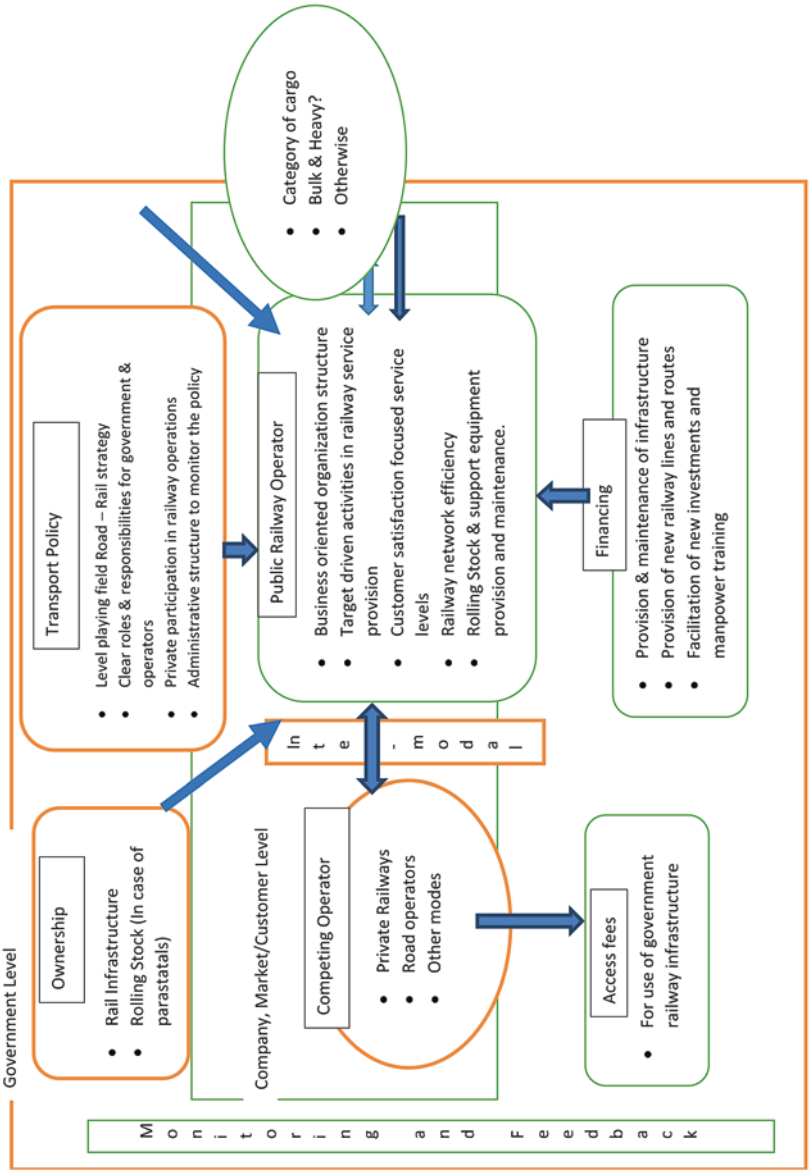

Fig. 14.3 Framework for attracting bulk and heavy cargo to the rail. (Source: Made by the authors)

7.1 Explanation of the Framework

There are two main tiers of the framework: government level and market and/or customer level. The two levels allocate responsibilities to the state, railway operating companies and other stakeholders in order to attract traffic to the railways.

7.2 Government Level

Transport policy: The national transport policy should be such that it provides a level playing field for road and rail transportation. The policy must spell out clear roles and responsibilities of all the stakeholders in the national transport setup and the strategy guiding implementation.

Ownership: Railway infrastructure, track, signalling and telecommunication are very capital intensive in terms of provision and maintenance. It should therefore be the responsibility of the state to own and maintain all railway infrastructure and just charge access fee to the users just like it does to the road. This ownership by the state may be extended to rolling stock, locomotives, wagons and coaches in case of parastatal companies only. However, any private operator must own his rolling stock.

Regulation: Government policy should have a strong regulatory body/department for the railways. This body/office should take care of the monitoring of the management of the railways in terms of structures, economy, safety, technical and accident investigations amongst other systems of railway operations.

Financing: The role of government should include the sourcing of funds for financing of provision and maintenance of infrastructure, coming up of new railway lines and new investments in the railway sector. This should also include manpower development and rolling stock for parastatals.

Access fees: The provision and maintenance of railway infrastructure by the state can be alleviated greatly with funds raised through access fees by all using the infrastructure.

Penalties: The policy must provide for penalties for all breaking law on access fees and bulk and heavy goods conveyance.

7.3 Company and Stakeholder Level

Public railway companies: Government owned railway companies must be business oriented and not as a political tool with very little emphasis on efficiency and customer satisfying service delivery.

Competing operators: In addition to public railway companies, private railways are encouraged in addition to the road in order to promote completion and therefore improved performance. These competing transporters will enhance cooperation which would in turn lead to sustainable intermodal transportation.

Market/Customers: The transport market should be guided by national transport policy on what category of goods is exclusive for each type of transport mode. The government regulatory framework should monitor and enforce this.

8 Conclusion

This chapter has examined transport user's opinion on the factors influencing the accessibility and usage of freight rail transport in Zambia. It also evaluates the advantages that rail transport has compared to other land modes. It further looked at the relationship between the railways and economic development. The chapter concludes that, the underperformance of the railways in Zambia is due to poor rail infrastructure and equipment; poor government rail policies; poor management of the railways; very low speeds resulting in long transit times; limited rail routes; costly to operate especially in provision of and maintenance of rail infrastructure and equipment; net cost of rail charges/fees are high and safety of goods in transit is very low. However, rail transport is an important part of a good national and international transport system. This is because railways, though the initial costs are high, have a lot of advantages over other modes of transport which render its use cheaper. A good

performing railway therefore is indispensable for economic development. Based on these findings, this chapter proposes a framework that would attract bulk and heavy traffic to the rail by way of taking advantages of both the rail and its main land competitor, the road.

References

Abbasi, F. M. (1996). *U.S. Intermodal Freight Transportation: Opportunities and Obstacles*. Michigan: U.S. Department of Transportation Federal Highway Administration.

Adesanya, A. (2010). *Bringing the Nigerian Railways Back on Track: Challenges and Options*. Text of a Lecture Delivered at the Monthly NISER Seminar Series, Held at NISER, Ibadan.

Agbaeze, E. K., & Onwuka, I. O. (2014). Boosting Railway Systems Infrastructure in Nigeria: The Public-Private Partnership Option. *Journal of Business Administration and Management Sciences Research Vol., 3*(3), 039–048.

Bina, L., Binova, H., Brezina, E., Kumpost, P., & Padelek, T. (2014). Comparative Model of Unit Costs of Road and Rail Freight Transport for Selected European Countries. *European Journal of Business and Social Sciences, 3*(4), 127–136. Retrieved from http://www.ejbss.com/recent.aspx.

Central Statistical Office. (2014). Formal Sector Employment and Earnings Report: 2012 and 2013. Lusaka: CSO.

Dessler, G. (2014). *Human Resource Management*. Essex: Pearson.

Due, F. J. (1983). *Trends in Rail Transport of Four African countries of Zimbabwe, Zambia, Tanzania and Sudan*. Faculty working paper no. 937, Urbana-Champaign, University of Illinois.

Jorgensen, A. A. (2012). *The Role of Rail in Intra-Africa Trade*. Railroad Association of South Africa.

Mehta, V. (2015). What are the Advantages and Disadvantages of Railwaytransport? Retrieved from http://www.rajputbrotherhood.com/knowledge-hub/business-studies/what-are-the-advantages-a-disadvantages-of-railway-transport.html

Monson, J. (2004, December 1). Freedom Railway the Unexpected Successes of a Cold War Development Project.

Olievschi, V. N. (2013). Railway Transport, Framework for Improving Railway Sector Performance in Sub-Saharan Africa.

U.S. Federal Railroad Administration. (1991, April). *Rail vs. Truck Fuel Efficiency: The Relative Fuel Efficiency of Truck Competitive Rail Freight and Truck Operators Compared in a Range of Corridors*. Final Report. Abacus Technology Corporation.

World Bank. (1994). *Infrastructure for Development*. World Bank Report. World Bank, Washington, DC.

ZRL. (1990). Zambia Railways Limited, Facts and Figures. Kabwe.

ZRL. (2014, December). Update on Operations and Performance. Presentation to Stakeholders.

15

Planning and Designing Standard of Rural Road Construction in Lusaka Province: An Exploratory Study

Ephraim Sakala, Erastus M. Mwanaumo, and Sampa Chisumbe

1 Introduction

It has been acknowledged that rural roads should be treated as the last link of the transport network. Despite this, they often form the most important link in terms of providing access for the rural population. Their permanent or seasonal absence acts as a crucial factor in terms of the access of rural communities to basic services such as education, primary health care, water supply, local markets and economic opportunities (Donnges 2003). In a study in Ethiopia (Dercon and Hoddinott 2005) on 15 villages that were

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surveyed between 1994 and 2004, they concluded that access to all-weather rural roads reduced poverty by 6.9% and increased consumption growth by 16.3%. Dercon and Hoddinott (2005) found that, in Ethiopia, an increase of 10 km in the distance from the rural village to the closest market town had a dramatic effect on the likelihood that the household purchased inputs. Mu and Van de Walle (2007) showed that markets in Vietnam were more likely to develop as a result of rural road improvements where communities had access to extended networks of transport infrastructure.

It was shown in Uganda that benefits from improving access to basic education depended on complementary investments in infrastructure (Deininger and Okidi 2003). Road improvements in Bangladesh led to lower input and lower transportation costs, higher production, higher wages and higher output prices (Khandker and Koolwal 2011). Access to rural roads in Nepal improved the productive capacity of poor households. Rural road rehabilitation in Georgia increased the opportunities for off-farm and female wage employment (Lokshin and Yemtsov 2005). Rehabilitation and maintenance of rural roads in Peru improved access and attendance to schools and child health centres (Escobal and Ponce 2003). According to the Rural Accessibility Index of 2010 and also Torero and Chowdhury (2004), majority of rural communities in Africa have inadequate and unreliable infrastructure services with only 34% of rural Africans living within 2 kilometres of an all-weather road compared to 59% in Latin America, 65% in East Asia and over 90% in other developed regions. The Africa Infrastructure Country Diagnostic of 2010 indicated that even where feeder roads exist, the rural environment presents particular institutional challenges for road maintenance. Only half of the existing rural road network is in good or fair condition, which is much lower than the 80% found for the interurban network.

Pinstrup-Anderson and Shimokawa (2010) and Fan (2011) indicated that the provision of rural infrastructure contributed to the delivery of goods and services that promoted prosperity and growth; the quality of life, including social well-being, health and safety; and the quality of the environment. It will help reduce the cost of inputs and transport to markets, also increase farmer's access to enlarged markets, facilitate trade flow and spur value addition and crowd in investment. Foster and Briceno-Garmendia (2010) stated that the variation in road quality throughout the various sub-Saharan African countries reflected several interacting

factors. Firstly, the relation to affordability where the GDP per capita is most strongly correlated with the percentage of the main road network in good condition, signifying that richer countries tended to spend more on maintenance. No such clear relationship exists for rural roads. The second factor relates to topographic and climatic influences where mountainous and wet countries normally have poorer road conditions in both main and rural networks (Johannessen 2008). Thirdly, they observed that countries with road funds and road agencies have considerably better road conditions than those that have neither.

Addo-Abedi (2007) noted that a number of African countries had embarked on reforms in the last few decades supported by four "building blocks", namely, ownership, financing, responsibility and management. The main aim of the reforms was to manage roads as a business and bring them into the market place by charging for road use on a fee for service basis. The mean distance to services and community assets diminished significantly due to rehabilitation of rural roads in Zambia's eastern province (Kingombe 2011). The purpose of this study therefore was to review whether the planning of rural road construction in Lusaka province is adequate, as well as to determine whether the design standards and the technology used in Lusaka province are appropriate.

2 Research Methodology

Mixed-methods approach was adopted for this study, with both the qualitative and quantitative approaches. Qualitative data was collected through structured interviews with respondents from the National Council for Construction, Ministry of Finance, National Road Fund Agency, Ministry of Works and Supply, Rural Road Unit as well as Ministry of Local Government. The data collected was used to come up with an informed opinion that was correlated to measurements collected through tests.

Quantitatively, six rural roads were sampled including two from Chongwe, two from Lusaka West as well as two from Lusaka North; these were picked at random. Road dimension tests, road profile tests and physical check of the road features were conducted on the full length of

these rural roads. The first test was the road dimension test using tapes to check the accuracy of the carriageway and the side drains. The second test was the road profile test using the line level where the camber of the carriageway and the longitudinal profile of the carriageway were checked, and the final test was the visual test that was checking for the presence of culverts, culvert rings, wing walls, head walls, ramps, outfalls, mitre drains, scour checks, lay-bys, ditch and the shoulder, and these were presented in the form of check lists. The following were the check lists used:

1. *Road Dimension Tests*

The standard cross section of rural roads in Zambia is one having a carriageway of 5.5 m, with a gravel coarse of 5 m span, side slope of 1.2 m, a ditch of 1 m and a back slope of minimum 3:1 and a maximum of 1:1. The type of tests carried out were simple checks on the dimensional accuracy of the construction works using measuring tapes.

To test for the camber of the carriageway and check on the longitudinal profile of the carriageway, the research used the line level. For the simple checks on the dimensional accuracy of the construction works, measuring tapes were used.

2. *Road Profile Tests*

Two types of tests were carried out: checking on the camber of the carriageway and checking on the longitudinal profile of the carriageway; for both of them, the line level was used.

3. *Gravel Layer Test*

To test the gravel for the thickness of compaction and degree of compaction, measuring tapes and special laboratory tests were carried out.

4. *Compaction*

The compaction method is usually specified. The following are factors that can influence compaction: moisture content, amount of compaction and thickness of the layer.

2.1 Study Limitations

This research was only conducted in Lusaka West, Chongwe and Lusaka North areas because most of the ministries and agencies responsible for rural road design, approval, procurement, construction and supervision are located in Lusaka. Another limiting factor was the scarce availability of data on the causes of poor quality of rural roads. That which exists is often not readily available or tailored to local conditions. Engineering guidelines are either very old or have not been refined in recent years to exploit possible potential cost savings.

3 Findings

The following data was collected on six rural roads from Lusaka West, Chongwe and Lusaka North areas. The results were compared to the theory with the view of finding out whether our rural roads are built to specifications, or if not, why?

In Zambia the Road Development Agency undertakes annual surveys to determine the road condition indices for unpaved roads within the Core Road Network. The variations are considerable, and give the status of the condition on the Core Road Network. For example, during the period 2014–2015, over 70% of unpaved trunk, main and district roads and 82% of the unpaved primary feeder roads (PFR) were in poor condition. The condition of PFR substantially remained unchanged.

It was clear from the findings that the planning process was followed adequately. It starts from the National Development Plans to the Transport Sector Plans. These are then incorporated into the annual programs and budgets. Local plans are then drawn from them. That's when project plans are done and then the detailed plans, and finally the

maintenance plans are done. All these plans are governed by a legal and regulatory framework.

The roads in Zambia are properly classified, and those providing access to and from local communities are often under the jurisdiction of the local authorities. The government develops a set of design guidelines. These design guidelines include general directions on the geometric features of the roads, such as appropriate dimensions of the road cross section and curvature, surfacing options, drainage solutions and road reserves. All public expenditure is governed by a comprehensive set of procedures and directives detailing how funds are to be used and accounted for. These procedures include budgeting and accounting procedures as well as detailed regulations on the contracting arrangements.

3.1 On-the-Spot Tests

On-the-spot check on six rural roads that were picked in Lusaka North, Lusaka West and Chongwe revealed that rural roads are not constructed according to design standards and specifications. The road standard design is one having a carriageway of 5.5 m, gravel coarse width of 5 m, side slope of 1.2 m with a slope of 1 in 4 with the shoulder and a ditch of 1 m. All roads surveyed conformed to the longitudinal alignment as specified in the design standards of 5.5 m carriageway and a gravel coarse of 5 m. Shoulders were not to specifications of 1.2 m. The shoulders on all roads surveyed were less than the desired 1.2 m. Where the ditch was present on the roads, it averaged 0.5 m instead of the recommended 1 m.

Culverts were missing, inadequate or wrongly constructed. The 300-mm culvert ring seems to be the most preferred against the standard 600 mm that is easy to clean in case of silting. Observed on some of the roads were wing walls constructed at angles outside the 45° and 75° alignment to the centreline band. Head walls were not constructed to the right height and width, and most culverts did not have ramps to protect the rings; where ramps existed, they were not of the recommended two-thirds height. The outfall on most of the culverts was beyond the recommended 20 m.

All the roads surveyed had few or no mitre drains at all. Where they existed, they were wrongly constructed and positioned. In some cases,

Table 15.1 Transmitter road dimension test (rural road dimension test using the tape)

Test	Average (mm)	Location	Every (m)	Tolerance (mm)
Width of carriageway	5.5	Field	300	±50
Width and depth of side drains	0.5 and 0.2	Field	10	±20

Source: Made by the authors

Table 15.2 Transmitter road profile test (rural road dimension test using the line level)

Test	Average (m)	Location	Test interval (m)	Tolerance (mm)
Camber	0.1	Field	20	±10
Longitudinal profile	–	Field	20	±50

Source: Made by the authors

instead of discharging the water from the drains, they were charging the drain. No scour checks were observed on any of the roads surveyed. And no lay-by was observed either as shown in Tables 15.1, 15.2, 15.3, 15.4, 15.5, 15.6, 15.7, 15.8, 15.9, 15.10, 15.11, 15.12, 15.13, 15.14, 15.15, 15.16, 15.17 and 15.18, respectively.

3.1.1 Transmitter Road in Lusaka West of Lusaka District

Total length of road, 2.5 km; carriageway, 5.5 m

3.1.2 China-Zambia Road in Lusaka West of Lusaka District

Total length, 1.9 km; carriageway, 5.5 m

Table 15.3 Transmitter road condition inventory check list

Road condition inventory	Specifications	Comments
Soil type	Laterite	Laterite soil present
Surface material	Laterite	Laterite
Road surface width	5.5 m	5.5 m
Maximum gradient	12%	<6%
Camber	5% after compaction	5%
Shoulder	1.2 m	1 m
Side slope	1:4	0.2 m
Side drain left	1 m	0.5 m
Side drain right	1 m	0.5 m
Tree and stump removal	6 m clearance from centre	Not adhered to
Sand removal	Must be removed	Done
Boulder removal	<0.5 m boulders buried along the road	No presence of boulders observed
Clear side drain	Must be cleared	Overgrown with grass
Clear mitre drains	Must be cleared	Overgrown with grass
Scour checks	12% gradient must be 6 m apart	No scour checks observed
Grass planting	Must be done	Done
Catch water drains	5 m away from the ditch	Present but less than 5 m from the side drain
Gravel surface thickness	125 mm after compaction	Less than 50 mm thickness
Culverts per km	For maximum gradients of 12%, 2 to 4 per km	No culvert for the entire stretch of the road
Culvert pipe size	600 mm	No pipes culverts present
Wing walls	45° < centreline < 75°	No wing walls present
Head walls	200 mm	No head walls present
Ramp	20 m approach distance	No ramp present
Lay-by	5 m	No lay-by found

Source: Made by the authors

Table 15.4 China-Zambia road dimension test

Test	Average (m)	Location	Every (m)	Tolerance (mm)
Width of carriage	5.5	Field	300	±50
Width and depth of side drains	0.8 and 0.2	Field	10	±20

Source: Made by the authors

Table 15.5 China-Zambia road profile test

Test	Average	Location	Test interval (m)	Tolerance (mm)
Camber	<0.1 m	Field	20	±10
Longitudinal profile	–	Field	20	±50

Source: Made by the authors

Table 15.6 China-Zambia road condition inventory check list

Road condition inventory	Specifications	Comments
Soil type	Laterite	Laterite soil present
Surface material	Laterite	Laterite
Road surface width	5.5 m	5.5 m
Maximum gradient	12%	<6%
Camber	5% after compaction	5%
Shoulder	1.2 m	1 m
Side slope	1:4	0.2 m
Side drain left	1 m	0.8 m
Side drain right	1 m	0.8 m
Tree and stump removal	6 m clearance from centre	Not adhered to
Sand removal	Must be removed	Done
Boulder removal	<0.5 m boulders buried along the road	Presence of boulders observed along the road
Clear side drain	Must be cleared	Overgrown with grass
Clear mitre drains	Must be cleared	Overgrown with grass
Scour checks	12% gradient must be 6 m apart	No scour checks observed
Grass planting	Must be done	Done
Catch water drains	5 m away from the ditch	Present but less than 5 m from the side drain
Gravel surface thickness	125 mm after compaction	125 mm thickness
Culverts per km	For maximum gradients of 12%, 2 to 4 per km	No culvert for the entire stretch of the road
Culvert pipe size	600 mm	No culverts pipes present
Wing walls	45°< centreline < 75°	No wing walls present
Head walls	200 mm	No head walls present
Ramp	20 m approach distance	No ramp present
Lay-by	5 m	No lay-by found

Source: Made by the authors

Table 15.7 Kapepe-Nyendwa road dimension test

Test	Average (m)	Location	Every (m)	Tolerance (mm)
Width of carriage	5.5	Field	300	±50
Width and depth of side drains	0.5 and 0.2	Field	10	±20

Source: Made by the authors

Table 15.8 Kapepe-Nyendwa road profile test

Test	Average	Location	Test interval (m)	Tolerance (mm)
Camber	<0.1 m	Field	20	±10
Longitudinal profile	–	Field	20	±50

Source: Made by the authors

Table 15.9 Kapepe-Nyendwa road condition inventory check list

Road condition inventory	Specifications	Comments
Soil type	Laterite	Laterite soil present
Surface material	Laterite	Laterite
Road surface width	5.5 m	5.5 m
Maximum gradient	12%	<6%
Camber	5% after compaction	5%
Shoulder	1.2 m	1 m
Side slope	1:4	0.2 m
Side drain left	1 m	0.5 m
Side drain right	1 m	0.5 m
Tree and stump removal	6 m clearance from centre	Adhered to specifications
Sand removal	Must be removed	Done
Boulder removal	<0.5 m boulders buried along the road	No presence of boulders observed
Clear side drain	Must be cleared	Overgrown with grass
Clear mitre drains	Must be cleared	Overgrown with grass
Scour checks	12% gradient must be 6 m apart	No scour checks observed
Grass planting	Must be done	Done
Catch water drains	5 m away from the ditch	Present at 5 m from the side drain
Gravel surface thickness	125 mm after compaction	Less than 50 mm thickness

(*continued*)

Table 15.9 (continued)

Road condition inventory	Specifications	Comments
Culverts per km	For maximum gradients of 12%, 2 to 4 per km	Two culverts per km observed
Culvert pipe size	600 mm	300 mm culverts pipes
Wing walls	45° < centreline < 75°	Not to specifications
Head walls	200 mm	Not to specifications
Ramp	20 m approach distance	<20 m approach distance
Lay-by	5 m	No lay-by found

Source: Made by the authors

Table 15.10 Evergreen-Nyendwa road dimension test – width of carriage and side drains

Test	Average (m)	Location	Every (m)	Tolerance (mm)
Width of carriage	5.5	Field	300	±50
Width and depth of side drains	0.6 and 0.1	Field	10	±20

Source: Made by the authors

Table 15.11 Evergreen-Nyendwa road dimension test – camber and longitudinal profile

Test	Average	Location	Test interval (m)	Tolerance (mm)
Camber	0.2 m	Field	20	±10
Longitudinal profile		Field	20	±50

Source: Made by the authors

3.1.3 Kapepe School to Nyendwa Bar Road in Chongwe District

Total length, 10.8 km; carriageway, 5.5 m

3.1.4 Evergreen to Nyendwa Road in Chongwe District

Total length, 9 km; carriageway, 5.5 m

Table 15.12 Evergreen-Nyendwa road condition inventory check list

Road condition inventory	Specifications	Comments
Soil type	Laterite	Laterite soil present
Surface material	Laterite	Laterite
Road surface width	5.5 m	5.5 m
Maximum gradient	12%	<6%
Camber	5% after compaction	5%
Shoulder	1.2 m	1 m
Side slope	1:4	0.1 m
Side drain left	1 m	0.6 m
Side drain right	1 m	0.6 m
Tree and stump removal	6 m clearance from centre	Adhered to
Sand removal	Must be removed	Done
Boulder removal	<0.5 m boulders buried along the road	No presence of boulders observed
Clear side drain	Must be cleared	Cleared
Clear mitre drains	Must be cleared	Cleared
Scour checks	12% gradient must be 6 m apart	Scour checks observed
Grass planting	Must be done	Done
Catch water drains	5 m away from the ditch	Present and at 5 m
Gravel surface thickness	125 mm after compaction	Spot gravelling 125 mm thickness
Culverts per km	For maximum gradients of 12%, 2 to 4 per km	6 culverts
Culvert pipe size	600 mm	300 mm culverts pipes
Wing walls	45° < centreline < 75°	Present
Head walls	200 mm	Present
Ramp	20 m approach distance	Ramp present
Lay-by	5 m	No lay-by found

Source: Made by the authors

Table 15.13 Mpandika's Palace road dimension test

Test	Average (m)	Location	Every (m)	Tolerance (mm)
Width of carriage	5.5	Field	300	±50
Width and depth of side drains	0.6 and 0.2	Field	10	±20

Source: Made by the authors

Table 15.14 Mpandika's Palace road profile test

Test	Average	Location	Test interval (m)	Tolerance (mm)
Camber	0.1 m	Field	20	±10
Longitudinal profile		Field	20	±50

Source: Made by the authors

Table 15.15 Mpandika's Palace road condition inventory check list

Road condition inventory	Specifications	Comments
Soil type	Laterite	Laterite soil present
Surface material	Laterite	Laterite
Road surface width	5.5 m	5.5 m
Maximum gradient	12%	12%
Camber	5% after compaction	5%
Shoulder	1.2 m	1 m
Side slope	1:4	0.2 m
Side drain left	1 m	0.6 m
Side drain right	1 m	0.6 m
Tree and stump removal	6 m clearance from centre	Adhered to
Sand removal	Must be removed	Done
Boulder removal	<0.5 m boulders buried along the road	No presence of boulders observed
Clear side drain	Must be cleared	Overgrown with grass
Clear mitre drains	Must be cleared	Overgrown with grass
Scour checks	12% gradient must be 6 m apart	No scour checks observed
Grass planting	Must be done	Done
Catch water drains	5 m away from the ditch	Not present
Gravel surface thickness	125 mm after compaction	Earth road
Culverts per km	For maximum gradients of 12%, 2 to 4 per km	3 culverts
Culvert pipe size	600 mm	600 mm culverts pipes
Wing walls	45°< centreline < 75°	No wing walls present
Head walls	200 mm	Head walls present
Ramp	20 m approach distance	No ramp present
Lay-by	5 m	No lay-by found

Source: Made by the authors

Table 15.16 Spin-along road dimension test

Test	Average (m)	Location	Every (m)	Tolerance (mm)
Width of carriage	5.5	Field	300	±50
Width and depth of side drains	0.5 and 0.3	Field	10	±20

Source: Made by the authors

Table 15.17 Spin-along road profile test

Test	Average (m)	Location	Test interval (m)	Tolerance (mm)
Camber	0.1	Field	20	±10
Longitudinal profile	Ok	Field	20	±50

Source: Made by the authors

Table 15.18 Spin-along road condition inventory check list

Road condition inventory	Specifications	Comments
Soil type	Laterite	Laterite soil present
Surface material	Laterite	In situ laterite
Road surface width	5.5 m	5.5 m
Maximum gradient	12%	<6%
Camber	5% after compaction	5%
Shoulder	1.2 m	No shoulder observed
Side slope	1:4	0.3 m
Side drain left	1 m	0.5 m
Side drain right	1 m	0.5 m
Tree and stump removal	6 m clearance from centre	Adhered to
Sand removal	Must be removed	Done
Boulder removal	<0.5 m boulders buried along the road	No presence of boulders observed
Clear side drain	Must be cleared	Overgrown with grass
Clear mitre drains	Must be cleared	Overgrown with grass
Scour checks	12% gradient must be 6 m apart	No scour checks observed
Grass planting	Must be done	Done

(*continued*)

Table 15.18 (continued)

Road condition inventory	Specifications	Comments
Catch water drains	5 m away from the ditch	Not present
Gravel surface thickness	125 mm after compaction	No gravel
Culverts per km	For maximum gradients of 12%, 2 to 4 per km	No culvert for the entire stretch of the road
Culvert pipe size	600 mm	No culverts pipes present
Wing walls	45°< centreline < 75°	No wing walls present
Head walls	200 mm	No head walls present
Ramp	20 m approach distance	No ramp present
Lay-by	5 m	No lay-by found

Source: Made by the authors

3.1.5 Headman Mpandika's Palace Road in Lusaka North

Total length, 4.2 km; carriageway, 5.5 m

3.1.6 Spin-Along Road in Lusaka North

Total length, 3.2 km; carriageway, 5.5 m

4 Discussions

During planning at the local level, annual work plans are done by people who are inexperienced and unqualified. The processes of identification, screening, appraisal, ranking and approval are not properly followed, and in most cases, they are influenced by excessive political pressure without due consideration to the social and economic significance of these rural roads. The unfortunate result of this is having improperly designed rural roads that substantially hinder and prevent vehicle movement whether seasonally or throughout the year due to deep rutting, soft soils, slippery surfaces, poor water crossing and so on. Roads missing basic infrastructure such as culverts, bridges or poor surfaces are a common feature of most rural roads. All ten provinces had five engineers, two in Lusaka,

whereas Central, Northern and Northwestern had one each. Muchinga, Luapula and Eastern were manned by diploma holders, while Southern was manned by a certificate holder. This issue of human resource is so profound that right from drawing up annual work plans to the actual implementation of the works, it is felt.

The specifications and standards from literature need to be and must be clear and understandable, appropriate to the local road environment, capable of being applied by local contractors, aimed at producing a technically sustainable rural road, cover all relevant technical and cost issues and compatible with the overall regulations. From the findings of the research, it is clear that we have a problem in adhering to the specifications and the implementation of the plans. All the roads surveyed demonstrated that quality issues were not taken seriously. The 14-m bush clearing width is not adhered to. This is supposed to be the first item to be carried out on a rural road construction. Neither is the 12 m tree and stump width adhered to. Also from the quality of the culverts observed, it is clear that not only didn't the vertical alignment take precedence over the longitudinal alignment of the road, but also the culverts weren't constructed according to specifications.

Observed were wrong angles of wing walls that were outside the recommended 45° to 75°, wrong height of head walls, missing guard posts, excessive culvert outfall length (beyond the recommended 20 m or less), silting of the culvert, silting of the culvert outfall, erosion of the culvert outfall and most of these culverts had 300 mm, instead of the 600 mm, bore rings that are very difficult to clean. Also, the overfill in most cases was less than two-thirds of the bore diameter. The mitre drains were mainly inadequate, missing and not constructed according to specifications. The angles were wrong, and in some cases, instead of the mitre drain discharging water away from the drainage, they actually feedback water to the drainage system, thereby compromising the integrity of the road. Almost all the roads observed had no scour checks, and the effect of fast-flowing water was very evident on the roads: gulleys. The procurement processes are too long such that by the time they are done, the factors on the ground would have changed resulting in incorrect works being done.

5 Conclusion and Recommendations

The potential contribution of rural roads to the socio-economic development of Zambia cannot be overemphasised. The impact of quality rural road infrastructure could be far reaching, going beyond poverty reduction, a goal which many leaders now view as unambitious to sustain economic growth and structural transformation. Zambia's large and sparsely populated landmass underscores the relevance and important role of rural roads in the successful implementation of most, if not all, development policies. In essence, poor quality rural road systems negatively affect other sectors of the economy.

The research established that planning is adequate but the problem lies with the planning personnel who are inadequately trained to undertake the tasks. While designs and specifications needed to take into account the alignment requirements, technical performance, pavement solutions, material requirements and structures that are specific to an area, results indicate that planners use a one-size-fits-all kind of approach of designing. This is compromising the quality. This chapter therefore recommends that local councils employ competent people who will help, especially during the planning process, to come with detailed plans, project plans and local plans. Design standards should be based on reliability and durability not just concentrating on accessibility.

References

Addo-Abedi, F. Y. (2007). Sustainable Rural Road Financing and Investment, Arusha, Tanzania.

Deininger, K., & Okidi, J. (2003). Growth and Poverty Reduction in Uganda, 1992–2000: Panel Data Evidence. *Development Policy Review, 2*(4), 481–509.

Dercon, S., & Hoddinott, J. (2005). *Impact of Agricultural Extension and Roads on Poverty and Consumption*. Oxford, UK: Agricultural and Applied Economics Association.

Donnges, C. (2003). *Improving Access in Rural Areas; Guidelines for Integrated Rural Accessibility Planning*. Assist-AP Rural Infrastructure Publication, No. 1. International Labour Organisation, Bangkok.

Escobal, J., & Ponce, C. (2003). *The Benefits of Rural Roads: Enhancing Income Opportunities for the Rural Poor*. Grade Working Paper 40.

Fan, H. (2011). *Rural Road Maintenance in China: Planning for Accessibility and Rural Roads*. Transport and Communications Bulletin for Asia and the Pacific, No. 81. ESCAP, United Nations, Bangkok, pp. 52–68

Foster, V., & Briceno-Garmendia, C. (Eds.). (2010). *Africa's Infrastructure: A Time for Transformation*. Washington, DC: The International Bank for Reconstruction and Development and The World Bank.

Johannessen, B. (2008). *Building Rural Roads—Bangladesh*. International Labour Organisation.

Khandker, S. R., & Koolwal, B. G. (2011). *Estimating the Long-Term Impacts of Rural Roads: A Dynamic Panel Approach*. WPS 5867. World Bank, Washington, DC

Kingombe, C. (2011). *Achieving Pro-poor Growth Through Investment in Rural Feeder Roads: The Role of Impact Evaluation*. ODI.

Lokshin, M., & Yemtsov, R. (2005). *The Poverty Impacts of Rural Roads: Evidence from Bangladesh*. ILO.

Mu, R., & Van de Walle, D. (2007). *Rural Roads and Poor Area Development in Vietnam*. World Bank Policy Research Working Paper 4340.

Pinstrup-Anderson, P., & Shimokawa, S. (2010). *Rural Infrastructure and Agriculture Development.* Paper presented at the Annual Bank Conference on Development Economics. Tokyo, Japan.

Torero, M., & Chowdhury, S. (2004). *Increasing Access to Infrastructure for Africa's Rural Poor*. International Food Policy Research Institute, European Commission.

16

International Listed Real Estate Market Portfolio Diversification in BRICS

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1 Introduction

Diversification is a strategy option usually used by portfolio managers to minimise the risk while improving the performance of the investment portfolio. The reduction of risk can successfully be made when the assets combined in a portfolio are without co-integration (Liu et al. 1990). Brooks (2008) suggests that when two or more variables hold both long-run and short-run relationships with one another, then it means that there is a co-integrated relationship between the variables. Therefore, it is important to establish a relationship between assets within a portfolio before reaching a diversification decision.

Portfolio returns do not only depend on shares selection but also on strategic asset allocation (Byrne and Lee 1995; Lee and Hwa 2011).

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Ghirdari (2016) indicated that the important factor regarding asset allocation is to determine if the listed real estate markets are integrated with one another. In simple terms, if the international listed real estate assets in a portfolio do not move in the same direction, it is possible to diminish risk through diversification. Diversification challenges arise when the international financial real estate assets in a portfolio move in the same direction. Therefore, when diversifying an internationally listed real estate portfolio, it is vital to always seek alternative investment avenues.

PWC predicted that by 2020 the listed real estate industry globally would grow by more than 55 per cent. This growth in the listed real estate industry will be higher in the emerging markets resulting in better tenant quality and stronger property rights in some countries due to economic development. Mohammad and Velmurugan (2017) suggested that nowadays emerging economies are mostly preferred for multinational portfolios. Based on the reports concerning emerging countries, BRICS countries have been receiving attention. Maheta and Joshi (2016) indicated that BRICS refers to emerging economies such as Brazil, Russia, India, China and South Africa that came together and formed a group. Curran (2019) suggested that China and India would be among the top five economies in the world whilst Brazil and Russia would be among the top ten economies in the world, using standard chartered PLC findings.

Akinsomi et al. (2018) indicated that in 2016 the BRICS market GDP represented about US$16.84 trillion combined, with China ranked number two in the world at US$11.20 trillion, India ranked number seven at US$2.26 trillion, Brazil ranked number nine at US$1.80 trillion, Russia ranked number twelve at US$1.28 trillion and South Africa ranked number thirty-nine at US$0.295 trillion. Akinsomi et al. (2018) stated that China and India are the big contributors to the BRICS statistics. Piper adds that during 2010 China GDP was $5.88 trillion; as a result China became the world's second largest economy.

Considering the growth in the listed real estate industry and BRICS as the five biggest fast growing emerging economies, it is therefore important for this study to examine the existence of diversification benefits of listed real estate within a BRICS markets portfolio, as this will assist the investors and portfolio managers to know where to diversify their portfolio to reach the optimal goal. It is very important for this paper to test the

co-integration relationship between the BRICS listed real estate markets because this research is relevant for various reasons: Firstly, most studies on BRICS markets focused more on stock or mixed assets portfolios and less on the listed real-estate-only portfolio.

Mohammad and Velmurugan (2017) examined BRICS equity markets and found that emerging markets like BRICS do offer diversification options as BRICS equity markets are not integrated. They also mention that each stock market is driven by country specific factors. However, in a mixed-asset portfolio of BRICS stock and real estate investment trusts (REITs), Gil-Alana et al. (2018) indicated that BRICS stock and REITs were integrated at level 1 but no evidence of a long-run relationship was found between the variables. With the focus on listed real-estate-only portfolios, Akinsomi et al. (2018) examined the long-run as well as the short-run relationship between the BRICS REIT and developed economies such as the United States, Australia and the United Kingdom REIT markets. The findings were that there was no co-integration between these markets in the long-run but in the short-run BRICS REIT was influenced by the three developed REIT markets. This means that BRICS listed real estate markets can offer diversification benefits in the developed listed real estate markets portfolios. The difference in previous results of these studies motivates this study, as the literature has indicated that results of the previous literature of BRICS cannot be applied to BRICS listed real estate markets.

Secondly, the examination into the BRICS listed real estate markets would provide knowledge regarding investing in listed real estate markets within the emerging markets. This could be beneficial for investors and portfolio managers when making informed decisions regarding diversification of listed real estate markets while seeking alternative investments in emerging markets.

2 Literature Review

Research on international listed real-estate-only based portfolios began as early as the 1990s where different techniques were tested in order to demonstrate the existence of benefits in international diversification. Giliberto

(1990) is one of the first researchers to test the international diversification of listed real estate focusing on the eleven countries, but the results did not conclude anything regarding diversification opportunities in those markets.

From the perspective of a Singapore investor, Addae-Dapaah and Kion (1996) who investigated internationally listed real estate diversification focusing on seven of these, and by analysing the efficient frontiers, concluded that diversification benefits do exist.

Thereafter the study by Paul et al. (1991) analysed the existence of diversification benefits between US REITs and international real estate equities. Using the Markowitz mean-variance framework researchers found that the benefits of diversification do exist as there are low positive correlations between US REITS and international real estate equities.

Studies in the 2000s including a study by Bigman (2002) examined the role of internationally listed real estate companies in a real-estate-only portfolio. The monthly real estate company's data from the USA, Europe, non-Japan Asia and Japan was used for this study. The researcher also used the correlation coefficients and concluded that internationally diversified real estate portfolios outperform a domestic portfolio.

Forbes and Rigobon (2002) argued that the use of correlation coefficients can be biased, since correlation coefficients are temporally unstable, possibly leading to fewer diversification benefits than originally anticipated. This means that a well-structured international diversified listed real estate portfolio which was selected based on correlation analysis for one period may not be able to hold up in the long-run. Gordon and Canter (1999) added that the selection of assets using correlation coefficients becomes more problematic over time.

With the focus on co-integration of listed real estate in a mixed asset portfolio, Liow and Yang (2005) examined the long-term co-memories and short-term adjustment between listed real estate and equity markets in four Asian markets. The fractional co-integration method was used and the findings were that there is a long-run co-integration between listed real estate and equity markets in all four Asian markets.

More recent studies included research by Gil-Alana et al. (2018) which focused on the emerging markets using a similar methodology by Liow and Yang (2005); the fractional integration and co-integration methods to investigate co-movements between stock and REITs in the BRICS countries. The findings were that BRICS stock and REITs were integrated at level 1 but no evidence of a long-run relationship was found between the variables. Both studies found similar results in terms of markets being co-integrated, but different results for the long-run relationship.

Akinsomi et al. (2018) examined the long-run as well as the short-run relationship between the BRICS REIT and the United States, Australia and the United Kingdom REIT markets. Fractional co-integration methods were employed and the findings were that there was no co-integration between these markets in the long-run. The results further found that in the short-run BRICS REIT was influenced by the three developed REIT markets. Other studies on the topic include "Anon (2017), Cooper & Schindler (2013), Collins & Hussey (2009), Easterby-Smith et al. (2008), Eichholtz (1997), Hair Jr. et al. (2003), Li & Jiang (2013), Pierzak (2001), Quinlan (2011), Westerheide (2006), Wilson & Zurbruegg (2003), Yunus (2012), Zivot & Wang (2006).

The previous studies above used different methodologies, which resulted in different empirical results. The co-integration technique was used in most of the studies as a tool to test diversification within mixed assets, which supports Wilson and Zurbruegg's (2002) study. Therefore, it is clear that there are limited studies on the international diversification of listed real-estate-only portfolios, especially on BRICS markets only.

3 Methodology

3.1 Data Description

The objective of this study is to determine whether co-integration between BRICS listed real estate markets exists. For the purpose of this study the existing selected BRICS listed real estate indices data was selected in

order to test the co-integration between the selected BRICS markets. The data consists of daily observations over the period of 11 January 2010 to 30 December 2016. The listed real estate indices used for this study are Brazil (IMOB), China (Shanghai SE Real estate index), India (NIFTY Reality index), Russia (PIK Group, LSR Group, Opin and HALS-Development) and South Africa (South Africa Property index).

Due to the lack of a listed real estate index in Russia, all four real estate companies listed on the Moscow exchange were used and an average was taken into account as a representation of the Russian listed real estate market for this study. The real estate companies selected are PIK Group, LSR Group, Opin and HALS-Development which are all listed on the Moscow exchange. This was done in accordance to the Olaleye and Ekemode (2014) study which used a real estate company (UACN property development company) listed on the Nigerian stock exchange as a representation of the Nigeria listed real estate market due to the lack of listed real estate companies or indices in Nigeria.

3.2 Methods

Due to the nature of the research and based on the literature review, the following quantitative methodologies were deemed the most appropriate.

3.2.1 Unit Root Testing Stationarity

For the purpose of testing co-integration, the time series data need to be tested for stationarity. Stationarity is essential for establishing reliable and trustworthy results when it comes to running a co-integration test. Hunt (2017) indicated that for the consequences of using non-stationarity time series data that is not co-integrated and consequently modelled, the outcome might be incorrect and missing. Brooks (2008) stated the reasons for the importance of testing the time series data for stationarity. To determine if the data are stationary or not stationary the existence of a unit root must be tested and this can be done using two tests. The Augmented Dickey-Fuller (ADF) test is the first test for testing the

presence of a unit root. According to Asteriou and Hall (2007) the equation of the ADF is presented as follows:

$$\Delta Y_t = a_0 + \gamma Y_{t-1} + a_2 t + \sum_{i=1}^{p} \beta_i \Delta Y_{t-1} + u_t$$

where, ΔY_t represents the change in the dependent variable at time t; α, γ, β represents the coefficients estimated using the ordinary least squares method; u_t represents the error term at time t.

Phillip-Perron (PP) is the second test for testing the presence of a unit root. Phillip-Perron (PP) is used as an additional test to confirm the ADF test results. In simple terms PP assists in determining whether the ADF results will be accepted or rejected but often PP gives the same results as the ADF (Ghirdari 2016). Hunt (2017) concludes however, that if the data is determined to be stationary then further analysis such as VAR modelling should be performed.

3.2.2 Vector Autoregressive Model

VAR models became popular in economics during the 1980s as used by Christopher Sims. Rachev et al. (2007) stated that VAR models are models of vectors of variables as auto-regressive processes, where each variable depends linearly on its own lagged values and those of the other variables on the vector. Brooks (2008) indicated that the VAR model is considered as a combination of univariate models and simultaneous equations models. The literature reviewed has shown that the model used for international diversification of listed real estate is a vector autoregressive model (VAR).

The VAR equation is presented as follows:

$$y_t = \beta_1 y_{t-2} + \cdots + \beta_k y_{t-k} + u_t$$

The VAR equation above indicates that there are y_t endogenous variables which form the $(n \times 1)$ matrixes and the β_k coefficient estimators

from ($n \times n$) matrixes. The k represents the lags of each variable (Brooks 2008).

Based on reviewed literature the VAR model was the most appropriate model to investigate the interaction between variables included in the study. If it is determined that there is a relationship between the variables then a short-run and long-run relationship should be considered. Long-run relationships between variables can be tested through the co-integration test. Before investigating the long-run relationship it is vital to determine the appropriate lag length structure.

Co-integration is a linear combination of variables that are stationary (Brooks 2008). Stationarity indicates that a long-run relationship exists (Hunt 2017). Based on the literature the most appropriate co-integration test for this study is Johansen's co-integration test.

Johansen's co-integration test is suitable for this study because of the use of five variables (BRICS listed real estate indices) and is able to determine the number of co-integration relationships. Hunt (2017) indicated that these co-integration relationships are known as the co-integration rank.

After exploring the potential long-run relationship between the BRICS listed real estate markets the next step was to determine any short-run relationships using VECMs (Vector Error Correction Models). Asteriou and Hall (2007) indicated that VECMs are unable to establish the dynamic properties of variables in the model; therefore it is important to use the impulse response function to determine the interactions between variables. Brooks (2008) indicated that the ordering of the variables is important when calculating impulse response and variance decomposition. The order is China, South Africa, Brazil, India and Russia.

3.3 Visual Inspection of the Data

Visual inspection of the data was carried out in order to analyse whether the data was stationary or not, by visual observation of the data. When the data is stationary it means that the data has a constant mean; therefore there is no trend or seasonality or up and down fluctuation.

From the above data for the various BRICS listed real estate, indices showed that there was some sort of trend and fluctuation and therefore

the data was not stationary. This was based on the visual observation of the data and such results cannot be regarded as accurate. An ADF test was run in order to make statistical conclusions regarding stationarity of the data. In order to run an econometric model the data has to be converted to the stationary form.

3.3.1 Unit Root Findings

The ADF test was performed to test the unit root of the BRICS listed real estate indices time series. The results suggested that all five selected indices were non-stationary at a given level but once differenced to the first level the time series became stationary across all variables. This confirms that there was no need to run the Phillip-Perron (PP) test as the results were the same for all variables at both tests. These results indicated that the data was integrated to the first order I(1). This satisfies the prerequisite to run the Johansen co-integration test.

3.3.2 Johansen Co-Integration Findings

The Johansen co-integration test was run in order to measure the long-run relationship between the BRICS listed real estate indices. The tests were performed on EViews and the results are illustrated in Tables 16.1 and 16.2.

Table 16.1 Johansen co-integration test (trace test)

Hypothesized No. of CE(s)	Eigenvalue	Trace statistic	0.05 critical value	*P*-value
Unrestricted co-integration rank test (trace test)				
None	0.019700	60.40215	69.81889	0.2232
At most 1	0.006202	25.70331	47.85613	0.8986
At most 2	0.004469	14.85378	29.79707	0.7895
At most 3	0.003096	7.042346	15.49471	0.5727
At most 4	0.000936	1.633706	3.841466	0.2012

Trace test indicates no co-integration at the 0.05 level
Source: EViews computation

Table 16.2 Johansen co-integration test (maximum eigenvalue test)

Hypothesized No. of CE(s)	Eigenvalue	Trace statistic	0.05 critical value	*P*-value
Unrestricted co-integration rank test (maximum eigenvalue test)				
None	0.019700	34.69884	33.87687	0.0398
At most 1	0.006202	10.84953	27.58434	0.9691
At most 2	0.004469	7.811432	21.13162	0.9149
At most 3	0.003096	5.408640	14.26460	0.6896
At most 4	0.000936	1.633706	3.841466	0.2012

Max-eigenvalue test indicates 1 co-integration eqn(s) at the 0.05 level
Source: EViews computation

Trace and maximum Eigenvalue tests were used in order to determine any presence of co-integration between selected time series. Trace test results indicated that there was no co-integration at the 5 per cent level, as the trace statistic of 60.40215 is smaller than the 0.05 critical value of 69.81889; therefore it was insignificant.

The Maximum Eigenvalue test showed that the BRICS real estate indices were co-integrated at level 1 at the 5 per cent level, as the trace statistic of 34.69884 is bigger than the 5 per cent critical value of 33.87687; therefore it was significant. In the event of these two tests contradicting each other, Brooks (2008) states that maximum Eigenvalue test must be chosen as the test for the Johansen co-integration test.

The null hypothesis that there are no co-integration equations was then rejected; therefore there is a co-integration equation present in the model. In addition, the probability value was 0.0398 which was more than 5 per cent, thus stating that the null hypothesis could not be accepted. Therefore both the Max-Eigen statistic and probability values showed that there are co-integrating vectors present in the model.

The Maximum Eigenvalue test indicated that there was 1 co-integration equation at the 5 per cent level between the data. This means that BRICS listed real estate indices were integrated, but not to a huge extent, or else their co-integration level is low. Therefore the long-run association between BRICS listed real estate markets does exist at a minimal level.

This could mean that there might be some diversification benefits between BRICS real estate markets as their co-integration level is low. To

further investigate this matter the VECM was established in order to identify the co-integration dynamics between the variables.

3.3.3 Vector Error Correction Model (VECM)

Running the VECM model was for the purpose of showing how a variable reacts to a shock from other variables combined. In addition, the VECM model shows if one variable is insulated or independent from other variables, as it has been identified that the co-integration does exist. The overall results show that China's listed real estate market is the only independent market compared to other BRICS listed real estate markets, as was indicated by the 47 per cent level of speed it took to recover from shocks, which was faster compared to the rest of the BRICS listed real estate markets. Brazilian, Indian, Russian and South African listed real estate markets are more dependent on BRICS listed real estate markets as a whole. Hence they showed a range of 0.1 per cent to 5 per cent, which is a slow speed of recovery from shocks to their respective markets. As suggested in the methodology that VECM is unable to establish the dynamic properties of variables, the impulse response was run in order to provide accurate interactions between variables. The next test was performed in order to identify the exogeneity and endogenous variables (Table 16.3).

3.3.4 VEC Block Exogeneity Wald tests

This test was run in order to be able to do the ordering of the variables in terms of most powerful (exogenous) to less powerful (endogenous). The results displayed in Table 16.4 showing probability values for Brazil, China, India, Russia, China and South African are 0.0208, 0.1904,

Table 16.3 Vector error correction estimates

Error correction	D(BR)	D(CH)	D(IN)	D(RUS)	D(SA)
CointEq1	−0.003078	−2.277116	0.015134	−0.124472	0.006812
	(0.00124)	(0.47418)	(0.02648)	(0.05957)	(0.02191)

Source: EViews computation

Table 16.4 VEC block exogeneity Wald test

Dependent variable	All (*P*-value)	Exogenous/endogenous
Brazil	0.0208	Endogenous
China	0.1904	Exogeneity
India	0.0062	Endogenous
Russia	0.0034	Endogenous
South Africa	0.1010	Exogeneity

Source: EViews computation

0.0062, 0.0034 and 0.1010, These results indicate that China and South Africa are exogenous while Brazil, India and Russia are endogenous.

The results suggested that in terms of ordering, China is the most powerful followed by South Africa, then Brazil, India and lastly Russia. These results validate the VECM results that China is an independent market. This makes sense as China is the biggest and fastest growing economy within the BRICS group. Viewing South Africa as the second most powerful or influential market could be because South Africa has one of the best financial markets in the world, and the listed real estate market for the past few years has really evolved and even performed better than some of the major internationally listed real estate markets such as the UK. In addition, South Africa in recent years has seen international real estate companies listing on the JSE. Overall, this means that China and South Africa listed real estate markets do influence the other BRICS listed real estate markets.

3.3.5 Variance Decomposition Findings

Variance decomposition was carried out in order to indicate the proportion of the movements in the dependent variables caused by independent variables when shocks were applied to them. This was done in order to test the short-run relationship between the variables. The result of the variance decomposition suggested that applying a unit shock to Brazil, China, Russia, India and South Africa did not cause much fluctuation in each of the BRICS listed real estate indices over the short-run (ten days). The outcomes indicated that in a short run of a period of three days a shock applied to the South African listed real estate caused only 2.56 per

cent fluctuation in the variation of the Brazil listed real estate. Over the ten-day period a shock to the South African listed real estate caused only 2.56 per cent fluctuation in the variation of the Brazilian listed real estate. In a short-run period of three days a shock applied to the South African listed real estate caused only 0.21 per cent fluctuation in the variation of the Chinese listed real estate. Over the ten-day period a shock to the Russian listed real estate caused only 1.21 per cent fluctuation in the variation of the Chinese listed real estate.

Results further indicated in a short-run of a period of three days that a shock applied to the South Africa listed real estate caused only 2.44 per cent fluctuation in the variation of the India listed real estate. Over the ten-day period a shock to the South Africa listed real estate caused only 4.45 per cent fluctuation in the variation of the Indian listed real estate. In a short-run of a period of three days a shock applied to the South Africa listed real estate caused only 0.80 per cent fluctuation in the variation of the Russian listed real estate. Over the ten-day period a shock applied to the India listed real estate caused only 1.81 per cent fluctuation in the variation of the Russian listed real estate. In a short-run of a period of three days a shock applied to the Chinese listed real estate caused only 1.13 per cent fluctuation in the variation of the South African listed real estate. Over the ten-day period a shock to the Brazilian listed real estate caused only 1.48 per cent fluctuation in the variation of the South African listed real estate.

The overall conclusion was that the BRICS listed real estate indices during the short-run do cause fluctuations in the variation in one another but at a minimal level; therefore it further indicates that the co-integration between the variables was low.

3.3.6 Impulse Response

Impulse response was explained in order to determine the short-run dynamics of the model. The impulse response process consists of a unit shock which is applied to the error term and the effect on the VAR model over an identified time period is measured. Outcomes indicated that one unit shock in the South African listed real estate index indicated that

there was no major effect in the Chinese listed real estate market over the ten-day period. Impulse response was performed on all selected five BRICS listed real estate indices time series.

The overall findings were that when a shock was applied to each variable over a period of ten days the results indicated that no large movements or responsiveness by any of the BRICS listed real estate markets. This further confirms that during the short-run the co-integration between the variables was low with no suggestion of any causality.

4 Conclusion

The existence of current bilateral trade relationships between BRICS indicates the importance of a study on interrelationships between the listed real estate markets of BRICS countries. This study makes use of quantitative analysis techniques to investigate whether BRICS listed real estate markets are co-integrated for the emerging markets investor perspective. To address the research question and objective, the following order was carried out. First came unit root testing, followed by testing for long-run relationships using Johansen's co-integration test, then VECMs were used to determine exogeneity and endogenous variables, and lastly VAR was used to establish the short-run dynamics through variance decomposition and impulse response.

The overall findings of this study are that the selected emerging listed real estate markets (Brazil, Russia, India, China and South Africa) do have a co-integration relationship, but that there is no evidence of a long-run relationship between these markets as the co-integration level is low. This means that an international diversification benefit does exist between the BRICS listed real estate markets as their co-integration level is low. Even though China and South Africa are exogenous variables, there was no evidence of these two markets causing a major impact on the other three markets (Brazil, India and Russia) during a short- and long-run relationship. Therefore it further confirms that there is a possibility of diversification benefits which can be achieved within a BRICS listed real estate portfolio. The results of this study are in line with those of Gil-Alana et al. (2018) where the BRICS stock and REITs were integrated at

level 1, but no evidence of long-run relationship was found between the variables. Therefore, investors and portfolio managers could use the BRICS listed real estate markets in order to obtain diversification within a portfolio.

References

Addae-Dapaah, K., & Kion, C. (1996). International Diversification of Property Stock: A Singaporean Investor's Viewpoint. *The Real Estate Finance Journal, 13*(3), 54–66.

Akinsomi, O., Coskun, Y., Gil-Alana, L. A., & Yaya, O. S. (2018). *Is There Convergence between the BRICS and International REIT Markets?* (Working Paper No. 88756). Retrieved May 18, 2019, from https://mpra.ub.uni-muenchen.de/88756/1/MPRA_paper_88756.pdf

Anon. (2017). Why Use Vector Error Correction Model? Retrieved October 30, 2018, from https://stats.stackexchange.com/questions/77791/why-use-vector-error-correction-model

Asteriou, D., & Hall, S.G. (2007). *Applied Econometrics: A Modern Approach* (Rev. ed.). Basingstoke: Palgrave Macmillan.

Bigman, T. (2002). Investing in International Listed Property Companies. *PREA Quarterly,* Winter, pp. 53–61.

Brooks, C. (2008). *Introductory Econometrics for Finance* (2nd ed.). New York, NY: Cambridge University Press.

Byrne, P., & Lee, S. (1995). Is there a Place for Property in the Multi Asset Portfolio? *Journal of Property Finance, 6*(3), 60–83.

Collins, J., & Hussey, R. (2009). *Business Research: A Practical Guide for Undergraduate & Postgraduate Students*. London: Palgrave Macmillan.

Cooper, D. R., & Schindler, P. S. (2013). *Business Research Methods* (12th ed.). New York, NY: McGraw-Hill Education.

Curran, E. (2019). These Could Be the World's Biggest Economies by 2030. Retrieved May 19, 2019, from https://www.bloomberg.com/news/articles/2019-01-0

Easterby-Smith, M., Thorpe, R., Jackson, P., & Lowe, A. (2008). *Management Research: Theory and Practice* (3rd ed.). London: Sage Publications.

Eichholtz, P. (1997). How to Invest Internationally: Region and Property Type on a Global Scale. *Real Estate Finance, 14*(3), 51–56.

Forbes, K. J., & Rigobon, R. (2002). No Contagion, Only Interdependence: Measuring Stock Market Comovements. *Journal of Finance, 57*(5), 2223–2261.

Ghirdari, E. (2016). International Bond Market Portfolio Diversification in an Emerging Financial Market. Master's thesis. Johannesburg: University of Johannesburg.

Gil-Alana, L., Yaya, O., Akinsomi, O., & Coskun, Y. (2018). *How do Stocks in BRICS co-move with REITs?* (Working Paper No. 93273). Retrieved May 18, 2019, from https://mpra.ub.uni-muenchen.de/93273/10/MPRA_paper_93273.pdf

Giliberto, S. M. (1990). *Global Real Estate Securities: Index Performance and Diversified Portfolios*. Salomon Brothers, Inc.

Gordon, J., & Canter, T. (1999). International Real Estate Securities: A Test of Capital Markets Integration. *Journal of Real Estate Portfolio Management, 5*(2), 161–170.

Hair, J. F., Jr., Money, A. H., Samuel, P., & Page, M. (2003). *Research Methods for Business*. Chichester: John Wiley & Sons Ltd.

Hunt, D. A. G. (2017). Precious Metals as Safe Haven Assets in the South African Market. Master's thesis. Johannesburg: University of Johannesburg.

Lee, C. L., & Hwa, T. K. (2011). Linkages between Malaysian Housing Prices, Property Companies and Stocks. *Specific Rim Property Research Journal, 17*(2), 287–312.

Li, W., & Jiang, L. (2013). Interaction between Real Estate Prices of Beijing and Stock Prices based on VAR Model. *Proceedings of 20th International Conference on Industrial Engineering and Engineering Management*, pp. 985–994. Retrieved August 25, 2015, from http://0-link.springer.com.ujlink.uj.ac.za/chapter/10.1007/978-3-642-40063-6_97

Liow, K. H., & Yang, H. (2005). Long-term Co-memories and Short Run Adjustment: Securised Real Estate and Stock Markets. *The Journal of Real Estate and Economics, 31*(3), 283–300.

Liu, C. H., Hartzell, D. J., Greig, W., & Grissom, T. V. (1990). The Integration of the Real Estate Market and the Stock Market: Some Preliminary Evidence. *Journal of Real Estate Finance & Economics, 3*(3), 261–282.

Maheta, D., & Joshi, S. (2016). Integration Among BRICS Countries Stock Markets: Evidence from Co-integration Analysis. *Journal of Management & Research, 6*(1).

Mohammad, I. V. K., & Velmurugan, P. S. (2017). Stock Market Integration among BRICS Nations—An Empirical Analysis. Retrieved August 8, 2017, from SSRN: https://ssrn.com/abstract=2988673

Olaleye, A., & Ekemode, B. (2014). Integration between Real Estate Equity and Non-real Estate Equity. *Journal of Property Investment and Finance, 32*(3), 244–255.

Paul, A., Robert, K., & Carl, M. G. (1991). The Risk-Return Attributes of International Real Estate Equities. *Journal of Real Estate Research, 6*(2), 143–151.

Pierzak, E. (2001). *Exploring International Property Securities for US Investors*. London: Henderson Global Investors Property Economics & Research.

Quinlan, C. (2011). *Business Research Methods*. Andover: South-Western Cengage Learning.

Rachev, S. T., Mittnik, S., Fabozzi, F. J., Focardi, S. M., & Jasic, T. (2007). *Financial Econometrics from Basics to Advanced Modeling Techniques* (The Frank J Fabozzi Series). Hoboken, NJ: John Wiley & Sons, Inc.

Westerheide, P. (2006). *Co-integration of Real Estate Stocks and REITs with Common Stocks, Bonds and Consumer Price Inflation—An International Comparison*. (Discussion Paper No. 06-057). Retrieved August 24, 2015, from ftp://ftp.zew.de/pub/zew-docs/dp/dp06057.pdf

Wilson, P., & Zurbruegg, R. (2002). Structural Breaks, Diversification and International Real Estate Markets—Some New Evidence. *Briefings in Real Estate Finance, 1*(4), 348–366.

Wilson, P., & Zurbruegg, R. (2003). *International Diversification of Real Estate Assets—Is It Worth It? Evidence from the Literature*. (Working Paper No. 126). Retrieved September 9, 2017, from http://www.finance.uts.edu.au/research/wpapers/wp126.html

Yunus, N. (2012). Modeling Relationships Among Securitized Property Markets, Stock Markets and Macroeconomic Variables. *Journal of Real Estate Research, 34*(2), 127–156.

Zivot, E., & Wang, J. (2006). *Modelling Financial Time Series with S-Plus* (2nd ed.). New York, NY: Springer-Verlag.

17

Migration Trends in Sub-Saharan Africa-Domestic and International Socio-Politico-Economic Repercussions: Implications for Zambia

Kwesi Atta Sakyi

1 Introduction

This chapter on migration trends in sub-Saharan Africa is an attempt to contribute to the current topical discourse of youth unemployment by tracing the causes and consequences of youth migratory trends in Africa and projecting the socio-politico-economic impact of such trends on the economies of Africa. An attempt was made to trace the historical origin of migration and link it with the current debate. The assumption was made that male youth between the ages of 18 years and 35 years are those who are more mobile and have the greatest propensity to migrate to other countries. Thet (2014) defined migration as a movement geographically over time and space which leads to a permanent change in residence and it is motivated by the perception of inter-regional imbalance in the standard of living and access to amenities.

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Female youth in this age group tend to be exploited by human traffickers who often abuse them and land them into slavery and prostitution abroad; thus, in their bid to escape poverty at home and gain financial freedom and become affluent abroad, they sink further into sin and enslavement (Davidson 2013). The young men and women of Africa are the most at risk and also the most productive of the population.

The push and pull factors will be delineated in this chapter and examined with the view to helping policymakers make informed decisions on youth migration, youth unemployment, and youth empowerment. The Zambian National Youth Policy document of 2015 will form the bedrock of the discourse and narrative on Zambia. The chapter will cover the objectives of providing backdrop information as well as draw parallels from neighbouring countries. Some data from online sources will be deployed from credible sources to back arguments. The author would have loved to carry out primary research using the interpretivist, exploratory, and grounded research approaches but it was not possible to do so due to time and resource constraints.

However, despite these constraints and limitations, the author believes that, by and large, the results achieved from purely desk-based research will add value to the discourse and narrative, and will equally be instructive and insightful. It is hoped that the approach of relying on literature review which the author adopted will provide useful insights to shine some light in the dark corner of this expansive topic. The research outcome of this chapter will assist future researchers as well as those engaged in macro-level policymaking to come up with pragmatic interventions to address the burning issue of youth unemployment and its concomitant aspect of out-migration.

2 Literature Discussion

2.1 Youth Unemployment

Youth unemployment in Zambia is estimated at 17.6% against a national average of 12.3%. The population of Zambia in 2019 is currently

estimated at 17 million and it is growing at about 3% per annum (UNESCO 2019). The number of pupils in primary schools is estimated at 3.3 million and those in secondary schools at 2.5 million, while the number in tertiary institutions is estimated at 1.5 million. Therefore, those in schools in total represent about 43% of the total population (UNESCO 2019).

2.2 Historical Backcloth to Migration

Marco Polo in 1275 made a land journey from Venice in Italy to China on a business trip. It was part adventure, part business, and part of the human will to explore and have cultural ties with other people (silkroad.com). The route became known as the Silk Route and later it engendered the zeal among Europeans to find the sea route to the Far East. The quest for sea routes became a competition among the seafaring nations of Europe in the fifteenth century, especially in countries such as Spain, Portugal, the Netherlands, Britain, and Sweden (biography.com).

The King of Portugal, Henry the Navigator, and his predecessor, King John, established sailing schools in Sagres, and Queen Isabella and King Ferdinand of Spain became sponsors of voyages of discovery, spawning the journeys of Bilboa, Bartholomew Diaz, Vasco da Gama, Ferdinald Magellan, Cortez, Christopher Columbus, and Amerigo Vespucci, and in Britain, Queen Elizabeth I sponsored sailors such as Francis Drake, Jim Hawkins, and Sir Walter Raleigh to North and South America (Britannica.com)

Britain was later to supplant Spain and Portugal which earlier in 1498 had had the world divided between them into two hemispheres by Pope Alexander Borgia (Britannica.com). The quest for empires, colonies, and the undertaking of scientific voyages of discovery, the slave trade, and the religious fervour to win souls into Christendom brought Africans in touch with Europeans and exposed them to the so-called good life and Western ways of life which created a Eurocentric approach in viewing civilisation through Western lenses (biography.com). This unfortunate and erroneous mentality has remained with Africans for centuries, leading to the African proclivity for Western fashions and an insatiable desire

to emigrate to an imaginary El Dorado or a better and superior rich country abroad where life is supposedly luxurious and different from the drab and humdrum village life where taboos, fines, and drudgery work on the farms reign.

When Lord Lugard and Cameron came up with their Indirect Rule approach in the African colonies, they envisioned a Dual Mandate system of rule whereby a few Africans would access education and serve as Priests, Office Clerks, Court Interpreters, School Teachers, Local Police, and other lower-order jobs to protect British interests (Britannica.com; generalhistory.com). Some British Colonial official noted that education was not meant for everyone in the colonies, hence the need to charge user fees for those who could afford it. However, when in the 60s Africans gained independence, the political leaders saw education as the only multi-prong weapon to liberate the minds of the people, accelerate economic growth, and also provide a vehicle for upward social mobility for the majority of citizens who were caught in the jaws of poverty (france24.com).

Thus, education was seen as a universal solvent which would bring about social equalisation and also create an egalitarian society. That thought made the independence leaders pursue vigorously the massification of education whereby education was made free and many schools and colleges were built across the country. The noble aims of education were not to be achieved as the global economy slumped in the 70s and 80s with the dual shock of fall in commodity prices vis-à-vis a rise in oil prices on the world market. Those events led to deindustrialisation, privatisation, denationalisation, and painful retrenchments in the 80s and 90s. The onset of globalisation and explosion of the World Wide Web (www) around the year 2000 brought about disintermediation and downsizing of many businesses (Mills n.d.).

Many multinational corporations pulled out, preferring to outsource, engage in e-commerce, use robotics and Artificial Intelligence (AI), and relocate their businesses from Africa to China and the cheap-labour countries, in line with Michael Porter's Comparative Cost Advantage and the Diamond models. According to Adepoju (1998), many countries in Southern Africa such as Zimbabwe, Malawi, Mozambique, Lesotho, and Swaziland (Eswalitini) used to have thousands of migrant workers or

guest workers in the mines in South Africa but when Apartheid ended in 1994, most of these guest or anomie/erratic workers were no more needed as local people became xenophobic.

In West Africa, Adepoju (1998) observed that most internal migrations occurred from the poor Sahel regions in the north to the relatively rich coastal areas in the south to relatively prosperous countries such as Ghana, Ivory Coast, Nigeria, and Cameroon. Adepoju (1998) noted the trends among some homogenous groups or tribes such as the Yoruba to be that they had preferred destination countries in West Africa as they communicated among themselves through word of mouth and narratives from returnees. Migrants from particular ethnic groups practised what Adepoju (1998) termed as chain migration. Zambians in the past had many of her nationals emigrating to work in mines and industries in South Africa, Congo, and Zimbabwe. Many Africans believe that working away from home is better because of being free from many extended family commitments. Thus, some Africans became fugitives in their own country and they became economic migrants in the Diaspora in pursuit of happiness and the proverbial 'Golden Fleece' or the equivalent of the 'American Dream'.

2.3 Economic Growth

Davidson (2013) noted that African migrants' remittances back home contributed to 10% of GDP, citing countries such as Nigeria, Ghana, and Senegal whose receipts of remittances from migrants formed the second or third largest contributor to GDP and most of the countries were heavily indebted countries. Davidson (2013) suggested that some of the governments of these countries such as Senegal, Gambia, and Nigeria turned a blind eye to the issue of migrants because of the remittances received. In some of those countries with no capacity to create employment opportunities, emigration was a welcome relief to the heavy burden of governance. It is to be noted that from Africa, most emigrants to overseas countries are from relatively rich economies or from fairly well-to-do families. This does not mean that emigrants do not come from some of the poorest and distressed economies.

According to Davidson (2013), some emigrants were victims of fraudsters who charged their victims huge sums of money and promised to send them abroad, with the promise of offering them instant and lucrative jobs with decent living conditions. Most of those victims are young girls who end up in slavery as domestic slaves or servants in some Gulf State or as sex workers in Italy, Netherlands, Lebanon, and Australia among others or any other country outside Africa. Others end up in the business of street prostitution as that is said to be the one route with the quickest returns (Davidson 2013). Many unfortunate youth who are victims of human traffickers end up as drug pushers, plantation workers, criminals, and pimps. Davidson (2013) noted that would-be migrants do get into heavy debt before they embark on their journeys abroad, hoping to gain financial freedom but instead they get mired in deep debt and big trouble of being helpless and hopeless.

Ansell and Young (n.d.) chronicled in their research findings in South Africa that AIDS orphans who were maltreated by extended family members were encouraged to migrate to other countries in search of a better life. This informs this narrative that weak social and civic institutions could aggravate the migrant situation if suitable interventions are not put in place such as the state taking over the education and upkeep of orphans. This is why the commencement of free education and the school feeding programmes in some African countries are commendable programmes to emulate. Ansell and Young (n.d.) noted that about 17% of all children in Lesotho and Malawi were orphans and as such they were likely candidates for emigration, and they could be vulnerable to human traffickers. Youth who live in rural areas get to know life in cities so the pull factor is very great. There is a need to provide youth in the rural areas with the stay option. This will require the provision of creative activities and good social amenities in the rural areas. Besides, the youth need to be equipped with entrepreneurial skills which are related to their environments so that they become rural-centric.

2.4 Youth Migration and Population Characteristics

The youth of today are disconnected from their immediate environment as they have high ambitions of migrating to rich countries in pursuit of the good life (Thet 2014). Exposure to the internet and social media enable them to tune into the global environment and also carry on searches on their prospective destinations. Some are deceived by stories they hear from friends who arrive from overseas and display signs of affluence. Some are encouraged by the fact that they have distant relatives abroad and so they do not concentrate on their studies as they want the easy way out. Many youth begin to live in the imaginary land of cloud cuckoo, without supporting the business of their parents or guardians. Most times they are glued to Facebook or WhatsApp or any of the social media sites without studying or acquiring some life skills by doing domestic chores or farm work. The research work done by Francis (n.d.) for McKinsey Corporation indicated that modern consumers can be categorised into four main groups which are listed below in bullet points:

- Baby Boomers (60 years and above)
- Generation X (40 years and above)
- Generation Y or millennials (20 years and above)
- Generation Z (0 to 19 years)

According to Francis (n.d.) Baby Boomers are those who were born between 1940 and 1959, that is, post-Second World War babies. They are characterised by idealism and ideology, revolutionary ideas, and a collectivist mentality and are obsessed with movies and the good life. Generation X are those born between 1960 and 1979, that is, during the period of political transition to a world of capitalism and meritocracy. They are seen to be competitive, materialistic, individualistic, and status conscious with the desire to spend on luxury goods and branded items. Generation Y are those born between 1980 and 1994. They are those born at the time of the end of the Cold War, the emergence of globalisation, the arrival of the internet, and are made up of people who question everything, those who are selfish, and those who consume for the experience. They love

travel and festivals. The last categorisation is Generation Z made up of those who love mobility, access, and dialogue with everyone, and who seek after the truth. They have multiple identities and are digital natives, digital migrants, and digital nomads. They love networking, being unique, and they seek ethical consumption. It can be seen that it is cardinal to use Francis and Hoefel's classification to identify those characteristics of youth in Zambia in order to understand their behaviour and their motivations for emigration. It will be instructive to know that since Generations Y and Z love computing, they are likely candidates to emigrate unless they are equipped with skills such as coding or programming, which can help them to be useful to themselves and to add value to society through coding and programming to solve problems, create new things, and be self-employed.

2.5 Rural Poverty and Rural-Urban Migration

The average migration rate of 2.9% in Africa, as per United Nations Economic Commission for Africa (UNECA), is below the global average but higher than the rates for Asia and North Africa. It is estimated that between 1990 and 2010, migration had risen by 80% with less than 22% of all African migrants moving outside Africa (UNECA 2017). The majority of migrants from Africa move to North America followed by Europe. Those from North Africa tend to move to Europe, the Middle East, and within North Africa. Those from West Africa, South Africa, and East Africa go to North America (Canada and the USA) while most Mozambicans, Congolese, Rwandese, Angolans, and Zimbabweans go to South Africa. In Africa, Ethiopia, Rwanda, and Seychelles allow Africans into their countries without visa in order to promote tourism. Also, visa-free waiver applies to citizens of various economic groupings such as Economic Community of West African States (ECOWAS), Southern Africa Development Cooperation (SADC), and Common Market for Eastern and Southern Africa (COMESA). Although visa waiver boosts trade, commerce, and tourism, it also indirectly facilitates migration. Table 17.1 shows that in 1990 there were 23 million African migrants in

Table 17.1 Population of African migrants in the world (millions). (Source: Adapted from UNECA)

Year	Rest of world	Africa	Europe	North America
1990	1.2 million	5	12.5	23
1995	1 million	5	14	22
2000	1.2 million	5.1	12.5	21
2005	1.2 million	7.5	12.5	24
2010	2 million	8	13.5	27
2015	2.5 million	9	16	32

Source: Made by the authors

North America and in 2015 that figure had increased to 32 million migrants. Table 17.1 shows that about twice the number of migrants from African countries go to Europe and three or four times that number end up in the most preferred destination of North America in search of the 'American Dream'.

2.6 Neglect of Agriculture and Local Industries

In the rural areas of Africa, agriculture is the mainstay of rural economies. Agriculture is being abandoned at a fast rate as a result of many youth migrating to urban areas. Many youth see agriculture as tedious and not rewarding because of low prices paid for farm produce and also the lack of markets for harvested crops. As many youth become educated, they turn their backs on agriculture by preferring to get white collar jobs (Adaku 2013). This trend has to be reversed and the perception of agriculture being an industry for the uneducated or pensioners should be reversed by making agriculture lucrative by providing many incentives to would-be young farmers. That will stem the tide of youth migration. Our local government system should be made robust so that local governments can complement central government efforts in rapidly developing all parts of the country.

2.7 Paradigm Shift of Educational Curriculum

African governments should undertake school curricula reforms to align curricula content with labour market demand by pursuing new models of education such as STEM education, with emphasis on Science, Technology, Engineering, and Mathematics. This new emphasis will divert the attention of the youth from migration.

Figure 17.1 identifies the push factors which cause the youth to migrate, among them social, economic, and political exclusion, corruption in high places, lack of skills, poverty, conflict, and activities of human traffickers (Adaku 2013). These factors are well-documented in the literature on migration. These factors need to be addressed critically by the authorities if unplanned and illegal migration is to be curbed.

Fig. 17.1 Push factors. (Source: Made by the authors)

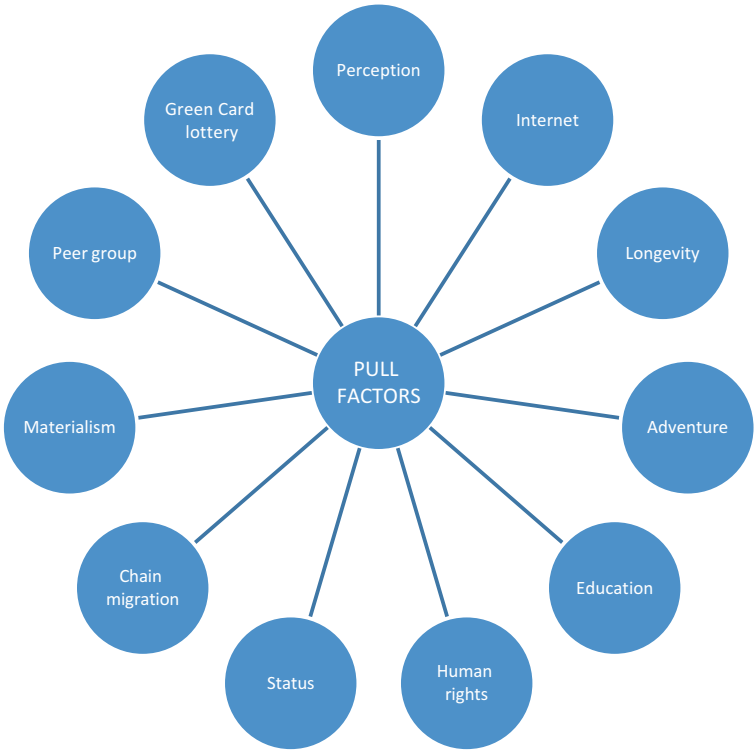

Fig. 17.2 Pull factors. (Source: Made by the authors)

Figure 17.2 captures the pull factors which attract migrants to emigrate. Among them are the enticement of the Green Card Lottery online, perception of a good life out there, the desire to earn the status of citizenship of a developed country, the pursuit of health insurance, and human rights protection. Migrants forget that those privileges do not come easy or cheap as it takes some migrants up to, say, 20 years or more to regularise their stay abroad. Those who do not succeed to regularise their stay in most cases become fugitives who constantly try to evade the long arm of the law. Many end up in prisons and detention centres. Many incentives which used to be accorded to migrants have been withdrawn following the 2007 and 2008 Global Economic Meltdown and the 9/11 terrorist attack in the USA. Migrants are now like unwanted and unwelcome commodities who must be sent back to the sender or maker (Tables 17.2 and 17.3).

Table 17.2 Causes of youth migration in Zambia

Push factors	Pull factors
Declining local industries due to globalisation and privatisation	Social media content
Lack of professional and vocational skills	Internet contacts
Lack of a well-articulated government support system to youth	Perceived high standards of living
Social rejection and lack of parental care for orphans	Perceived access to unskilled jobs
Peer influence from home and abroad	Adventure
High cost of living at home	High per capita incomes
Lack of access to basic facilities	Stable governments
Poor-paying jobs and high heavy taxes	Access to quality education
High levels of corruption	Social status of being been-to
Perceived poor governance system and bad policies such as the high pensionable age, lack of press freedom, electoral malpractices	invitations by friends
Neglect of youth in governance	Ageing population in rich countries
Perceived political corruption	Acquiring foreign citizenship via Green Card Lottery online
Tribalism, nepotism in public institutions	Acquiring luxury goods
Climate change	Access to high-quality medical care
HIV-AIDS and orphans	Having long life
War, conflicts, oppression	Accessing social insurance
Human traffickers	Market demand gap
Porous borders	Labour market demand gap
Poverty of local governments to provide local jobs and amenities	Human rights and civic organisations supporting migrants
Lack of recreational facilities	Fraudulent online emigration agents
Poor returns from farming	Colonial historical ties of language
Difficult access to capital	Group or chain migration by following a relative abroad
Running away from extended family responsibilities	Obtaining scholarship to pursue quality education abroad as African universities are not stable and they are not transparent
Exclusion	

Source: Made by the authors

Table 17.3 Trends and patterns of migration-generic analysis

Type of migration	Impact	Losing and receiving areas
1. Rural-rural migration	Normal; welcome	Rural
2. Rural-urban migration	Depopulation of rural and congestion of urban areas; increase in crime; inflation; unemployment	Urbanisation; shanty settlements; urban agglomeration
3. Urban-rural migration	Normal; welcome	Rural
4. Urban-urban migration	Unwelcome; normal; pressure on carrying capacity of land; deterioration in services	Urban; urban implosion; development of strong nodal connectivity and primate cities
5. Intra-country migration	Inter-cultural marriages; unity; integration; ethnic disputes over land; skewed development	Decay areas and growth poles; primate cities; ghost towns
6. Inter-country migration (Africa)	Competition; cheap labour; xenophobia; cross-fertilisation of ideas	Human capital attrition; capital outflows and inflows from remittances
7. Inter-regional bloc migration	Xenophobia, *anomie*; increase in trade volume; high standards of living. Synergy; economies of scale and scope; free trade and customs area	Circulation of ideas and skills; multilateral approach in solving regional problems
8. Inter-continental migration	Culture clash; brain drain; brain gain	Increased globalisation; increase in FDIs
9. Illegal migration	Diplomatic wrangles; stateless émigrés; cultural shock; crime; prison' repatriation costs	Maltreatment; modern slavery; human traffickers
10. Legal migration	Loss of highly skilled professionals	Exposure and gain in higher incomes and R&D

(*continued*)

Table 17.3 (continued)

Type of migration	Impact	Losing and receiving areas
11. Internal displacement	Trauma from war and loss of property due to natural disasters; government transfer payments; donor support	Loss of cultural artefacts; high cost of reintegration Land pressure and environmental degradation
12. External displacement	Trauma; double cultural shock	High cost of resettlement
13. Economic/ social/political/ environmental-refugees	Wasted man hours not working for years; high cost on host country	International intervention needed from the international community for security guarantees

Source: Made by the authors

We researched the global trends of migration showing the percentages of migrants as percentage of the total populations of their places of origin. Europe, Latin and Central America, and Oceania are the leading migrant destinations in the world. The trend for Africa from 1990 to 2010 seems to be stable around 2.9%. North America has the least number of migrants because it is an affluent area which receives more than it loses with a positive net migration (Brookings.online).

Table 17.4 shows the types of migration within Africa. All the types within Africa do not create international headlines because of cultural affinities. However, the trends also do show some linguistic affinities in the sense that a migrant from, say, a Lusophone country such as Angola may likely migrate to another Lusophone country such as Guinea Bissau or Mozambique while those from Francophone and Anglophone countries will follow similar patterns. To ease pressure on some countries, it will be instructive for schools in Africa to start teaching the major official languages in Africa such as Swahili, French, Portuguese, Spanish, Arabic, and Hausa in order that African would-be migrants become multilingual and bilingual. This will make migrants more mobile and they will have less cultural shock when they migrate. Table 17.5 shows rural-urban

Table 17.4 City populations in Zambia (2015)

City	Population
Lusaka	2,281,702
Kitwe	646,827
Ndola	530,129
Chipata	508,361
Lundazi	378,225

Source: CSO

Table 17.5 Population of Zambia by province (2015)

Lusaka	2,777,439
Copperbelt	2,362,207
Southern	1,853,464
Eastern	1,813,445
Central	1,515,086
Northern	1,304,435
Luapula	1,127,453
Western	991,500
Muchinga	895,058
North Western	833,818

Source: CSO

migration as accelerating urban implosion, agglomeration, and growth of conurbations or mega-cities which are not sustainable in the long run because they exceed their threshold populations and put pressure on accommodation, school places, and basic infrastructure. Rural-urban migration needs to be reversed by making farming more attractive to the youth in the rural areas (Adaku 2013). The education curricula should embrace the Pestalozzi philosophy of educating the head, heart, and hands of our youth so that they can think critically, have passion for entrepreneurship, and also learn to do things practically with their hands (Denny 2015).

In the pre-colonial period antedating the Portuguese arrival on the West Africa Coast around 1440, Africans used to trade among themselves with the famous example of the Trans-Saharan trade route linking the coastal parts of West Africa with the North African countries called the Maghreb.

Salt, kola, gold, leather-ware, guns, and animals formed some of the commodities of trade exchange. The trade routes linked places such as Kano, Fez, Marrakech, Agades, Gao, Timbucktu, Salaga, and Audaghost. That trade made people long to travel for commerce, adventure, and curiosity. It created migrants in those days. Starting from 1550, after the Spanish priest Las Casas had recommended that the black negroes would be suitable to work on the sugar and cotton plantations in the New World, the slave trade boomed and millions of young Africans were raided and captured to be sold into slavery from places such as Congo, Angola, Nigeria, Ghana, Benin, Senegambia, and other places in Africa. The trade in slaves, gin, sugar, arms, clothes, and arms was dubbed the Triangular Trade because it touched Europe, Africa, and the Americas. The slave trade caused mass migrations as people fled the slave raiding areas in search of safety elsewhere. By 1833, the slave trade had been abolished and it was replaced by legitimate trade which came with colonisation. From 1910 onwards, colonisation took root in Africa after Lord Lugard and Cameron had proposed Indirect Rule for Africa and the French had adopted the policy of Assimilation or Equality. The Portuguese adopted the policy of Assimilando. Colonial rule brought with it trade, education, Christianity, and Western values. Western education led to Euro-centrism or European interpretation of African values by using European standards. That led to Africans developing an inferiority complex and relegating their African cultures into limbo. Western education was tailored to the needs of the colonisers. When the colonisers left, the school curricula which they left behind led to mental colonisation and enslavement because they failed to address not only the labour needs of the ex-colonies but also all facets of their needs in every aspect of human endeavour. The colonial educational legacy to Africans led to many Africans developing the passionate desire to travel abroad to enjoy the good life or acquire their education abroad in order to earn them some superior status. Africans began to look down on their own home-grown education, leading to more migration.

Attainment of Independence in the 60s brought euphoria of abundance and self-rule. In the immediate post-independence period, jobs were galore because of the leaders' desire for rapid nationalisation and industrialisation. When in the 70s and 80s oil prices went up and export commodity prices went down on the global market (dual shock), many graduates from the schools and colleges had no choice but to migrate for greener pastures overseas, fleeing from economic hardships at home. They became economic migrants and fugitives. The crunch came in the 90s when the huge external debt crisis led to privatisation, denationalisation, deindustrialisation, mass retrenchments of labour, and a parlous economy with shortages of essential commodities such as sugar, cooking oil, flour, mealie meal, and detergents. At the time, it was realised that there was a disconnect between the educational curricula and the requirements of the labour market. Many school leavers and retrenchees lacked entrepreneurial skills as well as marketable vocational skills. The problems of the 90s were worsened by the HIV-AIDS pandemic which made people lose interest in living. To some, the only panacea was to plunge into a journey of migration to flee the burden of looking after so many orphans of deceased relatives. From 2000 onwards, globalisation and the internet arrived on the scene whereby many jobs were disintermediated by using either ICT facilities or robots. In some instances, jobs were outsourced or offshored to cheaper locations in labour-surplus countries such as India and China, thereby creating more unemployment (Mills n.d.). All these factors caused many people to migrate to relatively rich countries where skills and professionals are in short supply. Countries such as Japan, Canada, Norway, Sweden, Denmark, and the UK have high ageing populations and low fertility rates, which require them to have an inflow of skilled migrants. The young digital natives in Africa are those currently below 19 years, who are active and regular users of social media sites. They are at risk as they can easily be enticed online by human traffickers to migrate. This historical narrative informs the reader that migration in Africa has a long history and the factors which affect it are complex, ranging from ecological, political, social, economic, and psychological.

To formulate policies to address the issues of migration, these underlying factors have to be carefully analysed and weighed for their pros and cons.

The data shows that as per capita income increases the rate of migration reduces. This entails that African governments need to work hard to make their countries prosperous in order to reduce migration (Brookings, online).

3 Method

The chapter used secondary research by accessing online articles and journals. In this vein, it adopted the review approach by making deductive and inductive inferences, which led to the creation of valid and ethical knowledge by building upon what had already been done and trying to build a solid argument to support the premise of the research. Data collected from online sources were deployed to support arguments and they were duly acknowledged. These methods allowed the researcher to build his narrative on a solid foundation.

4 Results

In Table 17.5, it can be inferred that Lusaka is a Primate City in the sense that its population is more than all the other cities combined. This has negative implications in that it shows that development is not evenly distributed in Zambia and as such all roads lead to Lusaka for commercial and administrative transactions. Lusaka can become a sprawling urban conurbation that can easily lead to urban decay, urban implosion, and also an increase in anti-social activities such as prostitution and crime. In the urban hierarchy, Lusaka becomes a growth pole. Attempts should therefore be made to grow the other urban centres for them to become growth poles so that rural-urban migration can be reduced.

Table 17.5 shows the total populations of the ten provinces of Zambia. The last three provinces shown in the table with the lowest populations are North Western, Muchinga, and Western provinces. It can be inferred

from the figures that these regions, from historical records, are losing areas due to out-migration (Heisler 1973). They are far from the Line of Rail as well as from the Copperbelt. Added to that, they have the least developed infrastructure (Table 17.6). These three provinces from colonial times were supplying labour to the mines (Heisler 1973).

Insights gained from the literature on migration indicate that the main motive for migration in sub-Saharan Africa are primarily economic and demographic pressures (Adaku 2013). Migrants move out to other regions and countries in search of well-paying jobs as well as to improve their incomes, and have the means to remit monies home to look after their families and dependants. Other motives for African migrants to migrate are to pursue higher education abroad, to seek medical care, to join their families, and to seek adventure.

Table 17.7 shows net migration statistics for Zambia, which indicates that Zambia on five occasions gained from migration while on six occasions it lost out. This indicates that, overall, Zambia has had losses from migration

Table 17.6 Motives for migration

1. Employment
2. Education
3. Health
4. Family
5. Adventure

Source: Made by the authors

Table 17.7 Net migration rate change (% in Zambia)

2015	−0.46	−75.94%
2010	−1.92	16.33%
2005	−1.65	−201.92%
2000	1.62	−402.06%
1995	−0.54	−813.33%
1990	0.08	−95.88%
1985	1.82	181.02%
1980	0.65	−44.47%
1975	1.17	−632.88%
1970	−0.22	−245.03%
1965	0.15	
1960	0.00	

Source: UNECA

despite having a low population density of 17.4 people per square kilometre. Economically speaking, Zambia should be able to attain critical mass for rapid economic development if it were to allow more immigrants to come in in order to create a high demand for goods and services.

5 Conclusion

The discussion thus far has identified some of the causes for young Africans to emigrate outside their home countries in search of greener pastures. Those likely to migrate are young male non-professionals who lack professional and entrepreneurial skills, those with lower levels of education, those who are socially-challenged as orphans, and those who lack job opportunities where they reside. In fact, poverty is the bottom line of mass migration. Many youth feel bored because of lack of creative industries which can engage them in sports, art, dance, entertainment, among others. Some of the environmental factors which have been connected with migration are drought, floods, poor harvests, natural disasters, epidemics, and conflict in war-torn countries. Many youth follow peer pressure to emigrate because of lack of knowledge and also the wrong perception which is given to them that overseas countries are better to go to than for them to waste away in their towns and villages. Many youth have been exposed to foreign travel because of globalisation, internet connectivity, activities of human traffickers, and also because they have relatives abroad who invite them to follow suit to emigrate, in what is termed chain migration. On a national level, many migrants have been made to take risks of trying their luck elsewhere because they perceive a dead end in obtaining employment locally, because they complain of corruption, bureaucracy, nepotism, and high national debt which make the cost of living high. These are coupled with high rate of taxes and inflation. Despite media reports of dangers which migrants face in terms of hostile reception abroad and the likelihood of not making it to their destinations, the youth are willing to take the adventure to emigrate. The creation of trading blocs and political groupings such as COMESA and ECOWAS has not helped matters as they have led to porous national borders and the easy mobility of migrants.

6 Recommendations

The discussion thus far points to the following recommendations:

- African governments should start working in concert to crack down on human traffickers
- The issue of massification of education should be looked into by redesigning the school curricula and emphasising vocational skills and twinning schools to industry so that schools provide the skills employers look for
- School leavers should be registered and encouraged to undertake projects before they graduate so that they become self-employed
- Rural areas need to be developed to become growth poles and increase the stay option
- There should be even development of rural and urban areas by strengthening the capacity of local governments to absorb rural school leavers in local enterprises. The decentralisation exercise should be speeded up
- A lot of creative activities should be developed to entice the youth to stay within
- ICT should be used to empower the youth by teaching them coding or programming skills so that they can develop their own marketable programmes and innovative solutions
- Civic organisations and churches should be involved in educating the youth about the dangers and risks involved in unplanned migration abroad
- Government should improve economic and social conditions at home to reverse the trend of migration
- Schools and colleges should start teaching major African official languages to help would-be migrants integrate quickly in their destination countries

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References

Adaku, A. (2013). The Effect of Rural-Urban Migration on Agricultural Production in the Northern Region of Ghana. *Journal of Agricultural Science and Applications, 2*(4), 193–201. https://doi.org/10.14511/jasa.2013.020402.

Adepoju, A. (1998). Linkages between Internal and International Migration: The African Situation. *International Social Science Journal, 50*(157), 387.

Ansell, N., & Young, L. (n.d.). Enabling Households to Support Successful Migration of AIDS Orphans in Southern Africa. *AIDS Care, 16*(1), 3–10.

CSO Zambia Total Population. Retrieved from zambia.opendataforafrica.org/xmsofg/total-population

Davidson, J. O. (2013). Troubling Freedom: Migration, Debt, and Modern Slavery. *Migration Studies, 1*(2), 176–195. https://doi.org/10.1093/migration/mns002.

Denny, E. (2015). Educational Philosopher Johann Heinrich Pestalozzi. Retrieved from https://prezi.com/xb_aonse1od_/educational-philosopher-johann-heinrich-pestalozzi

Francis, H. (n.d.) Consumer Packaged Goods-Our Insights-True Generation z and Its Implications. Retrieved from https://www.mckinsey.com/industries/consumer-packagedgoods/our-insights/true-generation-z-and-its-implications-for-companies

Heisler, H. (1973). The Pattern of Migration in Zambia. *Cahiers d'Etudes africaines/Annee, 50*, 192–212.

Mills, J. F. (n.d.). The Risks, Threats and Opportunities of Disintermediation: A Distributor's View. Retrieved from https://www.emeraldinsight.com/doi/full/10.1108/

Thet, K. K. (2014). Pull and Push Factors of Migration: A Case Study in the Urban Area of Monywa Township, Myanmar. Retrieved from https://www.worldofstatistics.org/files/2014/03/pull-and-push-factors-of-migration-Thet.pdf

UNECA. (2017). African Migration-Drivers of Migration in Africa.

UNESCO. (2019). Zambia Education Statistics. Retrieved from uis.unesco.org/country/ZM

Zambia. (2015). *National Youth Policy*. Lusaka: Ministry of Youth and Sport.

18

Scenario of Modern Africa's Development Until 2030 with Preservation of the Pre-Digital Technological Mode

Bruno S. Sergi and Elena G. Popkova

1 Introduction

Transition to the pre-digital technological mode has been selected as the vector of growth and development of the modern global economy. There are several approaches to digital modernization of economic systems. The most developed and progressive economic systems implement the radical approach, realizing the fourth industrial revolution through transition to Industry 4.0. They actively develop and implement breakthrough (essentially new, unique) digital technologies: the Internet of Things, ubiquitous computing, blockchain, and quantum calculations of the technology

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of virtual and alternate reality. This allows them to create and to establish temporary monopoly in new markets of hi-tech products.

As a rule, these countries have the most favorable conditions for innovative development of the economy, possessing sufficient investments, skilled human resources, developed and innovations-active digital society, effective institutes of the digital economy, and so on. Transition to Industry 4.0 allows accelerating growth and development of economies of the countries that implement this approach. An example is countries of the OECD. Representatives of the radical approach are traditional leaders in the global ratings of countries and, due to transition to Industry 4.0, they strengthen and improve their positions in these ratings and have the highest digital competitiveness.

Countries that have the most dynamic development and significant innovative potential follow the conservative approach to digital modernization of their economic systems. This approach envisages implementation of digital technologies that are very popular in the global economy—Internet, cloud services, and so on. They do not have an opportunity to conduct large-scale scientific research and commercialization of innovations, due to deficit of investments, low susceptibility of the forming digital society to innovations, underdevelopment of the infrastructure of the digital economy, and imperfection of the institutes. That's why these countries use technologies that have already been tested in world practice.

This allows them to support and raise their digital competitiveness, though this does not ensure leadership in the world markets of hi-tech. An example is countries of BRICS (Brazil, Russia, India, China, and South Africa), which improved their indicators of socio-economic development due to digital modernization of the economy. African countries have stayed aside of the global tendency of digital modernization of the economy. They are not represented in the global rating of digital competitiveness of the economy, because they preserve the pre-digital technological mode.

What are the probable consequences of further implementation of this practice in countries of Africa and what is their scientific treatment—institutionalization of underrun from other countries of the world

("institutional trap") or observing their own vector of socio-economic progress, aimed at preserving the traditions and envisaging the refusal from "overtaking development"—is the scientific problem that is to be solved in this chapter.

2 Materials and Method

The specific features and regularities of development of socio-economic systems in the digital age are reflected in the works Haabazoka (2019a, b), Petrenko et al. (2018), Popkova (2019), Popkova and Sergi (2018, 2019, 2020), Ragulina (2019), Ragulina et al. (2019a, b), Sergi et al. (2019a, b, c, d, e, f), Sergi (2003, 2019), and Wamboye et al. (2015b). The current tendencies and peculiarities of development of the modern African countries are studied in the works Tiruneh et al. (2017), Wamboye and Sergi (2019), and Wamboye et al. (2013, 2014, 2015a, 2016).

At the same time, despite the high level of elaboration of certain components of this problem, the future perspectives of development of modern Africa with preservation of the pre-digital technological mode require scientific research. For this, the authors use the methodology of the Theory of Games (in particular, the method of regression and scenario analysis and the simplex method). We use the noosphere approach and thus we're interested in the long-term consequences of preserving the pre-digital technological mode for African countries.

The above methods are used for determining the interconnection between the environmental performance index (y), GDP per capita (y_2), the quality of life index (y_3), and the level of global competitiveness (resulting indicator that reflects the socio-economic position of the economic system, x) in 2018. The objects for the research are top ten most competitive African countries in 2018. Based on the established interconnections, we determine probable consequences of development of modern Africa until 2030 with preservation of the pre-digital technological mode.

3 Results

The values of the selected indicators in countries of Africa, their direct averages, values of the rating's leaders, and the underrun from the leaders are shown in Table 18.1.

The scenario with preservation of the pre-digital technological mode envisages the changes of the global competitiveness index "with all other conditions being equal". This allows setting the same change of the global competitiveness index in 2030 as compared to 2018 (for the next 12 years) as in 2018 as compared to 2007 (for the previous 12 years). As shown in Table 18.1, in 2017 the average value of the global competitiveness index in countries of Africa constituted 37.95 points, and in 2018–53.92 points.

Therefore, the change in 2018, as compared to 2007, constituted 1.42 (53.92/37.95). The forecast value of the global competitiveness index in 2030 constitutes 76.61 points (53.92 × 1.42). Change of the value of this indicator with the leader constituted 1.5 (85.6/56.7). However, the leader's economy will be developing not according to the scenario "with all other conditions being equal" but according to the scenario "accelerated growth based on Industry 4.0". That's why we set in the forecast double increase of the values of the indicators y_2 and y_3 of the leaders for the set value of their changes for the last ten years (1.5 × 1.5 = 2.25). Ecological costs of Industry 4.0 are high (in particular, energy costs). That's why we set the expected reduction y_1 with the leader by 2.25 times.

For forecasting the values of other indicators (y_1, y_2, y_3) we built the regression curves that reflect their regression and correlation dependence on the global competitiveness index (Fig. 18.1).

The regression equations of the type $y = \alpha + \beta \times x$ allow determining the forecast values of dependent variables with the calculated value of the independent variable (76.61 points). Thus, for example, let us put this value into equation $y_1(x)$—we then receive $y_1 = 0.4601 \times 76.61 + 25.75$ 5 = 61 points. The results of the performed scenario analysis of development of modern Africa until 2030 with preservation of the pre-digital technological mode are shown in Table 18.2.

Table 18.1 Initial data for the selection of African countries

Country	Global competitiveness index (2007), points 1–100	Global competitiveness index (2018), points 1–100	Environmental performance index (2018), points 1–100	GDP per capita (2018), USD	Quality of life index (2018), points 1–200[a]
		x	y_1	y_2	y_3
Botswana	39.60	54.50	51.70	8258.64	121.68
Kenya	36.10	53.70	47.25	1710.51	73.14
Mauritius	41.60	63.70	56.63	11,238.69	142.22
Namibia	38.50	52.70	58.46	5931.45	117.66
Nepal	33.80	50.80	31.44	1025.80	113.42
Nigeria	36.90	47.50	54.76	2028.18	106.05
Rwanda	n/a[b]	50.90	43.68	772.97	113.65
Seychelles	n/a[b]	58.50	66.02	16,433.94	130.61
South Africa	44.20	60.80	44.73	6339.57	135.75
Zambia	32.90	46.1	50.97	1539.90	102.93
Average	37.95	53.92	50.56	5527.97	115.71
Leader of the rating	56.7 (USA)	85.6 (USA)	87.42 (Switzerland)	166,726.1 (Monaco)	196.47 (Denmark)
Underrun from the leader (%)	−33.07	−37.01	−42.16	−96.68	−41.10

Source: calculated and compiled by the authors based on Numbeo (2019), Wendling et al. (2019), World Bank (2019), World Economic Forum (2019a), "The World Bank (2019a), The World Bank (2019b), The World Bank (2019c)" and World Economic Forum (2019b)

[a]Values for the countries for which data are absent were obtained by the authors with their own expert evaluations

[b]n/a—No data

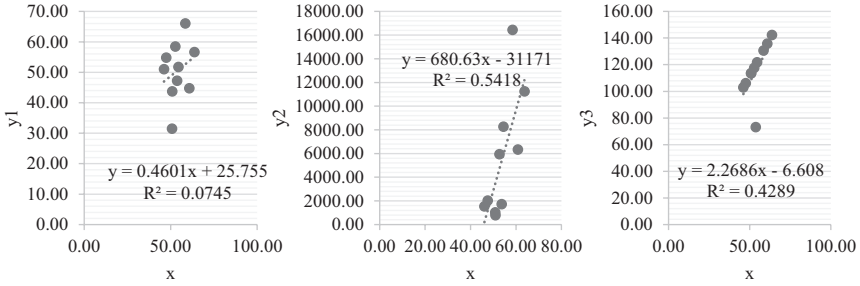

Fig. 18.1 Regression curves. (Source: calculated by the authors)

Table 18.2 Scenario analysis of development of modern Africa until 2030 with preservation of the pre-digital technological mode

Characteristics of the scenario	x	y_1	y_2	y_3
Forecast value of the variable in 2030	76.61	61.00	20,972.37	167.19
Value of the variable in 2018	53.92	50.56	5527.97	115.71
Growth in 2030 as compared 2018 (%)	−29.62	−17.11	−73.64	−30.79
Coefficient α of regression equation	0.00	25.76	−31,171.00	−6.61
Coefficient β of regression equation	0.00	0.46	680.63	2.27
Value of the leader in 2030 (the 2018 value × 2.25)	195.10	38.36	380,001.23	447.79
Underrun from the leader in 2030	−60.73	59.05	−94.48	−62.66
Change of the underrun from the leader in 2030 as compared to 2018, times	1.64	−1.40	0.98	1.52

Source: calculated by the authors

Let us consider the calculation from Table 18.2. As was shown in the table, the forecast value of variable y_1 in 2030 constitutes 61 points. Its growth in 2030, as compared to 2018, constitutes 17% (61 × 100/50.56–100). The value of the leader in 2030 constituted 38.36 points (87.42/2.25). Underrun from the leader in 2030 for the value of the environmental performance index will constitute 59.05% (50.56 × 100/38.36–100). The change of the underrun from the leader in 2030, as compared to 2018, will constitute 1.40 times (59.05/−42.16).

Thus, with preservation of the pre-digital technological mode until 2030, global competitiveness of African countries' economies grows (by 29.62%, to 76.61 points), but to a lesser extent as compared to other countries. Underrun from the most progressive countries will increase by

1.64 times. Environmental performance of African countries in 2030 will increase by 17.11% (up to 61 points), but underrun from the most progressive countries will grow by 1.65 times. GDP per capita of African countries in 2030 will grow by 73.64% (up to USD 20,972.37), and underrun from the most progressive countries will reduce by 0.98 times. The quality of life index of African countries in 2030 will grow by 30.79% (up to 167.19 points), but underrun from the most progressive countries will grow by 1.52 times.

Let us provide qualitative treatment of the compiled scenario. Global competitiveness of African countries will decrease, as preservation of the pre-digital technological mode will not allow them to be present at the most perspective and actively developing digital markets. At the same time, African countries will be able to focus on domestic development. They will be able to raise the population's living standards. Quality of life, through the prism of the indicators of education, healthcare, and so on, will be lower than in the most progressive countries. Environmental performance could be increased and could exceed environmental performance of progressive countries, which will probably bear large ecological costs of hi-tech economic growth.

4 Conclusion

The results of the performed research showed that the scenario of modern Africa's development until 2030 with preservation of the pre-digital technological mode is contradictory. On the one hand, the opportunities of international economic integration and export of African countries will be limited substantially. It is probably that their economic security will be threatened due to the establishment of sustainable dependence on the import of digital goods and services. Growth rate of African countries' economies will be balancing at the zero level—that is, there will be stagnation of their economies.

On the other hand, it would be possible to achieve the increase of population's living standards. Refusal from observing the global tendency of digitization of economy and preservation of the national culture in countries of Africa will make them attractive for living and tourism. Also,

African countries will not bear colossal costs due to the development of Industry 4.0. A favorable environment will also raise the comfort of living in countries of Africa.

Thus, the scenario of modern Africa's development until 2030 with preservation of the pre-digital technological mode is not negative—contrary to the generally accepted opinion, which is promoted by the supporters of digital modernization. This allows considering it as one of the perspective scenarios of development of modern Africa until 2030. These countries implement socio-economic progress with their own rate and orientation at their domestic development. At the same time, for selecting the optimal scenario of development of modern Africa until 2030 it is necessary to consider the possible alternatives. In particular, the hi-tech development of African countries deserves attention—it should be developed and analyzed in further research.

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References

Haabazoka, L. (2019a). A Study of the Effects of Technological Innovations on the Performance of Commercial Banks in Developing Countries—A Case of the Zambian Banking Industry. *Lecture Notes in Networks and Systems, 57*, 1246–1260.

Haabazoka, L. (2019b). Project Finance for Africa's Construction Sector: Can Stabilization Funds Work? *Lecture Notes in Networks and Systems, 57*, 32–60.

Numbeo. (2019). Quality of Life Index. Retrieved September 4, 2019, from https://www.numbeo.com/quality-of-life/rankings_by_country.jsp?title=2019-mid&region=002

Petrenko, E., Pritvorova, T., & Dzhazykbaeva, B. (2018). Sustainable Development Processes: Service Sector in Post-industrial Economy. *Journal of Security and Sustainability Issues, 7*(4), 781–791. https://doi.org/10.9770/jssi.2018.7.4(14).

Popkova, E. G. (2019). Preconditions of Formation and Development of Industry 4.0 in the Conditions of Knowledge Economy. *Studies in Systems, Decision and Control, 169*(1), 65–72.

Popkova, E. G., & Sergi, B. S. (2018). Will Industry 4.0 and Other Innovations Impact Russia's Development? In B. S. Sergi (Ed.), *Exploring the Future of Russia's Economy and Markets: Towards Sustainable Economic Development* (pp. 51–68). Bingley, UK: Emerald Publishing Limited.

Popkova, E. G., & Sergi, B. S. (Eds.). (2019). *Digital Economy: Complexity and Variety vs. Rationality*. Springer International Publishing.

Popkova, E. G., & Sergi, B. S. (2020). Human Capital and AI in Industry 4.0. Convergence and Divergence in Social Entrepreneurship in Russia. *Journal of Intellectual Capital*.

Ragulina, Y. V. (2019). Priorities of Development of Industry 4.0 in Modern Economic Systems with Different Progress in Formation of Knowledge Economy. *Studies in Systems, Decision and Control, 169*, 167–174.

Ragulina, Y. V., Alekseev, A. N., Strizhkina, I. V., & Tumanov, A. I. (2019a). Methodology of Criterial Evaluation of Consequences of the Industrial Revolution of the 21st Century. *Studies in Systems, Decision and Control, 169*, 235–244.

Ragulina, Y. V., Semenova, E. I., Avkopashvili, P. T., Dmitrieva, E. A., & Cherepukhin, T. Y. (2019b). Top-Priority Directions of Implementing New Internet Technologies on the Territories of Rapid Economic Development. *Advances in Intelligent Systems and Computing, 726*, 182–188.

Sergi, B. S. (2003). *Economic Dynamics in Transitional Economies: The Four-P Governments, the EU Enlargement, and the Bruxelles Consensus*. New York: Routledge.

Sergi, B. S. (Ed.). (2019). *Tech, Smart Cities, and Regional Development in Contemporary Russia*. Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Bogoviz, A. V., & Litvinova, T. N. (2019a). *Understanding Industry 4.0: AI, the Internet of Things, and the Future of Work*. Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Bogoviz, A. V., & Ragulina, J. V. (2019b). Costs and Profits of Technological Growth in Russia. In B. S. Sergi (Ed.), *Tech, Smart Cities, and Regional Development in Contemporary Russia* (pp. 41–54). Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Bogoviz, A. V., & Ragulina, J. V. (2019c). Entrepreneurship and Economic Growth: The Experience of Developed and Developing Countries. In B. S. Sergi & C. C. Scanlon (Eds.), *Entrepreneurship*

and Development in the 21st Century (pp. 3–32). Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Borzenko, K. V., & Przhedetskaya, N. V. (2019d). Public-Private Partnerships as a Mechanism of Financing Sustainable Development. In M. Ziolo & B. S. Sergi (Eds.), *Financing Sustainable Development: Key Challenges and Prospects* (pp. 313–339). Palgrave Macmillan.

Sergi, B. S., Popkova, E. G., Sozinova, A. A., & Fetisova, O. V. (2019e). Modeling Russian Industrial, Tech, and Financial Cooperation with the Asia-Pacific Region. In B. S. Sergi (Ed.), *Tech, Smart Cities, and Regional Development in Contemporary Russia* (pp. 195–223). Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Vovchenko, N., & Ponomareva, M. (2019f). Central Asia and China: Financial Development Through Cooperation with Russia. In W. A. Barnett & B. S. Sergi (Eds.), *Asia-Pacific Contemporary Finance and Development (International Symposia in Economic Theory and Econometrics Vol. 26)* (pp. 141–164). Bingley, UK: Emerald Publishing Limited.

The World Bank. (2019a). High-Technology Exports (% of Manufactured Exports). Retrieved September 3, 2019, from https://data.worldbank.org/indicator/TX.VAL.TECH.MF.ZS?most_recent_value_desc=true&view=chart

The World Bank. (2019b). Medium- and High-Tech Manufacturing Value Added Share in Total Manufacturing Value Added. Retrieved September 3, 2019, from https://tcdata360.worldbank.org/indicators/hbe238413?country=BRA&indicator=3794&viz=line_chart&years=1990,2014

The World Bank. (2019c). The World Bank in Africa: Countries. Retrieved September 3, 2019, from https://www.worldbank.org/en/region/afr

Tiruneh, E. A., Wamboye, E., & Sergi, B. S. (2017). Does Productivity in Africa Benefit from Advanced Countries' R&D? *Technology Analysis & Strategic Management, 29*(7), 804–816.

Wamboye, E., Adekola, A., & Sergi, B. (2016). ICTs and Labour Productivity Growth in Sub-Saharan Africa. *International Labour Review, 155*(2), 231–252.

Wamboye, E., Adekola, A., & Sergi, B. S. (2013). Economic Growth and the Role of Foreign Aid in Selected African Countries. *Development, 56*(2), 155–171.

Wamboye, E., Adekola, A., & Sergi, B. S. (2014). Foreign Aid, Legal Origin, Economic Growth and Africa's Least Developed Countries. *Progress in Development Studies, 14*(4), 335–357.

Wamboye, E., Tochkov, K., & Sergi, B. S. (2015a). Technology Adoption and Growth in Sub-Saharan African Countries. *Comparative Economic Studies, 57*(1), 136–167.

Wamboye, E. F., Adekola, A. F., & Sergi, B. S. (2015b). Sectoral Effects on Female Absolute and Relative Employment in Selected Least Developed Countries. *Gender, Technology and Development, 19*(1), 1–42.

Wamboye, E. F., & Sergi, B. S. (2019). Exploring the Nature, Motives, and Implications of Foreign Capital in Africa. *World Development Perspectives, 14*(June), 100108.

Wendling, Z. A., Emerson, J. W., Esty, D. C., Levy, M. A., de Sherbinin, A., et al. (2019). *2018 Environmental Performance Index*. New Haven, CT: Yale Center for Environmental Law & Policy. Retrieved September 4, 2019, from https://epi.yale.edu/

World Bank. (2019). GDP per capita (Current US$). Retrieved September 4, 2019, from https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?view=chart

World Economic Forum. (2019a). The Global Competitiveness Index 2007–2006 Rankings. Retrieved September 4, 2019, from http://allianceau.com/pics/advant/2007_WorldEconomicForum.pdf

World Economic Forum. (2019b). The Global Competitiveness Index 4.0 2018 Rankings. Retrieved September 4, 2019, from http://www3.weforum.org/docs/GCR2018/05FullReport/TheGlobalCompetitivenessReport2018.pdf

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Africa 4.0 as a Perspective Scenario for Neo-Industrialization in the Twenty-First Century: Global Competitiveness and Sustainable Development

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1 Introduction

Modern Africa entered a new age of globalization, in which its integration into the global economic system as a perspective participant that seeks its own interests and possesses the unique opportunities for growth and development takes place. The most important priorities in this process are increase of global competitiveness and the provision of sustainable development. Globalization of modern Africa takes place against the

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background of the fourth industrial revolution, which covered most countries of the world.

According to the latest (as a result of 2018) rating of global digital competitiveness (World Digital Competitiveness Ranking), the African region remains untouched by the fourth industrial revolution. The only country of the region that is present in the rating is South Africa—49th position among 63 countries, with 56.876 points out of 100 (IMD 2019). In the course of globalization, countries of Africa won't be able to remain aside from the global tendency. The current scientific and practical problem of modern economics is selecting the optimal method for Africa's accession to the fourth industrial revolution.

The most progressive countries of the European, American, and Asia-Pacific regions of the world (firstly, countries of the Organisation for Economic Co-operation and Development [OECD]—Germany, the USA, and Japan) have been implementing the model of neo-industrialization in recent years (Sergi and Scanlon 2019). This envisages transition to Industry 4.0, connected to the ubiquitous dissemination of breakthrough technologies of the fourth technological mode. It is expected that they will be able to start production of hi-tech products in all spheres of the economy and develop and use it as a growth pole (a source of acceleration of economic growth).

At the same time, a lot of developing countries (e.g., BRICS) have more restrained models of participation in the fourth industrial revolution, which envisage a digital modernization of the economy. Within this model, the breakthrough technologies (e.g., AI and the Internet of Things), which belong to the fourth technological mode, are implemented in certain hi-tech spheres that are unified into Industry 4.0. Digital modernization of other spheres envisages the implementation of technologies of the third technological mode (e.g., cloud technologies, radio-frequency identification [RFID] technologies, and broadband Internet).

Thus, implementation of the models of participation in the fourth industrial revolution is inadmissible, as instead of growth of global competitiveness and the provision of its sustainable development it may lead to opposite results—the depletion of national resources with the impossibility of development of effective production of hi-tech products,

absence of sale in the domestic market, and crisis of overproduction. Countries of Africa have to develop their own model, which takes into account the current needs and specific features of the economy. The purpose of this chapter is to study the perspectives of involvement of African countries in the global fourth industrial revolution based on breakthrough technologies of Industry 4.0.

2 Materials and Method

The perspectives of development of African countries in the modern economic conditions for the provision of their global competitiveness and sustainable development are discussed in multiple works of modern authors: Adekola and Sergi (2016), Batuo et al. (2018), Efremenko et al. (2017), Ndaguba and Hanyane (2019), Tiruneh et al. (2017), Wamboye et al. (2013, 2014, 2015, 2016), and Wamboye and Sergi (2019). The conceptual foundations and practical experience of various countries in the sphere of implementing the breakthrough technologies of Industry 4.0 are studied in detail in the works Bogoviz (2019), Popkova (2019), Popkova and Sergi (2018, 2019, 2020), Ragulina (2019), Ragulina et al. (2019a, b), Sergi et al. (2019a, b, c, d, e, f), Sergi (2003, 2019).

At the same time, it should be noted that the objects of the research in these works are primarily countries of the European, American, and Asia-Pacific regions of the world. The issues of participation of African countries in the fourth industrial revolution are poorly studied in the existing publications and remain unresolved.

In this chapter, the authors use the methods of imitation modeling, trend, regression and correlation analysis, variation analysis, and scenario analysis for determining the future scenarios of development of African countries until 2030. The selection of data includes information for all countries of Africa. The analyzed indicators are as follows

- global competitiveness index (the World Economic Forum);
- sustainable development index (the International Institute for Sustainable Development);

- growth rate of GDP at constant prices according to the International Monetary Fund (IMF);
- GDP per capita according to the IMF;
- total volume of investments according to the IMF;
- innovations index according to the World Intellectual Property Organization (WIPO);
- sectorial structure of gross added value according to the World Bank.

All indicators are analyzed based on the 2018 data; certain indicators (with available information) are analyzed based on the data of their dynamics for 2000–2022 (the data for 2019–2022 are forecasted data). The initial statistical data are given in Tables 19.1 and 19.2.

Table 19.1 shows that each statistical indicator lacks information on a lot of countries of Africa. The average level of global competitiveness of the economies of African countries in 2018 was low—3.59 points out of 7. The coefficient of variation is 11.35%, which shows rather high homogeneity of the selection. The average value of the index of sustainable development in African countries in 2018 was also low—51.48 points out of 100. The coefficient of variation constitutes 10.11%, which shows rather high homogeneity of choice. The average growth rate of GDP at constant prices in African countries in 2018 was moderate, constituting 4.34%. The coefficient of variation constitutes 62.38%, which shows heterogeneity of selection of data for this indicator.

The average level of GDP per capita in African countries in 2018 was low—USD 2496.31. The coefficient of variation constitutes 147.13%, which shows heterogeneity of selection of data for this indicator. The average total volume of investments into economies of African countries in 2018 was rather high—23.87% of GDP. The coefficient of variation constitutes 49.34%, which shows heterogeneity of selection of data for this indicator. The average value of the innovations index in African countries in 2018 constituted 25.06 points out of 100, which allows characterizing the innovative activity of these countries as low. The coefficient of variation constitutes 18.95%, which shows rather high homogeneity of the selection of data for this indicator.

Table 19.2 shows that statistical data for certain countries are absent. The average share of agriculture in the structure of gross value that was

Table 19.1 Indicators of socio-economic development of African countries in 2018

Country	Global competitiveness index, 1–7 y_1	Sustainable development index, points 1–100 y_2	Growth rate of GDP at constant prices, % x_1	GDP per capita, USD x_2	Total volume of investments, % GDP x_3	Innovations index, points 1–100 x_4
Angola	n/a	49.6	1.528	4627.096	7.308	n/a
Benin	n/a	49.0	6.032	813.496	27.354	n/a
Botswana	4.30	n/a	4.188	7543.525	31.863	n/a
Burkina Faso	n/a	50.9	6.339	681.47	17.654	18.95
Burundi	3.21	49.8	n/a	n/a	n/a	n/a
Cabo Verde	3.76	n/a	n/a	n/a	n/a	n/a
Cameroon	3.65	55.8	4.297	1250.993	20.578	n/a
Central African Republic		37.7	5.03	439.516	17.894	n/a
Chad	2.99	42.8	2.418	802.156	20.872	n/a
Democratic Republic of the Congo	3.27	43.4	3.451	473.991	13.076	n/a
Republic of Congo	n/a	52.4	8.826	1980.551	18.724	n/a
Cote d'Ivoire	n/a	55.2	n/a	n/a	n/a	19.96
Equatorial Guinea	n/a	n/a	–5.098	13,258.96	42.724	n/a
Eritrea	n/a	n/a	3.646	988.471	6.672	n/a
Eswatini	n/a	n/a	n/a	n/a	n/a	n/a
Ethiopia	n/a	53.2	7.51	889.181	35.274	n/a
Gabon	n/a	n/a	2.661	7559.919	36.495	n/a

(continued)

Table 19.1 (continued)

Country	Global competitiveness index, 1–7 y_1	Sustainable development index, points 1–100 y_2	Growth rate of GDP at constant prices, % x_1	GDP per capita, USD x_2	Total volume of investments, % GDP x_3	Innovations index, points 1–100 x_4
Gambia	3.61	51.6	3.497	503.361	16.537	n/a
Ghana	3.72	n/a	9.164	1617.693	25.738	24.52
Guinea	3.47	52.1	4.896	553.961	17.02	20.71
Guinea-Bissau	n/a	n/a	5	711.75	12.361	n/a
Kenya	3.98	56.8	5.753	1681.247	19.916	31.07
Lesotho	3.20	51.5	2.359	1308.384	15.342	n/a
Liberia	n/a	48.3	5.345	508.919	n/a	n/a
Madagascar	3.40	45.6	4.814	418.647	18.169	24.75
Malawi	n/a	50.0	5	338.202	12.147	n/a
Mali	n/a	n/a	4.73	848.597	19.451	n/a
Mauritius	n/a	64.5	4.014	10,054.75	22.562	n/a
Mozambique	2.89	50.7	5.5	406.191	70.736	23.06
Namibia	3.99	n/a	4.846	5355.723	23.426	28.03
Niger	n/a	n/a	5.528	426.473	43.003	20.57
Nigeria	3.30	47.5	1.893	2434.924	12.807	22.37
Rwanda	4.35	56.1	6.8	776.223	24.752	26.54
Sao Tome and Principe	n/a	n/a	5.5	1743.059	28.028	n/a
Senegal	n/a	57.2	7.005	1027.718	26.962	33.19
Seychelles	3.80	n/a	3.407	16,332.05	33.495	n/a
Sierra Leone	3.20	49.1	6.633	668.833	18.79	n/a

South Africa	4.32	n/a	1.569	5662.045	19.271	35.13
South Sudan	n/a	49.6	−1.085	342.02	17.701	n/a
Tanzania	3.71	55.1	6.924	1100.183	27.915	28.07
Togo	n/a	52.0	5.3	615.193	24.632	n/a
Uganda	3.70	54.9	5.753	666.621	30.045	25.32
Zambia	3.52	53.1	4.023	1385.797	38.159	20.66
Zimbabwe	3.32	58.8	−1.509	1054.339	15.284	23.15
Direct average	3.59	51.48	4.34	2496.31	23.87	25.06
Standard deviation	0.41	5.21	2.71	3672.90	11.77	4.75
Coefficient of variation (%)	11.35	10.11	62.38	147.13	49.34	18.95

Source: compiled by the authors based on International Institute for Sustainable Development (2019), the International Monetary Fund (2019), WIPO (2019), and the World Economic Forum (2019)

Table 19.2 Sectorial structure gross added value that was created in African countries in 2018, %

	Agriculture	Industry	Manufacturing	Services
Country	x_5	x_6	x_7	x_8
Angola	n/a	n/a	n/a	n/a
Benin	22	21	12	46.9
Botswana	2	30	5	58.7
Burkina Faso	28	21	6	42.0
Burundi	36	15	9	n/a
Cabo Verde	6	19	8	61.3
Cameroon	15	24	15	52.7
Central African Republic	40	15	7	39.3
Chad	49	15	3	33.5
Democratic Republic of the Congo	20	42	20	34.1
Republic of Congo	7	54	8	38.5
Cote d'Ivoire	20	27	13	41.6
Equatorial Guinea	2	56	25	40.7
Eritrea	n/a	n/a	n/a	n/a
Eswatini	n/a	n/a	n/a	n/a
Ethiopia	2	24	13	60.4
Gabon	6	45	7	43.0
Gambia	17	12	5	65.8
Ghana	17	24	6	52.2
Guinea	16	33	11	40.7
Guinea-Bissau	49	13	11	32.3
Kenya	32	17	48.1	45.4
Lesotho	5	33	16	52.6
Liberia	34	12	3	53.6
Madagascar	21	17	n/a	48.4
Malawi	26	14	9	52.4
Mali	38	23	n/a	36.7
Mauritius	3	18	12	66.9
Mozambique	22	18	9	54.2
Namibia	7	28	11	58.4
Niger	40	16	6	39.0
Nigeria	21	22	9	55.8
Rwanda	31	16	6	46.4
Sao Tome and Principe	11	15	7	71.4
Senegal	15	21	11	53.8
Seychelles	2	11	6	71.0
Sierra Leone	60	5	2	32.4
South Africa	2	26	12	61.5

(continued)

Table 19.2 (continued)

Country	Agriculture x_5	Industry x_6	Manufacturing x_7	Services x_8
South Sudan	n/a	n/a	n/a	n/a
Tanzania	30	26	6	37.5
Togo	41	17	4	29.8
Uganda	25	20	8	47.1
Zambia	7	36	8	52.7
Zimbabwe	10	22	8	56.3
Direct average	20.93	23.08	10.13	48.90
Standard deviation	15.24	11.11	7.83	11.14
Coefficient of variation, %	72.85	48.16	77.22	22.79

Source: compiled by the authors based on World Bank (2019)

created in African countries in 2018 constitutes 20.93%. The coefficient of variation constitutes 72.85%, which shows heterogeneity of selection of data for this indicator. The average share of industry in the structure of gross value that was created in African countries in 2018 constituted 23.08%. The coefficient of variation constitutes 48.16%, which shows heterogeneity of selection of data for this indicator.

The average share of the manufacturing structure of gross value that was created in African countries in 2018 constituted 10.13%. The coefficient of variation constitutes 77.22%, which shows heterogeneity of selection of data for this indicator. The average share of the service sphere in the structure of gross value that was created in African countries in 2018 constitutes 48.90%. The coefficient of variation constitutes 22.79%, which shows heterogeneity of selection of data for this indicator.

3 Results

3.1 The Current Tendencies of Development of African Countries

Let us study the tendencies of development of African countries in 2000–2022 (the data for 2019–2022 are the forecast of IMF specialists) (Figs. 19.1, 19.2, 19.3).

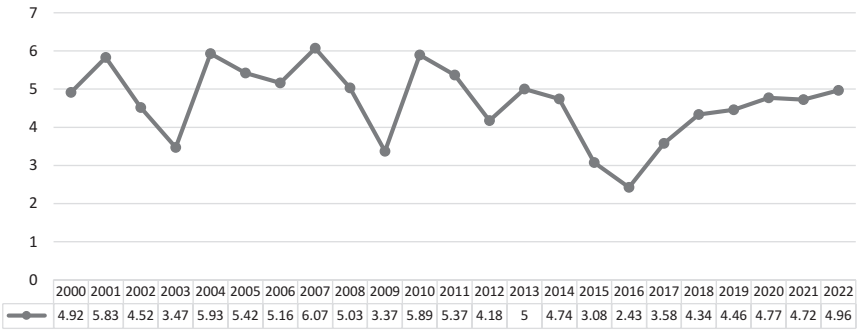

Fig. 19.1 Dynamics of the average growth rate of GDP at constant prices in African countries in 2000–2022, %. (Source: calculated and compiled by the authors based on International Monetary Fund (2019))

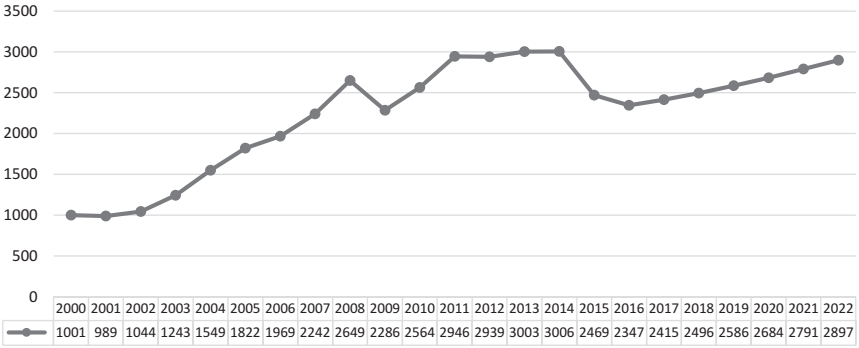

Fig. 19.2 Dynamics of average GDP per capita in African countries in 2000–2022, USD. (Source: calculated and compiled by the authors based on International Monetary Fund (2019))

Figure 19.1 shows that the average growth rate of GDP at constant prices in African countries in 2000–2022 is peculiar for high volatility. The general trend of this indicator is downward—the decrease of its value in 2018 (4.34%) as compared to 2000 (4.92%) constituted 11.78%. Its slight (4.96%) increase is expected by 2022.

Figure 19.2 shows that the average GDP per capita in African countries in 2000–2022 is peculiar for a vivid upward trend. Its value in 2018 (USD 2496) grew by 1.5 times as compared to 2000 (USD 1001). Its further growth by 16% is expected by 2022.

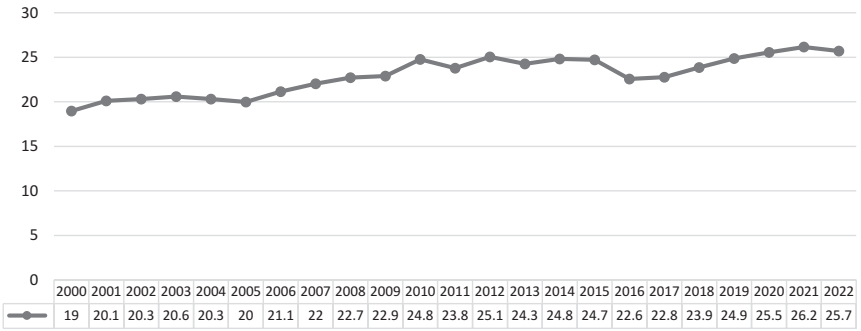

Fig. 19.3 Dynamics of average aggregate volume of investments into economies of African countries in 2000–2022, % of GDP. (Source: calculated and compiled by the authors based on International Monetary Fund (2019))

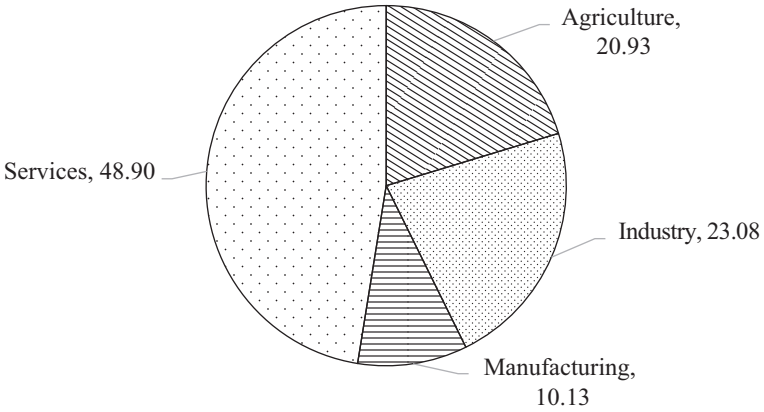

Fig. 19.4 Average sectorial structure of gross added value that was created in African countries in 2018. (Source: calculated and compiled by the authors based on World Bank (2019))

Figure 19.4 shows that the average aggregate volume of investments into the economies of African countries in 2000–2022 is peculiar for a slight upward trend. Its growth in 2018 (23.9% of GDP), as compared to 2000 (19% of GDP), constituted 25.78%. Its slight growth by 7.53% is expected by 2022 (25.7% of GDP).

The average sectorial structure of gross added value that was created in African countries in 2018 is presented in Fig. 19.4.

Figure 19.4 shows that African countries were peculiar for post-industrial direction in 2018—specialization in the service sphere, which shares in the structure of created gross added value, constituted 48.90%. The share of industry constituted 23.08%, and the share of manufacturing 10.13% (aggregate share of industry constituted 33.21%). The share of agriculture constituted 20.93%. On the whole, the sectorial structure of gross added value that was created in African countries in 2018 could be called well-balanced, as there's no vivid domination of the service sphere. This allows developing the production specialization in any direction, including in industry.

For determining the position of African countries in the modern global economic system and determining their specifics, we find the ratio of average values of the indicators of socio-economic development of African countries in 2018 to average values of the indicators of developed countries (OECD) (Fig. 19.5).

Figure 19.5 shows that countries of Africa are behind developed countries (OECD) as to the level of GDP per capita (0.06), the level of

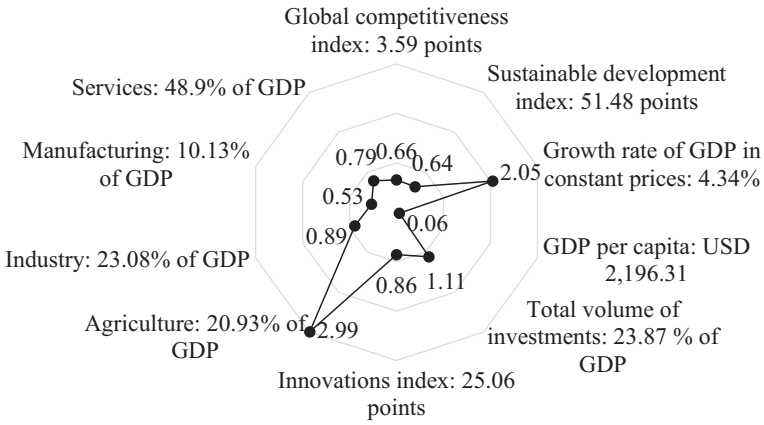

Fig. 19.5 Ratio of average values of the indicators of socio-economic development of African countries in 2018 to average values of the indicators of developed countries (OECD). (Source: calculated and compiled by the authors based on International Institute for Sustainable Development (2019), International Monetary Fund (2019), WIPO (2019), World Bank (2019), World Economic Forum (2019))

sustainable development (0.64), global competitiveness (0.66); the difference as to the level of innovative activity (0.86%) is lower. At the same time, countries of Africa show a higher growth rate of GDP at constant prices (2.05) and total volume of investments into the economy (1.11). The share of agriculture in the structure of gross added value that is created in African countries is higher than in developed countries (2.99); the share of industry is similar (0.89); and the share of the service sphere (0.79) and manufacturing (0.53) is lower.

3.2 Future Scenarios of Development of the African Countries Until 2030

Let us determine the most significant factors of global competitiveness and sustainability of development of African countries in 2018. For that we calculate the coefficients of autocorrelation of dependent variables (y_1, y_2) with independent variables (x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8) based on the data from Tables 19.1 and 19.2. The obtained results are given in Table 19.3.

Table 19.3 shows that the growth rate of GDP at constant prices has a slight positive influence on the level of global competitiveness and sustainability of development of African countries. The influence of GDP per capita is contradictory—its growth slightly increases global competitiveness but decreases sustainability of development of African countries a lot. The influence of the volume of investments, agriculture, the service sphere, and industry is also substantial. Increase in the volume of manufacturing stimulates slight growth of global competitiveness and vivid sustainable development of African countries.

Table 19.3 Autocorrelation of the indicators of socio-economic development of African countries in 2018

	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8
y_1	0.0447	0.0933	0.1423	0.3441	–0.1520	0.1891	0.0699	0.2121
y_2	0.1779	–0.3775	–0.0738	0.1563	0.2075	–0.0333	0.1555	–0.0059

Source: calculated by the authors

Table 19.4 Regression and dispersion analysis of dependence of global competitiveness of African countries on their innovative activity in 2018

Regression statistics						
Multiple *R*	0.3441					
R^2	0.1184					
Adjusted R^2	0.0974					
Standard error	7.4334					
Observations	44					
Dispersion analysis						
	df	SS	MS	*F*	Significance *F*	
Regression	1	311.7368	311.7368	5.6417	0.0222	
Residue	42	2320.7252	55.2554			
Total	43	2632.4620				
	Coefficients	Standard error	*t*-statistics	*p*-value	Lower 95%	Upper 95%
£	1.3472	1.4161	0.9514	0.3469	−1.5105	4.2049
β	0.2124	0.0894	2.3752	0.0222	0.0319	0.3928

Source: calculated by the authors

The most significant factor that shows the largest connection with global competitiveness of African countries in 2018 is innovative activity—coefficient of autocorrelation $ry_2x_4 = 0.3441$. Let us perform the regression and dispersion analysis of dependence of global competitiveness of African countries on their innovative activity in 2018 and compile a model of paired linear regression of the type $y_1 = £ + \beta \times x_4$ (Table 19.4).

According to the results of the regression analysis (Table 19.4), we have the following regression model: $y_1 = 1.3472 + 0.2124 \times x_4$. The compiled model allows stating that the growth in innovative activity of African countries by 1 point led to an increase in the level of their global competitiveness by 0.2124 points in 2018. However, the obtained value $R^2 = 0.1184$ shows weak connection between the studied indicators—the change of the level of global competitiveness of African countries in 2018 by only 11.84% is explained by the change of the level of their innovative activity.

The observed value of the *f*-criterion (5.6417) does not exceed the table value, which, with $\alpha = 0.05$, $k_1 = m = 1$, and $k_2 = n - m - 1 = 44 - 1 - 1 = 42$, constitutes 4.08—which shows statistical significance of the obtained regression equation. This is confirmed by verification with

the help of the *t*-criterion, whose observed value (2.3752) does not exceed the table value, which, with $p = 0.05$ and $n - 2 = 44 - 1 = 42$, constitutes 2.018. The obtained results show the necessity for increasing the level of innovative activity of African countries for growth of their global competitiveness.

For determining the most preferable scenario of innovative development of African countries let us analyze the dependence of the level of their innovative activity on the volume of hi-tech export in 2018. The initial data for this are given in Table 19.5, and the results of regression and dispersion analysis in Table 19.6.

Table 19.5 Volume of hi-tech export in African countries in 2018

Country	Volume of hi-tech export, USD thousand x_9	Country	Volume of hi-tech export, USD thousand x_9
Angola	n/a	Lesotho	n/a
Benin	n/a	Liberia	n/a
Botswana	49,682.76	Madagascar	4754.27
Burkina Faso	n/a	Malawi	n/a
Burundi	237.96	Mali	2164.48
Cabo Verde	n/a	Mauritius	26,573.5
Cameroon	28,690.44	Mozambique	32,059.25
Central African Republic	n/a	Namibia	14,734.53
Chad	n/a	Niger	n/a
Democratic Republic of the Congo	n/a	Nigeria	18,192.6
Republic of Congo	84,282.67	Rwanda	n/a
Cote d'Ivoire	n/a	Sao Tome and Principe	321.24
Equatorial Guinea	n/a	Senegal	9,468.67
Eritrea	n/a	Seychelles	62,598.41
Eswatini	n/a	Sierra Leone	1.35
Ethiopia	n/a	South Africa	1,817,259.05
Gabon	n/a	South Sudan	n/a
Gambia	n/a	Tanzania	15,651.17
Ghana	39,603.96	Togo	557.55
Guinea	n/a	Uganda	7081.46
Guinea-Bissau	n/a	Zambia	35,952.67
Kenya	45,768.89	Zimbabwe	n/a

Source: compiled by the authors based on World Bank (2019)

Table 19.6 Regression and dispersion analysis of dependence of innovative activity of African countries on the volume of their hi-tech export in 2018

Regression statistics						
Multiple *R*	0.3182					
R^2	0.1012					
Normed R^2	0.0798					
Standard error	12.1627					
Observations	44					
Dispersion analysis						
	df	SS	MS	*F*	Significance *F*	
Regression	1	699.8430	699.8430	4.7309	0.0353	
Residue	42	6213.1165	147.9313			
Total	43	6912.9595				
	Coefficients	Standard error	*t*-stat	*p*-value	Lower 95%	Upper 95%
£	8.9119	1.8675	4.7720	0.0000	5.1431	12.6808
β	0.000015	0.0000	2.1751	0.0353	0.0000	0.0000

Source: calculated by the authors

The data from Table 19.4 show weak connection between the studied indicators—innovative activity of African countries' growth by 0.000015 points with growth of the volume of their hi-tech export by USD 1000. Deep regression analysis is not required in this case, as connection between the indicators is very weak, and their close connection is logical. Therefore, the scenario of digital modernization that is connected to innovative development of only hi-tech spheres of economies of African countries will not allow ensuring systemic effect, connected to the growth of their global competitiveness and sustainable development.

The most preferable scenario of participation of African countries in the fourth industrial revolution is the alternative scenario, which envisages neo-industrialization (transition to Industry 4.0 of all spheres of economy). For quantitative characteristics of scenarios with the help of statistical indicators we use regression dependencies of indicators y_1, y_2, x_1, x_2, x_3, x_5, x_6, x_7, x_8 on indicator x_4. Though these dependencies are not statistically significant at the level $\alpha = 0.05$ they allow for assessment of the change of the statistical indicators in case of increase of the level of innovative development of African countries (Fig. 19.6).

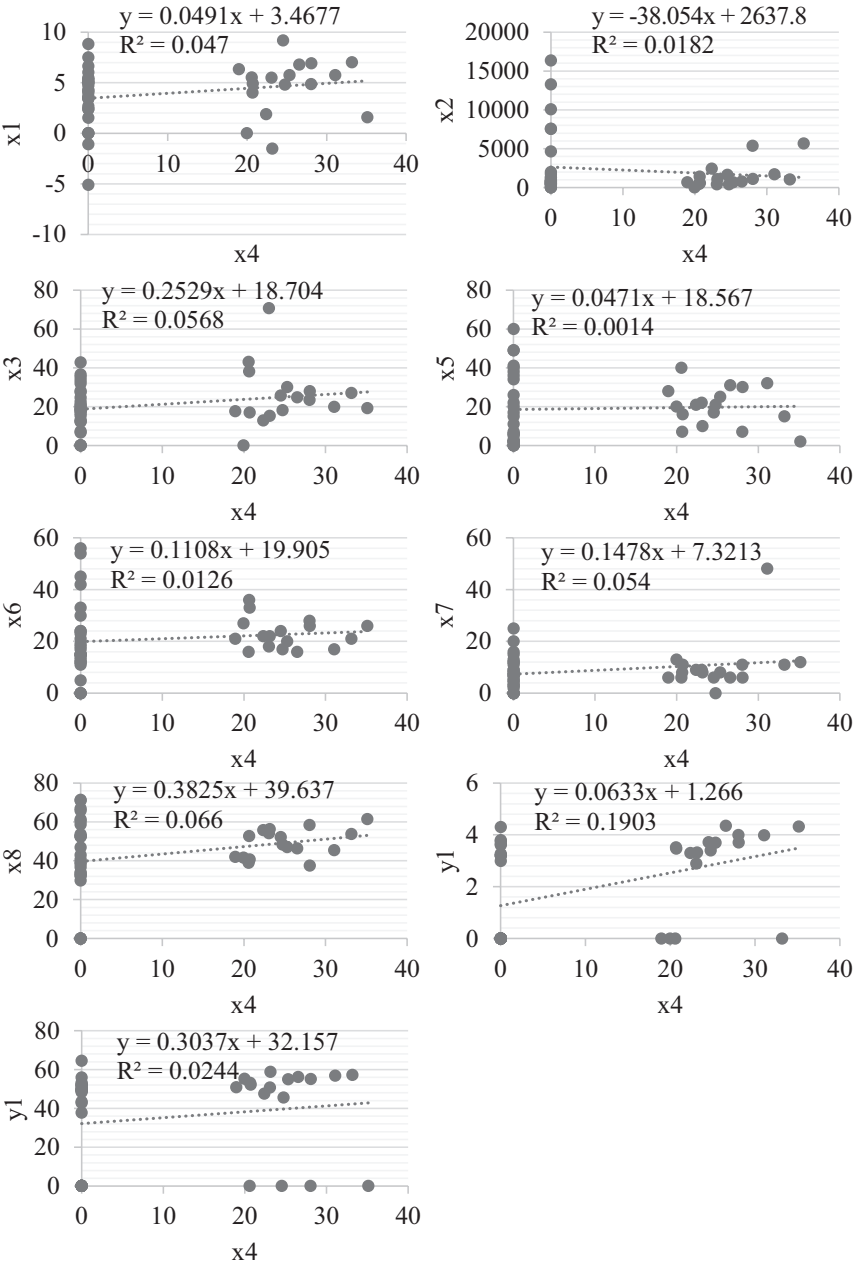

Fig. 19.6 Regression curves that reflect dependence of the statistical indicators on the level of innovative development of African countries in 2018. (Source: calculated and compiled by the authors)

Let us put the values of the indices of innovations into the obtained models of paired linear regression. Within the scenario of digital modernization, the value of this index will be close to the level of developing countries (33.16 points), and within the scenario of neo-industrialization to the level of developed countries (59.86 points). The following characteristics of the alternative scenarios of African countries' participation in the fourth industrial revolution were obtained (Table 19.7).

The data from Table 19.7 show that within the scenario of digital modernization the value of the global competitiveness index of African countries reduces as compared to the 2018 level, and within the scenario of neo-industrialization it increases by 40.81%. However, GDP per capita reduces within both scenarios—as well as the sustainable development index—as forecasting was conducted with all other conditions being equal. For preventing the reduction of the values of these indicators it is necessary to take extraordinary measures within the model of neo-industrialization.

3.3 Africa 4.0 as the Optimal Scenario: Policy Implications

The following conceptual model of Africa 4.0 was developed (Fig. 19.7). It takes into account the specifics of African countries that are connected to the contradictory influence of innovative development of their economies on global competitiveness (positive, direct influence) and on sustainability of their development (negative, reverse influence).

As is seen from Fig. 19.7, the offered model is aimed at well-balanced development of African countries, which ensures growth of their global competitiveness, and increase of sustainability of their economies. The tool of implementing the set goal is state management of the economy on the basis of AI. The basis of the economy is Industry 4.0—production, distribution, and consumption with the usage of new digital technologies. It is based on specialized infrastructure—R&D that is aimed at the creation and adaptation of new digital technologies to various economic operations, digital education, which allows developing digital competencies and ensures a high level of qualification of the employees of Industry

Table 19.7 Characteristics of the alternative scenarios of African countries' participation in the fourth industrial revolution until 2030

Indicators	Value in 2018	Values of the indicators within the alternative scenarios of African countries' participation in the fourth industrial revolution					
		Scenario of digital modernization			Scenario of neo-industrialization		
		Value	Growth (absolute)	Growth (%)	Value	Growth (absolute)	Growth (%)
Innovations index points	25.06	33.16	8.10	32.32	59.86	34.80	138.87
Growth rate of GDP at constant prices (%)	4.34	5.10	0.76	17.42	6.41	2.07	47.62
Share of agriculture (%)	20.93	20.13	–0.80	–3.83	21.39	0.46	2.18
Share of industry (%)	23.08	23.58	0.50	2.16	26.54	3.46	14.98
Share of manufacturing (%)	10.13	12.22	2.09	20.65	16.17	6.04	59.61
Share of the service sphere (%)	48.90	52.32	3.42	7.00	62.53	13.63	27.88
Total volume of investments, % of GDP	23.87	27.09	27.09	113.49	33.84	33.84	141.78
GDP per capita, USD	2496.31	1375.93	–1120.38	–44.88	359.89	–2136.42	–85.58
Global competitiveness index, points	3.59	3.37	–0.22	–6.27	5.06	1.47	40.81
Sustainable development index, points	51.48	42.23	–9.25	–17.97	50.34	–1.14	–2.22
Essence of the scenario	–	Selective innovative development, limited by hi-tech spheres of industry			Systemic innovative development of economy with the infrastructure-building role of industry		
Existing experience of scenario realization	–	Developing countries			Developed countries		

Source: calculated and compiled by the authors

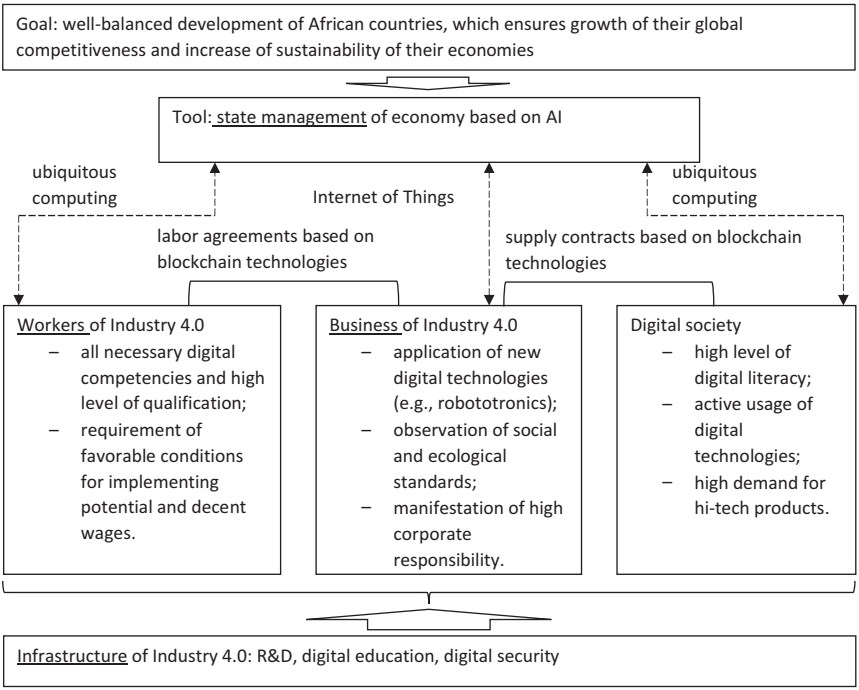

Fig. 19.7 The conceptual model of Africa 4.0. (Source: compiled by the authors)

4.0, and digital security, which ensures loyalty (trust) of business and society to digital technologies.

The central subject of the economy is the business of Industry 4.0, whose specific features are the application of new digital technologies (e.g., robototronics), observation of social and ecological standards, and manifestation of high corporate responsibility. State management of business is automatized on the basis of the Internet of Things. Another subject of the economy is employees of Industry 4.0, who possess all the necessary digital competencies and a high level of qualification and set requirements of favorable conditions for implementing potential and decent wages. Their labor relations with business have a contractual basis with the help of blockchain technologies, which prevent the development of a shadow economy.

A subject of economy is also digital society (consumers), whose specific features are a high level of digital literacy, active usage of digital technologies, and a high demand for hi-tech products. Their relations with business (connected to products supply) also have a contractual basis with the help of blockchain technologies, which prevents the development of the shadow economy. State management by the employees and society (consumers) is automatized on the basis of ubiquitous computing.

The following algorithm has been developed for successful and crisis-free neo-industrialization of African countries based on breakthrough technologies of Industry 4.0 (Fig. 19.8).

As is seen from Fig. 19.8, the offered algorithm is implemented in four consecutive stages. The first stage envisages the formation of the infrastructure of Industry 4.0 via modernization of the system of science and education and development of the system of provision of digital security. The second stage envisages internal and external (global) marketing of Industry 4.0 of African countries for the formation of demand for their hi-tech products.

The third stage envisages standardization (adoption of social and ecological standards) and stimulation (e.g., tax) of the business of Industry 4.0, whose value should depend on the level of corporate social and ecological responsibility. The fourth stage envisages monitoring and control of achievement of the set goals. It is offered to use the estimate (planned) values of the indicators of socio-economic development of African countries until 2030 within this scenario.

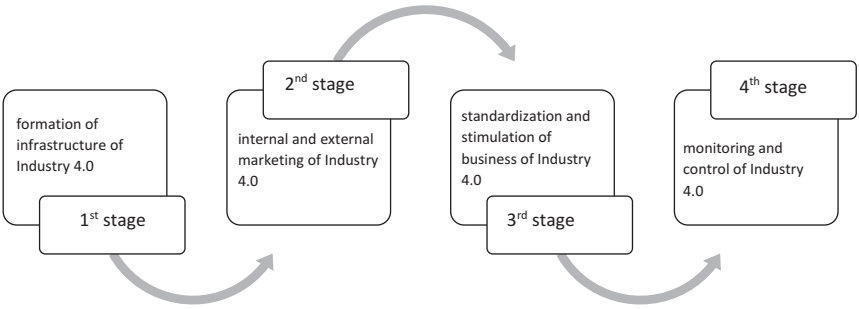

Fig. 19.8 Algorithm of neo-industrialization of African countries based on breakthrough technologies of Industry 4.0. (Source: compiled by the authors)

4 Conclusion

Thus, as a result of the research it is determined that the perspectives of involvement of African countries in the global fourth industrial revolution based on breakthrough technologies of Industry 4.0 are connected to their neo-industrialization. This scenario envisages full-scale transition to economies of African countries to Industry 4.0 and is preferable (as compared to selective digital modernization in the sphere of hi-tech spheres of industry), as it allows increasing the level of innovative development of economies of African countries, which is necessary for growth of their global competitiveness.

An important specific feature of African countries, which differentiates them from developed and developing countries in other regions of the modern global economy, is the contradictory influence of innovative development on their economies, which stimulates the growth of its global competitiveness with simultaneous reduction of sustainability of development. That is why in this work the model of neo-industrialization, which is implemented by modern developed countries, is adapted to the determined specifics of African countries.

This model envisages the standardization and stimulation of corporate social and ecological responsibility of the business of Industry 4.0. This will allow achieving growth of global competitiveness and increase of sustainability of development of economies of African countries until 2030. The offered model is to be implemented in stages according to the specially developed algorithm, which prevents a crisis of production and social and ecological crisis in African countries in the process of their neo-industrialization.

It should be concluded that the level of differentiation of socio-economic development of African countries is rather high. That is why the neo-industrialization model of these countries is inexpedient. It is recommended to adapt the offered conceptual model of Africa 4.0 to the national specifics of separate African countries for maximization of the effectiveness of its practical application.

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References

Adekola, A., & Sergi, B. S. (2016). *Global Business Management: A Cross-Cultural Perspective*. New York: Routledge.

Batuo, M., Mlambo, K., & Asongu, S. (2018). Linkages between Financial Development, Financial Instability, Financial Liberalisation and Economic Growth in Africa. *Research in International Business and Finance, 45*, 168–179.

Bogoviz, A. V. (2019). Industry 4.0 as a New Vector of Growth and Development of Knowledge Economy. *Studies in Systems, Decision and Control, 169*, 85–91.

Efremenko, I. N., Haabazoka, L., & Larionov, V. A. (2017). Development of the International Monetary System Conditions of Globalization. *European Research Studies Journal, 20*(3), 269–279.

IMD business school. (2019). World Digital Competitiveness Ranking 2018. Retrieved April 1, 2019, from https://www.imd.org/wcc/world-competitiveness-center-rankings/world-digital-competitiveness-rankings-2018/

International Institute for Sustainable Development. (2019). The 2018 SDG Index and Dashboards Report. Retrieved April 4, 2019, from http://sdgindex.org/reports/2018/

International Monetary Fund. (2019). World Economic Outlook Database. Retrieved April 4, 2019, from https://www.imf.org/external/pubs/ft/weo/2017/01/weodata/weoselgr.aspx

Ndaguba, E. A., & Hanyane, B. (2019). Stakeholder Model for Community Economic Development in Alleviating Poverty in Municipalities in South Africa. *Journal of Public Affairs, 19*(1), e1858.

Popkova, E. G. (2019). Preconditions of Formation and Development of Industry 4.0 in the Conditions of Knowledge Economy. *Studies in Systems, Decision and Control, 169*(1), 65–72.

Popkova, E. G., & Sergi, B. S. (2018). Will Industry 4.0 and Other Innovations Impact Russia's Development? In B. S. Sergi (Ed.), *Exploring the Future of Russia's Economy and Markets: Towards Sustainable Economic Development* (pp. 51–68). Bingley, UK: Emerald Publishing Limited.

Popkova, E. G., & Sergi, B. S. (Eds.). (2019). *Digital Economy: Complexity and Variety vs. Rationality*. Springer International Publishing.

Popkova, E. G., & Sergi, B. S. (2020). Human Capital and AI in Industry 4.0. Convergence and Divergence in Social Entrepreneurship in Russia. *Journal of Intellectual Capital*.

Ragulina, Y. V. (2019). Priorities of Development of Industry 4.0 in Modern Economic Systems with Different Progress in Formation of Knowledge Economy. *Studies in Systems, Decision and Control, 169*, 167–174.

Ragulina, Y. V., Alekseev, A. N., Strizhkina, I. V., & Tumanov, A. I. (2019a). Methodology of Criterial Evaluation of Consequences of the Industrial Revolution of the 21st Century. *Studies in Systems, Decision and Control, 169*, 235–244.

Ragulina, Y. V., Semenova, E. I., Avkopashvili, P. T., Dmitrieva, E. A., & Cherepukhin, T. Y. (2019b). Top-Priority Directions of Implementing New Internet Technologies on the Territories of Rapid Economic Development. *Advances in Intelligent Systems and Computing, 726*, 182–188.

Sergi, B. S. (2003). *Economic Dynamics in Transitional Economies: The Four-P Governments, the EU Enlargement, and the Bruxelles Consensus*. New York: Routledge.

Sergi, B. S. (Ed.). (2019). *Tech, Smart Cities, and Regional Development in Contemporary Russia*. Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., & Scanlon, C. C. (2019). *Entrepreneurship and Development in the 21st Century*. Bingley, UK: Emerald Publishing

Sergi, B. S., Popkova, E. G., Bogoviz, A. V., & Litvinova, T. N. (2019a). *Understanding Industry 4.0: AI, the Internet of Things, and the Future of Work*. Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Bogoviz, A. V., & Ragulina, J. V. (2019b). Costs and Profits of Technological Growth in Russia. In B. S. Sergi (Ed.), *Tech, Smart Cities, and Regional Development in Contemporary Russia* (pp. 41–54). Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Bogoviz, A. V., & Ragulina, J. V. (2019c). Entrepreneurship and Economic Growth: The Experience of Developed and Developing Countries. In B. S. Sergi & C. C. Scanlon (Eds.), *Entrepreneurship and Development in the 21st Century* (pp. 3–32). Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Borzenko, K. V., & Przhedetskaya, N. V. (2019d). Public-Private Partnerships as a Mechanism of Financing of Sustainable Development. In M. Ziolo & B. S. Sergi (Eds.), *Financing Sustainable Development: Key Challenges and Prospects* (pp. 313–339). Palgrave Macmillan.

Sergi, B. S., Popkova, E. G., Sozinova, A. A., & Fetisova, O. V. (2019e). Modeling Russian Industrial, Tech, and Financial Cooperation with the Asia-Pacific Region. In B. S. Sergi (Ed.), *Tech, Smart Cities, and Regional Development in Contemporary Russia* (pp. 195–223). Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Vovchenko, N., & Ponomareva, M. (2019f). Central Asia and China: Financial Development Through Cooperation with Russia. In W. A. Barnett & B. S. Sergi (Eds.), *Asia-Pacific Contemporary*

Finance and Development (International Symposia in Economic Theory and Econometrics Vol. 26) (pp. 141–164). Bingley, UK: Emerald Publishing Limited.

Tiruneh, E. A., Wamboye, E., & Sergi, B. S. (2017). Does Productivity in Africa Benefit from Advanced Countries' R&D? *Technology Analysis and Strategic Management, 29*(7), 804–816.

Wamboye, E., Adekola, A., & Sergi, B. S. (2013). Economic Growth and the Role of Foreign Aid in Selected African Countries. *Development, 56*(2), 155–171.

Wamboye, E., Adekola, A., & Sergi, B. S. (2014). Foreign Aid, Legal Origin, Economic Growth and Africa's Least Developed Countries. *Progress in Development Studies, 14*(4), 335–357.

Wamboye, E., Adekola, A., & Sergi, B. S. (2016). ICTs and Labour Productivity Growth in Sub-Saharan Africa. *International Labour Review, 155*(2), 231–252.

Wamboye, E., & Sergi, B. S. (2019). Exploring the Nature, Motives, and Implications of Foreign Capital in Africa. *World Development Perspectives, 2*(1), 28–34.

Wamboye, E., Tochkov, K., & Sergi, B. S. (2015). Technology Adoption and Growth in Sub-Saharan African Countries. *Comparative Economic Studies, 57*(1), 136–167.

WIPO. (2019). Global Innovation Index 2018. Retrieved April 4, 2019, from https://www.wipo.int/publications/ru/details.jsp?id=4330

World Bank. (2019). World Development Indicators: Structure of Output. Retrieved April 4, 2019, from http://wdi.worldbank.org/table/4.2

World Economic Forum. (2019). The Global Competitiveness Report 2017–2018. Retrieved April 4, 2019, from http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017–2018.pdf

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Africa 4.0 as the Optimal Model of Development of the African Region of the Global Economic System Until 2030

Elena G. Popkova

1 Introduction

Innovations are so important in the development of modern economic systems that their current evolutionary form was called the innovative economy. Though the concept of innovative development of the economy envisages active development and implementation of innovations into economic activities, the essence of this process could be different—depending on the type of innovations.

First type: moderate innovations. These are borrowed (imported) technologies that are used in the global economic system, but are new for this economy. Modernization is achieved during their usage, which allows the economic system to enter the previously inaccessible markets—but competitive advantages are not achieved. The effect from innovative development of economy is short-term.

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Such model of innovative development envisages "rapid development", as the economy that implements it constantly follows more progressive rivals, being unable to approach them or overtake them—because it performed modernization only if necessary. As of now, this model is connected to preservation of the pre-digital technological mode. It is implemented by most modern countries of Africa—for example, Zambia. Experiencing the deficit of the state budget and venture investments, they perform modernization of the economy only if necessary—but, in a lot of cases, by means of international financial support.

Second type: prominent innovations. Here we speak of the technologies that are developed and implemented by economic systems simultaneously around the world. Thus, short-term competitive advantages could be achieved. The advantage of prominent innovations is that their implementation requires only supporting the highly competitive environment in entrepreneurship and limited state investments in R&D. This makes prominent innovations accessible for economic systems.

Such model of innovative development means proactive modernization—that is, observing the global tendencies of technological progress for preventing the technological underrun of the economic system. As of now, implementation of this model envisages building the digital economy (mass distribution of digital technologies). The only country of Africa that follows this model is South Africa—it is the only representative of the African region in the Global Competitiveness Ranking for 2019 (IMD business school 2019).

Third type: breakthrough innovations. These are completely new technologies that are developed by economic systems independently. This requires large state financing of education and science and intense venture investments. Due to implementation of breakthrough innovations, the economic system creates and conquers new markets, acquires strong, unique, and long-term competitive advantages, and reaches the highest level of innovative development of the economy.

Such model of innovative development makes the economies that implement it the drivers of technological progress. At present, this envisages leading the fourth industrial revolution due to accelerated (before other countries) transition to Industry 4.0. The modern countries of Africa do not use this model due to deficit of finances, society's low

susceptibility to innovations (underdevelopment of the digital society), and insufficient level of development of R&D—despite high attractiveness of this mode. It is necessary to pay attention to the fact that implementing breakthrough innovations raises the ecological costs of economic growth. That's why during selection of this model it is necessary to compare the expected advantages with costs and risks (including the risk of ecological crisis).

Here we offer a hypothesis that until 2030 the transition to Industry 4.0 (breakthrough innovations) will become a necessary condition of innovative development of the economy. That's why satisfaction of African society's needs in the long term envisages using the mode of development "Africa 4.0". The purpose of this chapter is to determine the optimal model of development of the African region of the global economic system until 2030.

2 Materials and Method

The theory and practice of innovative development of the economy in the digital age by the example of various economic systems are studied in the works Haabazoka (2019a, b), Petrenko et al. (2018), Popkova (2019), Popkova and Sergi (2018), 2019, 2020) Ragulina (2019), Ragulina et al. (2019a, b), Sergi et al. (2019a, b, c, d, e, f), Sergi (2003, 2019), Wamboye et al. (2015b). The problems and perspectives of innovative development of the economy of modern countries of Africa are studied in Tiruneh et al. (2017), Wamboye and Sergi (2019), Wamboye et al. (2013, 2014, 2015a, 2016).

The performed content analysis of the literature sources showed that each region of the global economic system prefers different types of innovations, due to which all the above models of innovative development are actively used in modern economic practice. A clear scientific idea of the optimal model of innovative development of the African region of the global economic system until 2030 has not yet been formed.

In order to form this idea, the authors of this chapter perform scenario analysis, which includes regression analysis, comparative analysis, and the simplex method. The priority of innovative development is increasing the

level of happiness in society. That's why we model the interconnection between the index of innovative development of the economy (innovation index, x) and the indicators that are taken into account during calculation of the happy planet index: expected healthy life span (life expectancy, y_1), well-being (quality of life, y_2), inequality of incomes (the lower the better, [y_3]), the pollution of the environment (ecological footprint, the lower the better y_4). The research objects are the top ten countries of Africa in the rating of happy planet index for 2019, for which the values of the innovation index are available.

3 Results

Selection of data for the research is shown in Table 20.1.

As shown in Table 20.1, the African region of the global economic system was behind the most progressive countries by 61.35% as to the level of innovative development, by 28.13% as to expected healthy life span, and by 39.16% as to well-being; its inequality of incomes is higher by 85.24% and the ecological costs are higher by 60.24% (2018). Regression dependencies of the variables from Table 20.1 are shown in Fig. 20.1.

Based on the established dependencies (Fig. 20.1), we determine the most probable values of dependent variables (y_1, y_2, y_3, y_4) during various scenarios of the change of the independent variable (y). Thus, we compile three models of development of the African region of the global economic system until 2030:

1. Moderate innovations: refusal from digital technologies. The experience of Zambia is taken as an example. In 2011, the value of the innovation index of the Zambian economy constituted 25.27 points, and in 2019 it decreased by 19.43%—to 20.36 points (WIPO 2019). That's why the forecast value of the average value of the innovation index of the African countries' economies in 2030 is calculated by finding the product of its value in 2018 (25.99 points) and growth rate for the last nine years: 0.81 (20.36/25.27). We receive 25.99 × 0.81 = 20.94 points.

Table 20.1 Selection of data

Country	Index of innovative development, points 0–100 X	Expected healthy life span, years y_1	Well-being, points 0–10 y_2	Inequality of incomes (the lower the better), % y_3	Pollution of the environment (the lower the better), gha per capita y_4
Mauritius	30.61	74.00	5.50	17.00	3.50
Ethiopia	24.16	62.80	4.60	36.00	1.00
Zambia	20.36	58.40	5.00	41.00	1.00
Kenya	31.13	60.30	4.50	38.00	1.00
Mozambique	22.87	54.30	5.00	43.00	0.90
Nigeria	23.93	52.10	5.50	44.00	1.20
Tanzania	26.63	63.50	4.00	33.00	1.30
Malawi	23.00	60.10	4.30	45.00	0.80
Zimbabwe	22.30	53.70	5.00	0.37	1.40
Senegal	26.83	65.40	3.70	0.33	1.20
South Africa	34.04	56.30	5.10	0.33	3.30
Average	25.99	60.08	4.75	27.09	1.51
Leader	67.24 (Switzerland)	83.6 (Hong Kong, China)	7.8 (UK)	4 (Lesotho)	0.6 (Belize)
Underrun from the leader (%)	−61.35	−28.13	−39.16	85.24	60.24

Source: calculated and compiled by the authors based on New Economics Foundation (2019) and WIPO (2019)

2. Prominent innovations: building the digital economy. Within this scenario, South Africa is taken as an example. In 2011, the value of the innovation index of its economy constituted 35.22 points, and in 2019 it decreased by 3.35%, to 34.04 points (WIPO 2019). That's why the forecast value of the average value of innovative development of the African countries' economies in 2030 is calculated by finding the product of its value in 2019 (25.99 points) and the growth rate for the last nine years: 0.97 (34.04/35.22). We receive $25.99 \times 0.97 = 25.12$ points.

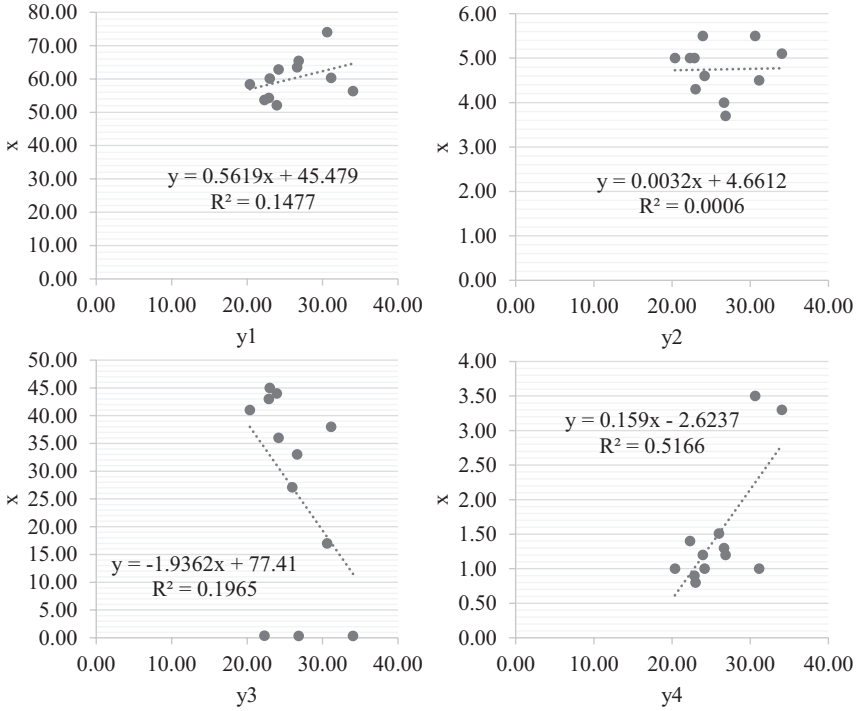

Fig. 20.1 Regression curves. (Source: calculated and compiled by the authors)

3. Breakthrough innovations: Africa 4.0 (transition to Industry 4.0). An example is the leader of the global innovative development ranking. In 2011, the value of the leader of the global innovative development ranking constituted 63.82 points, and in 2019 it grew by 5.36%, to 67.24 points (WIPO 2019). That's why the forecast value of the average index of innovative development of the African countries' economies in 2030 is calculating by finding the product of its value in 2019 (25.99 points) and the growth rate for the last nine years: 1.05 (67.24/63.82). We receive 25.99 × 1.05 = 27.38 points.

The results of the performed scenario analysis are shown in Table 20.2.

The key results of the calculations from Table 20.2 are shown in Fig. 20.2.

Table 20.2 Models of innovative development of the African region of the global economic system until 2030

Scenario	Characteristics of the scenario	x	y_1	y_2	y_3	y_4
Moderate innovations: refusal from digital technologies	Forecast value of the variable in 2030	20.94	57.24	4.73	36.87	0.71
	Value of the variable in 2018	25.99	60.08	4.75	27.09	1.51
	Growth in 2030 as compared to 2018 (%)	−19.43	−4.72	−0.36	36.08	−53.25
	Coefficient α of the regression equation	–	45.48	4.66	77.41	−2.62
	Coefficient β of the regression equation	–	0.56	0.00	−1.94	0.16
	Value of the leader in 2030	360.41	448.10	41.81	0.75	3.22
	Underrun from the leader in 2030	−94.19	−87.23	−88.69	4840.58	−78.07
	Change of the underrun from the leader in 2030 as compared to 2018, times	1.54	3.10	2.26	−56.79	1.30
Innovations: building the digital economy	Forecast of the value of the variable in 2030	25.12	59.59	4.74	28.78	1.37
	Value of the variable in 2018	25.99	60.08	4.75	27.09	1.51
	Growth in 2030 as compared to 2018 (%)	−3.35	−0.82	−0.08	6.22	−9.23
	Coefficient α of the regression equation	–	45.48	4.66	77.41	−2.62
	Coefficient β of the regression equation	–	0.56	0.00	−1.94	0.16
	Value of the leader in 2030	360.41	448.10	41.81	0.75	3.22
	Underrun from the leader in 2030	−93.03	−86.70	−88.66	3756.42	−57.41
	Change of the underrun from the leader in 2030 as compared to 2018, times	1.52	3.08	2.26	−44.07	0.95
Breakthrough innovations: Africa 4.0 (transition to Industry 4.0)	Forecast value of the variable in 2030	27.38	60.86	4.75	24.40	1.73
	Value of the variable в 2018	25.99	60.08	4.75	27.09	1.51
	Growth in 2030 as compared to 2018, %	5.36	1.30	0.07	−9.95	14.62
	Coefficient α of the regression equation	–	45.48	4.66	77.41	−2.62
	Coefficient β of the regression equation	–	0.56	0.00	−1.94	0.16
	Value of the leader in 2030	360.41	448.10	41.81	0.75	3.22
	Underrun from the leader in 2030	−92.40	−86.42	−88.64	3169.21	−46.22
	Change of the underrun from the leader in 2030 as compared to 2018, times	1.51	3.07	2.26	−37.18	0.77

Source: calculated and compiled by the authors

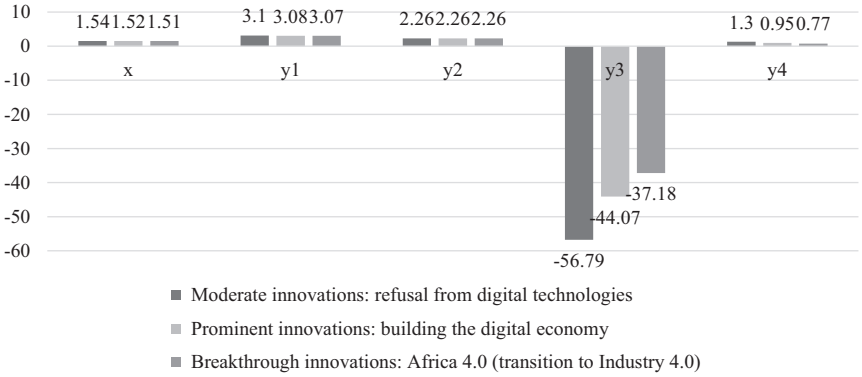

Fig. 20.2 Change of the underrun of African countries from the leader during various models of innovative development in 2030. (Source: calculated and compiled by the authors)

As is seen from Fig. 20.2, model "Africa 4.0" ensures the largest decrease of underrun of the African region of the global economic system from other (most progressive) regions by 2030 and thus is optimal.

4 Conclusion

Thus, the offered hypothesis has been confirmed—in order to overcome the systemic underrun from other countries of the world and in order to raise the level of happiness in society, the African region of the global economic system has to perform the transition to Industry 4.0 until 2030. This envisages implementation of model "Africa 4.0", which will ensure sustainable competitive advantages and thus will increase the expected healthy life span and well-being and will reduce the inequality of incomes with acceptable ecological costs. Therefore, Africa 4.0 is the optimal model of development of the African region of the global economic system until 2030.

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References

Haabazoka, L. (2019a). A Study of the Effects of Technological Innovations on the Performance of Commercial Banks in Developing Countries—A Case of the Zambian Banking Industry. *Lecture Notes in Networks and Systems, 57*, 1246–1260.

Haabazoka, L. (2019b). Project Finance for Africa's Construction Sector: Can Stabilization Funds Work? *Lecture Notes in Networks and Systems, 57*, 32–60.

IMD business school. (2019). World Competitiveness Ranking 2019. Retrieved September 5, 2019, from https://www.imd.org/wcc/world-competitiveness-center-rankings/world-competitiveness-ranking-2019

New Economics Foundation. (2019). Happy Planet Index. Retrieved September 5, 2019, from http://happyplanetindex.org/

Petrenko, E., Pritvorova, T., & Dzhazykbaeva, B. (2018). Sustainable Development Processes: Service Sector in Post-industrial Economy. *Journal of Security and Sustainability Issues, 7*(4), 781–791. https://doi.org/10.9770/jssi.2018.7.4(14).

Popkova, E. G. (2019). Preconditions of Formation and Development of Industry 4.0 in the Conditions of Knowledge Economy. *Studies in Systems, Decision and Control, 169*(1), 65–72.

Popkova, E. G., & Sergi, B. S. (2018). Will Industry 4.0 and Other Innovations Impact Russia's Development? In B. S. Sergi (Ed.), *Exploring the Future of Russia's Economy and Markets: Towards Sustainable Economic Development* (pp. 51–68). Bingley, UK: Emerald Publishing Limited.

Popkova, E. G., & Sergi, B. S. (Eds.). (2019). *Digital Economy: Complexity and Variety vs. Rationality*. Springer International Publishing.

Popkova, E. G., & Sergi, B. S. (2020). Human Capital and AI in Industry 4.0. Convergence and Divergence in Social Entrepreneurship in Russia. *Journal of Intellectual Capital*.

Ragulina, Y. V. (2019). Priorities of Development of Industry 4.0 in Modern Economic Systems with Different Progress in Formation of Knowledge Economy. *Studies in Systems, Decision and Control, 169*, 167–174.

Ragulina, Y. V., Alekseev, A. N., Strizhkina, I. V., & Tumanov, A. I. (2019a). Methodology of Criterial Evaluation of Consequences of the Industrial Revolution of the 21st Century. *Studies in Systems, Decision and Control, 169*, 235–244.

Ragulina, Y. V., Semenova, E. I., Avkopashvili, P. T., Dmitrieva, E. A., & Cherepukhin, T. Y. (2019b). Top-Priority Directions of Implementing New

Internet Technologies on the Territories of Rapid Economic Development. *Advances in Intelligent Systems and Computing, 726*, 182–188.

Sergi, B. S. (2003). *Economic Dynamics in Transitional Economies: The Four-P Governments, the EU Enlargement, and the Bruxelles Consensus*. New York: Routledge.

Sergi, B. S. (Ed.). (2019). *Tech, Smart Cities, and Regional Development in Contemporary Russia*. Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Bogoviz, A. V., & Litvinova, T. N. (2019a). *Understanding Industry 4.0: AI, the Internet of Things, and the Future of Work*. Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Bogoviz, A. V., & Ragulina, J. V. (2019b). Costs and Profits of Technological Growth in Russia. In B. S. Sergi (Ed.), *Tech, Smart Cities, and Regional Development in Contemporary Russia* (pp. 41–54). Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Bogoviz, A. V., & Ragulina, J. V. (2019c). Entrepreneurship and Economic Growth: The Experience of Developed and Developing Countries. In B. S. Sergi & C. C. Scanlon (Eds.), *Entrepreneurship and Development in the 21st Century* (pp. 3–32). Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Borzenko, K. V., & Przhedetskaya, N. V. (2019d). Public-Private Partnerships as a Mechanism of Financing of Sustainable Development. In M. Ziolo & B. S. Sergi (Eds.), *Financing Sustainable Development: Key Challenges and Prospects* (pp. 313–339). Palgrave Macmillan.

Sergi, B. S., Popkova, E. G., Sozinova, A. A., & Fetisova, O. V. (2019e). Modeling Russian Industrial, Tech, and Financial Cooperation with the Asia-Pacific Region. In B. S. Sergi (Ed.), *Tech, Smart Cities, and Regional Development in Contemporary Russia* (pp. 195–223). Bingley, UK: Emerald Publishing Limited.

Sergi, B. S., Popkova, E. G., Vovchenko, N., & Ponomareva, M. (2019f). Central Asia and China: Financial Development Through Cooperation with Russia. In W. A. Barnett & B. S. Sergi (Eds.), *Asia-Pacific Contemporary Finance and Development (International Symposia in Economic Theory and Econometrics Vol. 26)* (pp. 141–164). Bingley, UK: Emerald Publishing Limited.

Tiruneh, E. A., Wamboye, E., & Sergi, B. S. (2017). Does Productivity in Africa Benefit from Advanced Countries' R&D? *Technology Analysis & Strategic Management, 29*(7), 804–816.

Wamboye, E., Adekola, A., & Sergi, B. (2016). ICTs and Labour Productivity Growth in Sub-Saharan Africa. *International Labour Review, 155*(2), 231–252.

Wamboye, E., Adekola, A., & Sergi, B. S. (2013). Economic Growth and the Role of Foreign Aid in Selected African Countries. *Development, 56*(2), 155–171.

Wamboye, E., Adekola, A., & Sergi, B. S. (2014). Foreign Aid, Legal Origin, Economic Growth and Africa's Least Developed Countries. *Progress in Development Studies, 14*(4), 335–357.

Wamboye, E., Tochkov, K., & Sergi, B. S. (2015a). Technology Adoption and Growth in Sub-Saharan African Countries. *Comparative Economic Studies, 57*(1), 136–167.

Wamboye, E. F., Adekola, A. F., & Sergi, B. S. (2015b). Sectoral Effects on Female Absolute and Relative Employment in Selected Least Developed Countries. *Gender, Technology and Development, 19*(1), 1–42.

Wamboye, E. F., & Sergi, B. S. (2019). Exploring the Nature, Motives, and Implications of Foreign Capital in Africa. *World Development Perspectives, 14*(June), 100108.

WIPO. (2019). Global Innovation Index 2011, 2019. Retrieved September 5, 2019, from https://www.wipo.int/global_innovation_index/en/2019/

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Future Perspectives of Inclusive Growth of the African Economy

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Inclusive growth of modern Africa has large perspectives, one of which is the development of entrepreneurship. There is a range of spheres in which African entrepreneurship is successfully developing and which provide wide perspectives for its future growth. These spheres include consulting, construction, tourism, space industry, railroad and other transportation, and real estate. Corporate management in countries of Africa should be

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oriented not only at improvement of the commercial indicators of business activities—profitability, efficiency, and competitiveness—but also at increase of marketing activity, responsibility, and social significance of business. Society's interests should be taken into account in the activities of African companies. This will allow harmonizing the interests of society and business and balancing sectorial markets, thus increasing stability and sustainability of African countries, improving the indicators of their social development, increasing the volume of effective demand, and creating internal drivers of economic growth.

Another perspective is development of infrastructure and institutes. Here it is necessary to pay attention to wide opportunities of improvement and popularization of the practice of public-private partnership in countries of Africa, regulation of migration, perfection of criminal law, provision of gender equality, and stimulation of development of female entrepreneurship. Inclusiveness means reduction until full erasure of any social limitations and disproportions. This envisages flexible state regulation, aimed at adjusting the socio-cultural environment in countries of Africa and bringing it in accordance with the principles of inclusiveness.

The last, but not the least, perspective is hi-tech development of countries of Africa. Here we speak not only of growth of innovative activity of African entrepreneurship but, what's more important, of implementation of the scenario of digital development of the African region in the model Africa 4.0 until 2030. This scientific concept is not futuristic—it is based on the modern experience of African countries and the current opportunities of digital development for building the information society, expanding the networks of telecommunication infrastructure, disseminating hi-tech (digital) entrepreneurship, and popularizing e-government.

We expect that the presented systemic view of the future perspectives of inclusive growth of African countries will allow for clearer structuring and better usage of state and corporate management for socially oriented development of the African economy.

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[1] Note: Page numbers followed by 'n' refer to notes.

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