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Intellectual Capital of Africa: Comparison of the Five Most Competitive Countries

Driss Tsouli [α] & Bouchra Elabbadi [σ]

Abstract- This paper proposes a comparison of the national intellectual capital of African countries. Using the longitudinal data spanning the period from 2010 to 2014, based on 22 indicators. This study compares the national intellectual capital of the five most competitive African countries: 1 Mauritius, 2 South Africa, 3 Rwanda, 4 Botswana, and 5 Morocco. The results confirm the importance of intellectual capital in the competitiveness of countries. The research findings make clear the status of national intellectual capital of the five African countries, as a result of that to provide information for policymakers to establish public strategies for building sustainable national competitiveness.

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I. Introduction

The five African countries are among the African's most competitive economies (world economic forum, 2016).based on The Global Competitiveness Report 2015–2016, Mauritius (ranked 46), South Africa (ranked 49), Rwanda (ranked 62), Botswana 71, Morocco (ranked 72). Located in a continent poor in infrastructure, politically unstable and exploited by western economies, how did those countries achieve such outstanding economic competitiveness?

Do those countries possess hidden capabilities that have allowed to their economies to overcome the physical environment? Intellectual capital elements are the most likely answer.

According to World Bank, growth in Sub-Saharan Africa is forecast to pick up to 2.6 percent in 2017 and to 3.2 percent in 2018, predicated on moderately rising commodity prices and reforms to tackle macroeconomic imbalances. However, per capita output is projected to shrink by 0.1 percent in 2017 and to increase to a modest 0.7 percent growth pace over 2018-19. At those rates, growth will be insufficient to achieve poverty reduction goals in the region. Can the intellectual capital elements they have accumulated sustain the competitiveness of those countries? Our longitudinal study, spanning the years of 2010-2014, may provide some answers.

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In recent decades intangibles asset has become the most important resource for wealth and national progress (Bounfour and Edvinsson, 2005; Lin and Edvinsson, 2011).Intellectual capital fuels economic growth and social development in every region of the world (Dahlman et al., 2006).

According to Stewart (1997), intellectual capital can be defined as "knowledge, information, intellectual property, an experience that can be put use to create wealth". The Organization for Economic Co-operation and Development (OECD, 1999) which describes intellectual capital as "the economic value of two categories of intangible assets: organizational (structural) capital; and human capital".

Structural capital like proprietary software systems, distribution networks, and supply chains. Human Capital includes human resources within the organization (i.e. staff resources) and resources external to the organization, namely customers and suppliers. Following Lin and Edvinsson (2008), the combination of structural capital and human capital can be a key source of wealth at both organizational and national levels. For Bounfour and Edvisonn (2004) a country who has the knowledge and intensive industries will be the winners in terms of future wealth creation.

This study first built a measurement model to capture national IC, then used the world competitiveness reports of economic world forum to compare the IC of the five most competitiveness African countries.

II. Theoretical Framework

a) *Intellectual capital of countries*

For policymakers, the most important tasks are to allow for citizens the conditions for a better quality of life. Actually, intangibles are the fundamental source of wealth creation, well-being, and economic growth (Corrado et al., 2009).The IC and competitiveness of nations are highlylinked, both being results of the knowledge within countries (Stahle, P. and Stahle, S, 2006).Knowledge is defined as a territory that intangibles have effects on national growth Malhotra (2003). Bontis (2004) signalized that hidden values are related individuals, enterprises, institutions, communities, and regions that adequate management increases national wealth and economic success. Therefore, the measurement and management of intangibles improve the adaptation of public policies

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and use of good practices (Malhotra, 2003), supporting the creation of new and better investment programs, together with adequate incentives to promote development (Bontis, 2004).

In another hand, the comparison between countries based on IC elements can lead policymakers to benchmark their competencies, capabilities and to promote an integrated national development.

Since most measurement tools capturing IC and its effect at the national level, there is not a widely recognized methodology to assess national intellectual capital (Lin and Edvinsson, 2011; Alfaro et al., 2011). Although there have been some initiatives to measure national IC as described hereafter.

i. *Measurement proposed by academic models*

Models derived from the taxonomy presented by Edvinsson and Malone (1997), such as Intellectual capital navigator, Intellectual capital monitor, and Intellectual capital index, which seek to identify NIC, using indicators of intangibles that support country growth. These modelsinclude Human capital, Structural capital, and the local and international relationships.

Model	Author (s)
Intellectual Capital Navigator (ICN)	L. Edvinsson and M. Malone
National Intellectual Capital Index (NICI)	N. Bontis
Intellectual Capital Index (ICI)	D. Weziak
Value-Added Intellectual Coefficient (VAIC)	A. Pulic
Intellectual Capital Monitor (ICM)	D. Andriessen and C. Stam
Intellectual capital dynamic value (IC-dVAL)	A. Bounfour

Table I: Academic models of measuring intangibles at the country level (Labraand Sánchez, 2013)

ii. *Measurement Models developed by international organizations and international business schools (International organization models)*

International organization models simply combine the vision of intangibles with the traditional economic growth approach. The results of these models are far from IC principles, but the reported rankings are similar to those based on IC because intangible assets are highly important for both.

Model	International organizations or international business schools
KnowledgeAssessmentMethodology (KAM)	World Bank (WB)
Global Innovation Index (GII)	INSEAD
Global Competitiveness Index (GCI)	World Economic Forum (WEF)
World Competitiveness Index (WCI)	International Institute for Management Development (IMD)
HumanDevelopment Index (HDI)	United Nations Development Programme (UNDP)
Innovation Union Scoreboard (IUS)	European Union (EU)
Science, Technology and Industry Outlook (S&T I)	Organization for Economic Co-operation and Development (OECD)

Table II: International organization models of measuring intangibles at the country level (Labra and Sánchez, 2013)

b) The world economic forum competitiveness index

Competitiveness is a wide, multidimensional and complex concept (Hong, 2009), resulting from a lack of a unanimous agreement. However, some definitions have provided by the OECD (1992), which focuses on the output of the countries achievement, and the WEF (2001), which focuses on the inputs that make a country more competitive. Following the WEF, competitiveness is defined as the set of institutions, policies, and factors that determine the level of productivity of an economy, which in turn sets the level of prosperity that the country can earn.

Since 2005 the WEF has published the Global Competitiveness Index (GCI) developed by Xavier Sala-I-Martín in collaboration with the Forum. Since an update in 2007, the methodology has remained largely unchanged. The GCI combines 114 indicators of 140 countries that capture concepts that matter for productivity. These indicators are grouped into 12 pillars: institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labor market efficiency, financial market development, technological readiness, market size, business sophistication, and innovation.

The GCI includes statistical data from internationally recognized agencies, notably the International Monetary Fund (IMF); the United Nations Educational, Scientific and Cultural Organization; and the World Health Organization. It also includes data from the World Economic Forum's annual Executive Opinion Survey to capture concepts that require a more qualitative assessment, or for which comprehensive and

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internationally comparable statistical data are not available (WEF, 2015).

III. Research Method

This study proposes a model of measurement by using the widely accepted WEF and IMD databases, which contain both quantitative and qualitative indicators (Table III). This paper is focused on the most commonly used national IC framework, including human capital, market capital, process capital, and renewal capital. Variables were selected from the world competitiveness report.

The first type of national capital, human capital, is defined as the competencies of individuals in realizing national goals (Bontis, 2004). According to OECD (2000), human capital consists of knowledge about facts, laws, and principles in addition to knowledge relating to teamwork, and other specialized and communication skills. Education is the foundation of human capital. The variables used in this study include quality of the educational system, local availability of specialized research and training services, life expectancy, organized crime, brain drain, and internet access in schools.

The second type of national capital, market capital, is similar to external relational networking and social capital in a micro setting in that it represents a country's capabilities and successes in providing attractive, competitive incentives in order to meet the needs of its international clients, while also sharing knowledge with the rest of world (Bontis, 2004). The present study takes into consideration, venture capital availability, prevalence of foreign ownership foreign market size index, transparency of government policymaking, domestic market size index. The third type of national capital, process capital, comprises the non-human sources of knowledge in a nation. Embedded in a country's infrastructure, these sources facilitate the creation, accessibility, and dissemination of information. This type of capital is measured through the intensity of local competition, public trust of politicians, intellectual property protection, ease of access to loans, quality of overall infrastructure.

The fourth type of national capital, renewal capital, is defined as a nation's future intellectual wealth and the capability for innovation that sustains a nation's competitive advantage.

Company spending on R&D, university-industry collaboration in R&D, capacity for innovation quality of scientific research institutions, availability of scientists and engineers, government procurement of advanced technology products.

Market capital index	Human capital index
1. Venture capital availability 2. Prevalence of foreign ownership 3. Foreign market size index 4. Transparency of government policymaking 5. Domestic market size index	1. Quality of the educational system 2. Local availability of specialized research and training services 3. Life expectancy 4. Organized crime 5. Brain drain 6. Internet access in schools
Process capital index	**Renewal capital index**
1. Intensity of local competition 2. Public trust of politicians 3. Intellectual property protection 4. Ease of access to loans 5. Quality of overall infrastructure	1. Company spending on R&D 2. University-industry collaboration in R&D 3. Capacity for innovation 4. Quality of scientific research institutions 5. Availability of scientists and engineers 6. Government procurement of advanced technology products

Table III: Variables included in each type of capital proposed by this study

Notes: Variables are rated qualitatively using a scale of 1-7

This study follows the same research method used by Yeh-Yun Lin and Edvinsson (2008) in their article "National intellectual capital: comparison of the Nordic countries». But the selection of variables used is adapted to the specificity of African countries and availability of data in the Global Competitiveness Report co-published by the Institute for Management Development (IMD) and the World Economic Forum (WEF). The data analyzed in this study, therefore, describes 5 most competitive African countries over a period of 5 years, from 2010 to 2015.

In this study, there are two different types of data: data with an absolute rating such as "Total tax rate"; and data with a qualitative rating based on a scale of 1-7 such as "Quality of the educational system". For a meaningful integration of the quantitative score and qualitative rating, the ratio of the absolute value relative to the highest value of each quantitative variable was calculated and multiplied by 7 to transform the number into a 1-7 score.

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IV. Results

Since the five African countries share not only similar political well to improve their competitiveness but also similar historical background (The Western occupation), it is logical to examine them as a group. Among them, the overall ranking sequence, in descending order, is Mauritius, South Africa,Rwanda, Botswana, and Morocco.

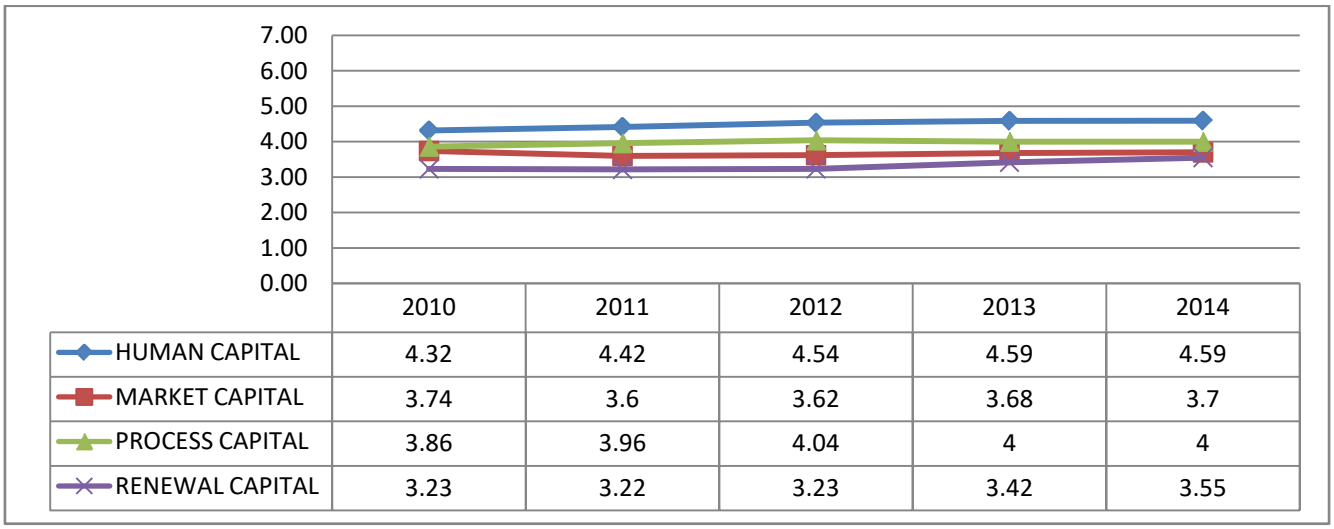
Mean of 2010-2014		Human capital	Market capital	Process capital	Renewal capital
Mauritius	Mean	4.48	3.66	3.97	3.33
	Ranking	1	4	4	2
South Africa	Mean	3.59	4.6	4.16	3.29
	Ranking	5	1	2	4
Rwanda	Mean	4.36	3.51	4.42	3.6
	Ranking	2	5	1	1
Botswana	Mean	4	3.87	4.11	3.28
	Ranking	4	3	3	5
Morocco	Mean	4.16	4.15	3.86	3.32
	Ranking	3	2	5	3

Table IV: Means and ranking comparison of the 5 most competitive African countries

Table (IV) shows the results of comparing types of capital within each country. It shows that Mauritius ranked highest in human capital, South Africa in market capital, and Rwanda in process capital and renewal capital.

Figures 1-5 show the characteristics and trends of intellectual capital in the five selected African countries. The comparisons focus on the four types of capital.

In figure 1, Mauritius's renewal capital slowly increased from around 3.23 to 3.55, yet it is still the lowest among the four types of capital.



	2010	2011	2012	2013	2014
HUMAN CAPITAL	4.32	4.42	4.54	4.59	4.59
MARKET CAPITAL	3.74	3.6	3.62	3.68	3.7
PROCESS CAPITAL	3.86	3.96	4.04	4	4
RENEWAL CAPITAL	3.23	3.22	3.23	3.42	3.55

Figure 1: Trends of intellectual capital in Mauritius

In figure 2 South Africa's renewal capital increased also slowly from 3.24 to 3.34 and it is also the weakest type of capital.

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	2010	2011	2012	2013	2014
HUMAN CAPITAL	3.58	3.62	3.57	3.55	3.65
MARKET CAPITAL	4.62	4.54	4.62	4.64	4.58
PROCESS CAPITAL	4.02	4.08	4.16	4.26	4.28
RENEWAL CAPITAL	3.24	3.29	3.23	3.33	3.34

Figure 2: Trends of intellectual capital in South Africa

In figure 3, Rwanda's renewal capital grew from 3.3 to 3.77 and it's the third type of capital, and in general, all three types of capital had upward trends for Rwanda than those of the other countries.

	2010	2011	2012	2013	2014
HUMAN CAPITAL	4.18	4.28	4.38	4.43	4.52
MARKET CAPITAL	3.26	3.44	3.58	3.66	3.64
PROCESS CAPITAL	4.12	4.40	4.62	4.52	4.46
RENEWAL CAPITAL	3.3	3.53	3.68	3.75	3.77

Figure 3: Trends of intellectual capital in Rwanda

In figure 4, Botswana's four types of capital decreased with renewal capital ranking last and with much stepper downward trends than other countries.

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	2010	2011	2012	2013	2014
HUMAN CAPITAL	4.03	4.04	4.17	4.02	3.78
MARKET CAPITAL	3.88	3.98	3.84	3.82	3.86
PROCESS CAPITAL	4.26	4.22	4.2	4.02	3.86
RENEWAL CAPITAL	3.28	3.30	3.40	3.23	3.18

Figure 4: Trends of intellectual capital in Botswana

In figure 5, Morocco's renewal capital increased slowly from 3.25 to 3.5, while the other types of capital had the same trend.

	2010	2011	2012	2013	2014
HUMAN CAPITAL	4.11	4.23	4.22	4.11	4.17
MARKET CAPITAL	4.02	4.18	4.2	4.18	4.2
PROCESS CAPITAL	3.72	3.88	3.88	3.84	4
RENEWAL CAPITAL	3.28	3.32	3.25	3.28	3.50

Figure 5: Trends of intellectual capital in Morocco

The intellectual capital of each country has increased (except Botswana) over the 5 year research period. As shown in figures 1-5, Mauritius, South Africa Rwanda and Morocco have a similar development pattern.

Figures 6-10 further compare the country's four types of capital. Generally, the variations in human, market and process capitals among the five countries are very small, indicating little difference in the qualification of people, the international reputation, and the national infrastructure. However, as figure 9 shows, there is greater variation among in renewal capital for Mauritius and Rowanda.

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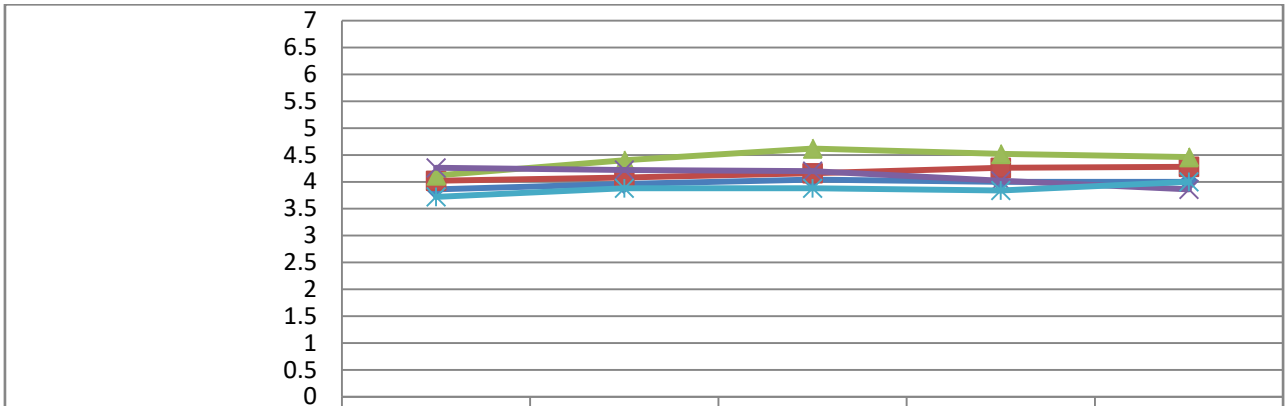
	2010	2011	2012	2013	2014
Mauritius	3.74	3.6	3.62	3.68	3.7
South Africa	4.62	4.54	4.62	4.64	4.58
Rwanda	3.26	3.44	3.58	3.66	3.64
Botswana	3.88	3.98	3.84	3.82	3.86
Morocco	4.02	4.18	4.2	4.18	4.2

Figure 6: Human capital comparisons of the five most competitive African countries



	2010	2011	2012	2013	2014
Mauritius	3.86	3.96	4.04	4	4
South Africa	4.02	4.08	4.16	4.26	4.28
Rwanda	4.12	4.4	4.62	4.52	4.46
Botswana	4.26	4.22	4.2	4.02	3.86
Morocco	3.72	3.88	3.88	3.84	4

Figure 7: Market capital comparisons of the five most competitive African countries

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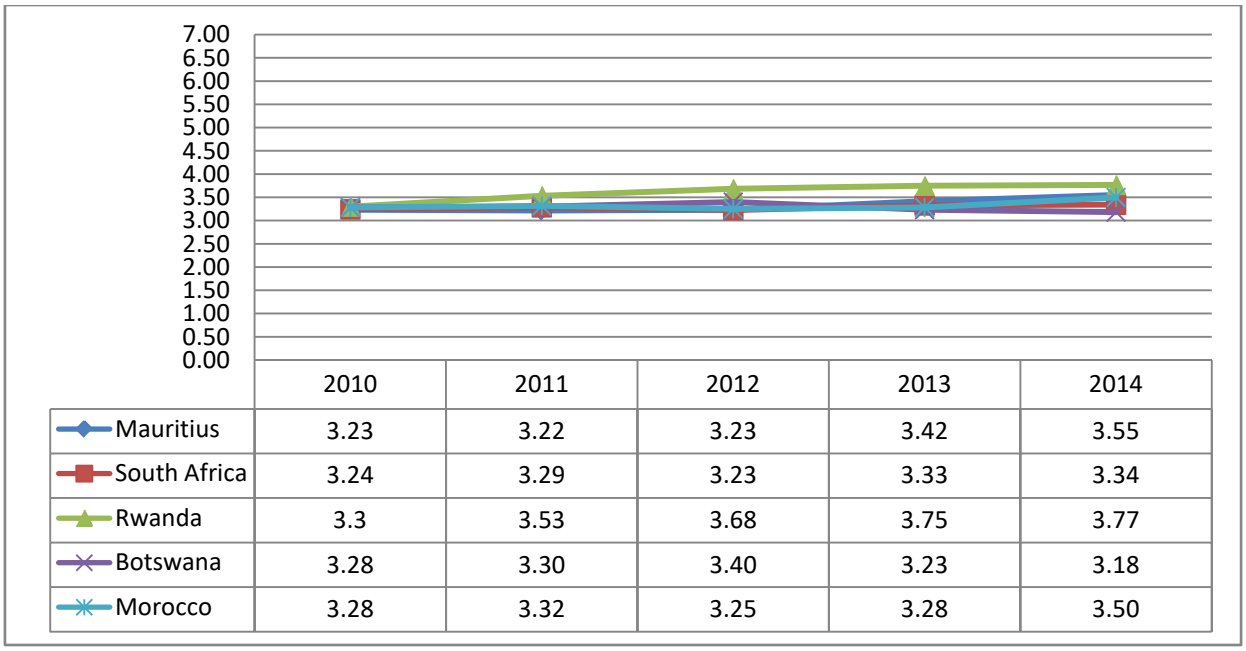
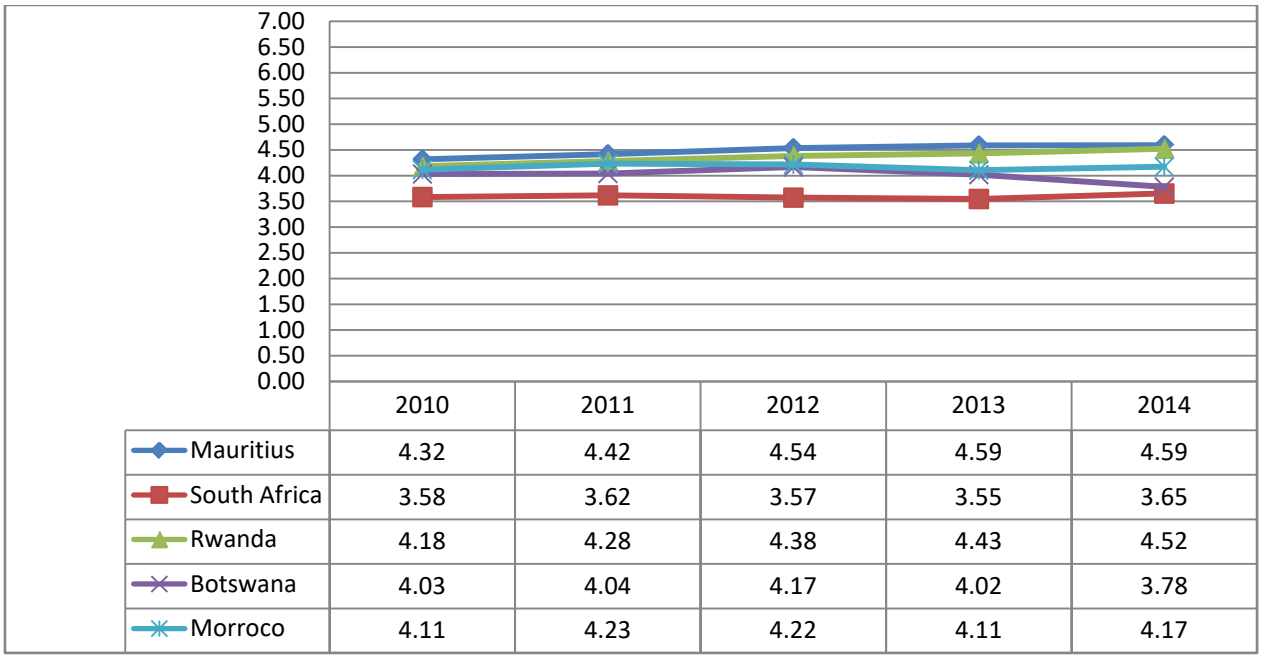


	2010	2011	2012	2013	2014
Mauritius	3.23	3.22	3.23	3.42	3.55
South Africa	3.24	3.29	3.23	3.33	3.34
Rwanda	3.3	3.53	3.68	3.75	3.77
Botswana	3.28	3.30	3.40	3.23	3.18
Morocco	3.28	3.32	3.25	3.28	3.50

Figure 8: Process capital comparisons of the five most competitive African countries



	2010	2011	2012	2013	2014
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South Africa	3.58	3.62	3.57	3.55	3.65
Rwanda	4.18	4.28	4.38	4.43	4.52
Botswana	4.03	4.04	4.17	4.02	3.78
Morroco	4.11	4.23	4.22	4.11	4.17

Figure 9: Renewal capital comparisons of the five most competitive African countries

In general, the progression of the degree of intellectual capital of African countries can be traced to their effort to build a social system, which provides free education, a factor that helps cultivate qualified human resources. In addition, heavy reliance on foreign trade and external social networking and the development of a national infrastructure were conductive to technology advancement.

V. Conclusion

As noted in the theoretical framework of this study, The Intellectual capital and competitiveness of nations are highly linked, so the degree of intellectual capital and competitiveness of a country may not be indicative of the efficient production and the proper use of resources. National intellectual capital and competitiveness are a comparative concept; a country can or cannot be viewed as competitive in relation to other countries. Consequently, the fact that a country

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shows higher IC than other countries in indicators measuring IC will mean that this country is more competitive, although this does not necessarily mean that this country is doing well; it just means that it is doing better than others.

The proposal presented in this paper tried to assess and compare intellectual capital from the competitiveness pillars .it requires a high level in selected pillars that compose the index of every IC component, in order to consider that a country is competitive, and therefore avoiding the current pillar compensation mechanism. Furthermore, our proposal does not only take into account the position of each country in relation to other, but to provide some guidelines for African countries that are seeking ways to improve their intellectual capital and competitiveness. For example, South Africa may look into ways to focus more on renewal capital, Morocco and Botswana need to enhance their process capital and market capital, Rwanda can put more effort into expanding their Human capital.

We can conclude that the comparison of intellectual capital of the five most competitive African countries is a comparison of the hidden value of the individuals, companies, institutions, and communities that constitute current and potential sources of national wealth.

The limitations of this research include the following: first comparisons are limited to the world competitiveness reports. Second the selection only of a qualitative score on a scale of 1-7, and the research period of five years .third the number of variables (only 22).

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