Private Sector Federation
(PSF- Rwanda)

DRAFT REPORT

SKILLS ASSESSMENT

FOR THE REAL ESTATE & CONSTRUCTION SECTOR SPECIFIC

April 2022

FOREWORD OF THE CEO

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LIST OF ABBREVIATIONS AND ACRONYMS

GDP: Gross domestic product

NST: National Strategy for Transformation

GoR: Government of Rwanda

ODL: Occupations on Demand List

LMT: Labour Market Testing

NSDEPS: The National Skills Development and Employment Promotion Strategy

TVET: Technical and Vocational Education and Training

ICT: Information Communication Technology

STEM: Science, Technology Engineering and Mathematics

SDGs: The Sustainable Development Goals

EAC: East African Community

NISR: National Institute of Statistics of Rwanda

SSA: Sub-Saharan Africa

PSF: The Private Sector Federation

RDB: Rwanda Development Board

IT: Information Technology

R&D: Research and Development

SMEs: Small and Medium Enterprises

GCI: Global Competitiveness Index

CBD: Central Business District

EDPRS: Economic Development and Poverty Reduction Strategy

LMIS: Rwanda Labour Market Information System

BIM: Building Information Modelling

IPD: Integrated Project Delivery

IoT: Internet of things

AR: augmented reality

VR: Virtual reality

IPRCs: Integrated Polytechnic Regional Centres

VTCs: Vocational Training Centres

TSSs: Technical Secondary Schools

CAT: Computer-Automated Technologies

MINEDUC: Ministry of Education

CIOB: Chartered Institute of Building

CMCI: Construction Manager Certification Institute

CPD: Continuing Professional Development

CSR: corporate social responsibility

CMSII: Construction method selection, implementation, and improvement

EXECUTIVE SUMMARY

This Report documents the findings of Skills Assessment of the Real Estate and Construction Sector in Rwanda that was commissioned by Private Sector Federation (PSF). The Report examines the performance of the sector, drivers of change and their skills implications, skills status, skills supply and the future skills needs for the Real Estate and Construction sector. The report also points out areas to be prioritized for action in the short, medium and long term.

A desk review combined with consultations with sector stakeholders, administration of online questionnaires to private sector establishments, and key informant interviews provided data and the basis for recommendations made this report. The skills were assessed both qualitatively and quantitatively from real estate and construction enterprises categorized as micro, SME, and large enterprises, and grouped based on the number of employees.

The assessment found out that the Real Estate and Construction sector contributed to strong growth acceleration stimulated by private constructions and large public investments including infrastructure projects like Kigali Arena, Bugesera international airport, National and urban roads construction, industrial buildings in Special Economic Zone (SEZ), implementation of the Kigali City Master plan and 6 secondary cities of Kigali.
The report indicates that the real estate and construction sector employs 12.6% of the employed Rwandan labour force. The sector grew by 7% and 6% respectively due to an increase in government expenditure and private sector or informal construction activities, but decline by a percentage from the previous year (2020). The report shows that the construction sector's share to the GDP declined from its highest ever contribution of approximately 33% in 2019 to-6% in 2020 , while the real estate share of employment dropped to 4,098 in 2020 from 4,260 in 2019, that of construction rose from 315,022 in 2019 to 435,720 in 2020 due COVID 19 pandemic. On the other hand, the assessment found out that Rwanda's real estate and construction sector displays a high level of informal employment, volatile employment relationships and a low level of payment.

All of the evidence reveal that the industry is facing skills deficiencies in crucial construction jobs like architects, bidding engineers, construction project manager, real estate manager, construction project/real estate engineers, building control surveyor, mechanical engineers, environmental engineers, and skilled building and construction trades. These do not necessarily imply a headcount shortage but can indicate a shortage of relevant skills externally that they expect would affect them if they had to recruit and/or a deficiency of skills within the workforce. The report discuss how these deficiencies in skills lead to poor performance of employees in real estate and construction sector.

The report maps out skills required in four occupational categories that are i) the Construction Manager, and construction researchers, Architects & other scientist, ii) Specialised finishers, iii) construction trades iv) the artisans or casuals workers. The most required skills are technical skills including bricklaying, carpentry, painting, pouring cement, putting up drywall, and installing specific types of equipment. It also include construction project management, architectural design skills, structural design, building completion and finishing, estate management, construction of roads and railways, as well as construction trades skills. In addition to the technical skills, most

establishments cite shortfalls in soft skills as a severe impediment to their productivity and expansion. These include communication skills, critical thinking, problem solving and leadership as inadequate and hampering their operation.

The Report highlights the quality and market-relevant skills to build a competitive industry. The evidence points to skills supply being well supported by an extensive initial and continuing vocational education and training infrastructure with a substantial increase in the number of people being qualified in the subjects and skills upon which the construction and real estate sector is dependent. The SSA report indicate how provision of vocational training leads to improvements in company performance as well as generating a wider set of benefits relating to, for instance, the satisfaction employees derive from their employment. This will definitely lead to the production of relevant and required skills on the Rwandan labour market as well as affecting the entire job creation value chain within the industry.

The assessment shows that companies or contractors do not invest in 'on-the-job' training especially in the construction projects where lower-skilled category workers exist due to the nature of contracts, hence limiting skills development thereof. As result, the skills deficits limit the sector's competitiveness and reduce economic and social development potential. The study also found out that there is informal recruitment of specialized by sub-contractors, indicating that employers are reluctant to invest in upskilling of their workers.

The report points out the initiatives undertaken by the Government to respond to the skills deficits by investing heavily in technical education and skills training, mainly in STEM education and infrastructure. The assessment found out that a number of higher education institutes have specific expertise in construction and real estate development.

The SSA report is divided into six sections:

Section one presents the Introduction, background, and objectives of the assessment, and Section two discovers the sector profile and employment trends, Section three displays the drivers of change and their skills implication, Section four also presents the skills status in real estate and construction Sector with skills supply for the construction sector and future implication in Section five. While the sector skills projection and forecasting to 2030 presented in section six. Finally, the last section presents the conclusion and key recommendations for competitive needs of the sector to 2030, in the context of Rwanda's overall transformative vision.

The report is critical for Rwanda's private sector to continue to attract high-level skills that will drive growth in the sector and build a skilled and dynamic workforce to ensure current employers and interested investors access the skills they need, now and in the future. The report recommends that the provision of continuing learning and development is strongly related to business survival and competiveness of real estate and construction industry in Rwanda. The evidence presented in this report suggests that if enterprise invest in skills, they will obtain significant gains from doing so.

CHAPTER ONE: INTRODUCTION AND OBJECTIVES

1.1 Background and Context

Rwanda's economic growth was experienced a strong acceleration over the past decade. Growth would have reached 10.1% of GDP in 2019, stimulated by large public investments for implementation of the National Strategy of Transformation[1] (NST1). Real Estate & Construction Sector is one of the essential contributor of the growth acceleration. Supported by private constructions and large scale public infrastructure projects like Kigali Arena, Bugesera airport, and the roads, the construction sector experienced the highest growth rate (30.2 percent) in a decade[2] (World Bank: 2020).

Rwanda's real estate and construction industry has rapidly grown in the past couple of years with both government and private sector engaged in the construction of buildings and roads infrastructure triggering what is now dubbed as a "construction boom in Rwanda". The construction industry is being transformed from being state funded to private funding resulting in more private real estate developers coming on board to develop housing estates for commercial use. Similarly, several private investors have come on board to develop commercial and industrial areas using private funds.

In 2019, the real estate and construction sector contributed 647 Billion Rwandan Francs to the national GDP; in 2019/2018, the sector grew by 4%, because of sustained expansion in private constructions and public works[3]. The most tangible opportunities in the real estate and construction sector is the implementation of the Kigali City Master plan and secondary cities that encompasses a broad vision and guidelines for the entire city serving as the basis for more specific planning at the District's secondary cities and the Central Business District (CBD). This presents sustainability in land use, infrastructure and economy progress.

Rwanda has also earmarked six secondary cities, namely Rusizi, Rubavu, Musanze, Huye, Muhanga, and Nyagatare, to foster their growth and economic development. The secondary cities present enormous opportunities especially in real estate and infrastructure development. The target in the housing sector is a steady annual increase of building on one hand and access to housing mortgages on the other. A second target is to develop new local construction materials and housing typologies. The achievement of these targets will be the backbone for the roll-out of affordable and decent housing countrywide.

The country needs 5.5M (150,000 dwelling units to be constructed annually) to cater for 22M by 2050. Start by replacing and upgrading existing informal settlements and densifying existing cities and centers before using the new land. Construction Volume from 2020-2050 will be 4.5M dwelling units (3.0M New + 1.5M Replacements), the annual average construction will have to supply 150,000 dwelling units.

Investment in the real estate sector has grown from Us$ 100 million to Us$ 480million in the last decade, driven by population growth, an emerging and growing middle class, increased

[1] https://www.worldbank.org/en/country/rwanda/overview

[2] World Bank Group, Rwanda Economic Update : Accelerating Digital Transformation in Rwanda, January 2020

[3] https://rdb.rw/investment-opportunities/real-estates/

diaspora investment in Rwandan property markets and the government investment in infrastructure expansion and modernization of urban and rural infrastructure[4].

Strong growth was expected to continue in 2020, prior to the COVID-19 pandemic which has disrupted priority sectors of Rwandan economy, including the Real Estate and Construction Sector. The global COVID-19 pandemic drove Rwanda's economy into its first recession since 1994 whereby its Gross domestic product (GDP) fell by 3.4% in 2020, compared to an expansion of 8% in the year 2019 (World Bank, 2021). According to the National Institutes of Statistics' (NISR,2020) data, the Real estate contributed 0% in 2020 compared to 4% in the previous year (2019), while the construction sector's share to the GDP declined from its highest ever contribution of approximately 33% in 2019 to -6% in 2020. However, despite the decline in the percentage share of the construction sector's contribution to the country's GDP, the sector generated 729 billion into the economy in 2020 compared to 698 billion generated in 2019. On the other hand, in terms of revenue generation the real estate generated 645 billion in 2020 compared to 648 billion in 2019 which is 3 billion decline. Furthermore, the government of Rwanda's (GoR) ambition is to transform the economy into a knowledge-based economy which will move her Labor force from subsistence agriculture into the productive service sector aiming at turning the country into an upper-middle income country by 2035, and a high-income economy by 2050 (NST1). For the country to have a sustained and an inclusive growth, key drivers including but not limited to innovation, integration, agglomeration, human capital development, export dynamism and regional integration, a well-managed urbanization, a competitive domestic enterprise, a modernization agricultural, as well as a capable and accountable public institution are paramount.

According to the World Bank, (2021), the Rwandan government infrastructure investment has improved and it was 13% of GDP in 2019 and the prime objective was to support in the establishment of the country as a hub for meetings, incentives, conferences/conventions and events/exhibitions. The investment has seen Rwandan infrastructure services, as measured by the Global Competitiveness Index (GCI), score is 52, compared to an average score of 45 for Sub-Saharan Africa (SSA).

According to Giang and Pheng (2011), there is significant relationship between construction sector and country's economic growth especially developing nations of which Rwanda is one of them. However, it should be pointed out that further expansion of the construction sector beyond the adaptive capacity of the country's economy is likely to be wastage of the national resources even though it is difficult to understand how the adaptive capacities of other sectors in the economy have on the construction sector. Chiang, Tao, and Wong, (2015), also found out that there is a significant relationship between the construction sector and the country's GDP growth through the generation of employment. On the other hand, it is also believed that, the real estate investment and the fixed assets investment increase country's real GDP (Shen, & Liu, 2004).

[4] Rwubahuka Jean Claude, Rwanda Real Estate Investment Independent Feasibility Report, February 2019

In Rwanda, the importance of the construction sector's development has been at the heart of policy initiatives (Vision 2020, EDPRS2, and Private sector development strategy/PSDS) that highlighted the need for a strong focus on construction as priority sector with high potential for growth and employment. In the same vein, the National Strategy for Transformation (NST1) - as bridge between the finalization of the Vision 2020 and the beginning of the Vision 2050 - emphasises on promotion of local construction materials in collaboration with the private sector in line with the 'Made in Rwanda' policy to support the growth of the construction sector and the affordable and low cost housing programme (NST1). The demand for construction materials is expected to boost growth in industrial subsectors that feed into construction. Furthermore, NST1 sets to create about 1.5 million decent jobs by the year 2024. And among the key identified economic sectors to drive this ambition is real estate and construction not forgetting Agro-processing, Horticulture, Manufacturing, Value-addition of Minerals, Touring & Transport, Knowledge-based Services and Creative Art.

1.2 Rationale

The prime purpose of this study was to critically assess the required skills to successfully deliver within the transformed business environment and compare this to the existing skillsets with the aim to target our regional competitive edge in such a way that our capacity building funds are best used and contribute to private sector's growth. Additionally, the only way Rwanda's Private sector to contribute to Rwanda's economic transformation is by having the right skills that would enable them harness their competitiveness advantage to the regional and global market.

1.3 Objectives and Scope of the Assignment

The overall objective of the study was to assess the skills requirements of the Real Estate and Construction Sector in Rwanda over the period 2020-2030, and to formulate policy recommendations to ensure that the future skills requirements in the sector can be addressed out to the end of NST1. Specifically, the objectives of the study are many folds:

- Provides information on the current performance of the Real Estate and Construction, its workforce and the demand and supply, shortage, gaps and required of skills in sector expected performance.
- Assessing the global drivers of change impacting the Real Estate and Construction and the relevant consequences for future skills needs;
- Identifies areas to be prioritized for action in the short, medium and long term
- Forecasting the skills for the Real Estate and Construction Sector up to 2030 based on mid and long-term national development and specific targets to deliver on;

1.4 Methodological Approach

1.4.1 Approach

To conduct the Real Estate and Construction sector skills needs assessment, the study employed different methods and approaches. A desk review was undertaken of relevant literature and documentation on the real estate and construction sector in Rwanda and various countries, including a review of documentation on skills assessments previously conducted, and capacity development approaches. The review also covered real estate and construction statistics, reports, academic literature, articles on skills assessment and capacity building as well as reports issued by international bodies and professional firms. In addition, qualitative information was also collected via interviews with senior managers, heads of department in a representative sample of real estate and construction companies. (See Annex 1).

A quantitative data collection from stakeholder institutions was carried out through Monkey survey, comprising questionnaire covering companies' profiles, skills specifications, qualifications and experience. Thus, the data were then processed and analysed to form the basis of the current report, which highlights findings and ways for developing the skills in the sector of the Real Estate and Construction. The SSA report builds on an extensive existing literature, complementing it with online survey and on-site consultations and an updated statistical analysis of the National Institute of Statistics of Rwanda (NISR) and relevant stakeholders' insight in the real estate and construction Sector.

1.4.1.1 Assessment Process

The assessment was conducted through the process that was guided by systematic conduction of steps that led to obtaining data that shaded light to the real situation in terms of skill in the sector. The Assessment was conducted in four stages as illustrated in the graph below:

1.4.1.2 Formulation of the Skills Assessment

This process involved reviewing different documents informing the specific sector skills needs assessment. Accordingly, policy and strategic documents outlining the Real Estate and Construction development goals at the international and national levels were reviewed. Furthermore, international conventions, good practices frameworks for workforce development on how companies have successfully addressed their skill gaps, and national frameworks relevant to the Real Estate and Construction sector were thoroughly researched to inspire the current skills needs assessment.

1.4.1.3 Participative Approach

In assessing the required skills in the Real Estate and Construction sector in Rwanda, PSF and its stakeholders (institutions providing Real Estate and Construction services in Rwanda) were informed by a participatory approach. Therefore, it involved participation and consultations by senior management, staff, other relevant stakeholders, and some key PSF senior personnel. The survey covered the identified categories or a representative sample of the Real Estate and Construction sector and its subsectors including all actors in the Real Estate and Construction sector. In addition, the interviews participatory approach also covered the regulatory and supervisory bodies as well as institutions involved in Real Estate and Construction sector capacity (see a full list of interviewees is provided in Annex 1).

1.4.2 Process

1.4.2.1 Desk Review and Research

The question here was where is **Rwanda's Real Estate and Construction Sector today?** To have a sound understanding, we thoroughly reviewed existing information on assessing the skill requirements for real estate and construction sector. The review analysis entailed understanding the structural framework under which Education Sector in Rwanda operate. In addition, we reviewed relevant policy documents, national statistics (official statistics reports), academic literature, skills assessment articles, and previous real estate and construction sector skills assessment reports developed by multi- and bi-lateral agencies. Findings from the desk research helped: (1) map out the required current skills; (2) identify the essential skills gaps and explore initiatives to help bridge those gaps. (3) Gain an understanding of the strengths and challenges, as well as policy gaps that need to be addressed. Illustratively, reference was made to several key policy documents, which include but not limited to:

- The National Skills Development and Employment Promotion Strategy, (2019-2024)
- Employment and Skills Dynamics in the Construction Sector 2021
- Infrastructure Development, the Construction Sector and Employment in Rwanda 2018

- Rwanda Economic Update 2021 (The role of the private sector in closing the infrastructure gap)
- Rwanda Economic Update (2019): Lighting Rwanda-World Bank Group;
- Rwanda National Urban Housing Policy 2008
- Rwanda labour force survey report (2018)
- National Transport Policy and Strategy for Rwanda 2021
- Energy Sector Strategic Plan 2013/14-2017/18
- Skills Area and Numbers of Priority Skills Required Across Rwanda-MIFOTRA;
- Annual Reports-PSF;
- Employment and Skills Dynamics in the Construction Sector-2021-RDB;

1.4.2.2 Key Informant Interview

Furthermore, this assessment used face to face or calls phone interviews with Key Informants using an interview guide. With this method, Key informants were identified in close collaboration with the client (PSF) from relevant stakeholders and/or members about its functioning and mandate. Anticipatively, the stakeholders were contacted (***listed in annex_1***) for a conversation aimed at helping the consultant team to gather relevant information about the subject under study. In developing this assessment report, different views were collected from different institutions. Participants in the interviews were purposively selected.

a) Response Rate

It was initially planned to conduct consultations with **51** companies from the five identified categories in Real Estate and Construction Sector: (i) Construction of Buildings, Real estate, (ii) Roads and Bridges, (iii) Drinking Water Supply, (iv) Dams, (v) Marshland and Hillside Development. As shown from *table_1* below, 43 out of **51** expected companies, **43** were covered, making a responsive rate of **84.3%,** largely sufficient and representative to make significant analysis.

Table 1: Response rate as per companies

N°	Names of Companies	Expected Responses	Response Rate (%)
1	SOCOSE Ltd	1	100
2	Ultimate Developers Ltd	1	100
3	EPOS	1	100
4	TECOS	1	100
5	AZIZA CONSTRUCTION LTD	1	100
6	SMEC	1	100
7	AZIZA CONSTRUCTION LTD	1	100

Nº	Names of Companies	Expected Responses	Response Rate (%)
8	GAKENKE ENGENEERING	1	100
9	GENESIS \GILGAL	1	100
10	UDL	1	100
11	ABCD Ltd	1	100
12	BIZIZIMANA CONSTRUCTIION LTD	1	100
13	GM ENGINEERING	1	100
14	MURENZI SUPPLY	1	100
15	BETRA	1	100
16	DND DEVELOPERS	1	100
17	SAM CONSTRUCTION	1	100
18	ENTREC OF	1	100
19	DELTA	1	100
20	UNIQUE GENERAL SUPPLY	1	100
21	ESEC LTD	1	100
22	RIHICO LTD	1	100
23	BEMS DUHANGE	1	100
24	EMICORWA	1	100
25	SINCO LTD	1	100
26	LOANNE SUPPLY LTD	1	100
27	AEBTP	1	1
28	HORIZON	1	100
29	FAIR CONSTRUCTION LTD	1	100
30	ST JOSEPH POLYTECHNIC	1	100
31	PRIVATE SCHOOL ASSOCIATION	1	100
32	IPRC KIGALI	1	100
33	RWANDA POLYTECHNIC	1	100
34	EGC LTD	1	100
35	ONE AND ALL LOVE KARONGI LTD	1	1
36	CHAMBER CONSTRUCTION	1	100
37	CIVIL ENGINEERING WORKS		
38	INDUSTRY CHAMBER /CHAIRPERSON	1	100
39	NPD COTRACO	1	100
40	RWANDA INSTITUTE OF ARCHITECTS	1	100
41	WASA CORPORATION	1	100

N°	Names of Companies	Expected Responses	Response Rate (%)
42	2020 CONSTRUCTION LTD	1	100
43	GENERAL SUPPLY AND CONSTRUCTION LTD	1	100
	Total	43	100

Source: Customized from primary data collection, 2020

b) Data Collection

Qualitative information was also collected via interviews with senior managers, heads of departments in a representative sample of Real Estate and Construction institutions, institutions of learning, and regulatory or supervisory bodies. (*See Annex_1 for a list*)

A quantitative survey of key informants was carried out through Monkey survey, comprising a questionnaire covering companies' profiles, skills, job specifications, qualifications and experience.

In terms of sampling, stratified random sampling was used to maximize information accuracy. This consists of dividing the sample population into smaller groups, or strata, based on shared characteristics. A random sample is selected from each stratum based on the percentage that each subgroup represents in the population. Stratified random samples are generally more accurate in representing the population.

The survey data was then processed and analysed to form the basis of the current report, which highlights the key findings and recommendations for developing skills in Rwanda's Real Estate and Construction sector.

c) Report Outline

The outline of the report is as follows:

Chapter one: Introduction
Chapter two: Real Estate and Construction Sector Profile in Rwanda
Chapter three: Drivers of Change and their Skills Implication
Chapter four: Skills Status in Rwanda Real Estate and Construction Sector
Chapter five: Sector Skills Response to address the Identified Skills Gap

Finally, the last chapter presents the Conclusion and Key Recommendations of the Assessment Report.

CHAPTER TWO: REAL ESTATE & CONSTRUCTION SECTOR PROFILE IN RWANDA

2.1 Introduction

The Government of Rwanda (GoR) has embarked on its development agenda that aimed at transforming the country into a middle-income country by the year 2020, since 1998. The country also anticipates transforming the economy targeting to have an upper middle-income and a high-income country by 2035 and 2050 respectively. The Vision 2020 (Vision 2050) are being implemented through a medium-term planning framework for successive five or seven-year periods (NST1 2017 to 2024). It also aligns with Agenda 2063 (African Union, 2015), a strategic framework for the socioeconomic transformation of Africa over the next 50 years through existing initiatives in the continent for growth and sustainable development.

The elaboration of the long and medium-term strategies is an opportune moment for the full integration of global and regional planning commitments, including: The Sustainable Development Goals (SDGs), African Agenda 2063, and the East African Community (EAC) Vision 2050 (EAC, 2015). According to NST1, the real estate and construction sector is crucial and potential driver of future economic growth. The most tangible opportunities in the real estate and construction sector is the implementation of the Kigali City Master plan and secondary cities that encompasses a broad vision and guidelines for the entire city serving as the basis for more specific planning at the District's secondary cities and the Central Business District (CBD). This presents sustainability in land use, infrastructure and economy progress.

2.2 Real Estate & Construction Sector Profile

Rwanda is Africa's most densely populated non-island nation with a population density with **525 habitants per Km^2**, more than 7 million strong labor force of which 56.4% are in the labour force (NISR, 2021).

There is a growing demand for houses due to a 2.31% annual projected population growth rate as per census 2010 (RPHC4). The country's construction and real estate industry accounts for 1% and 0.2% contributed to the Gross Domestic Product (GDP) growth rate, respectively in 2021.

The sector employs 12.6% of the employed Rwandan labour force. Construction and real estate activity grew by 7% and 6% respectively, due to an increase in government expenditure and private sector or informal construction activities, but decline by a percentage from the previous year (2020).

The ministry of infrastructure's report (2020) highlights that, the sector is cross-cutting that is to say, it includes the Energy, Transport, Water and Sanitation as well as Urbanization and Human Settlement. In terms of the sectors' growth as per Vision 2020 and NST, the energy sector'

customers grew by 134,356 to a new on grid connections and 62,306 connection on off grid solutions, leading to an increase of access to electricity power from 51% to 55.4% of with about 478 productive users being connected between 2019 and 2020. In addition, power generation capacity rose to 228.418MW in 2020 from 225.8MW in 2019. This resulted from an improvement of the 220/110kV power transmission capacities project located at Mamba-Rwabusoro-Bugesera-Gahanga. Moreover, an additional 1,268 km of Medium Voltage (412 km) and Low voltage (856km) lines were added to the distribution network across the country.

The same report pointed out that, in transport, paved road networks were improved including the rehabilitation of Rusumo _ Kayonza _ Kagitumba (208km) as well as upgrading National roads and Urban roads across the country. All of these interventions had a positive impact on the riding quality whereby paved roads network sustained a 96% of roads in good conditions whereas paved and unpaved national roads combined were at 79.3%. Furthermore, in regards to the air transport, major airport infrastructure developments are underway whereby the Bugesera International Airport is up- to 30% from 27.52% in 2019.

2.2.1 Structure of Real Estate & Construction Sector

The figure below (1), shows how the sector is structured

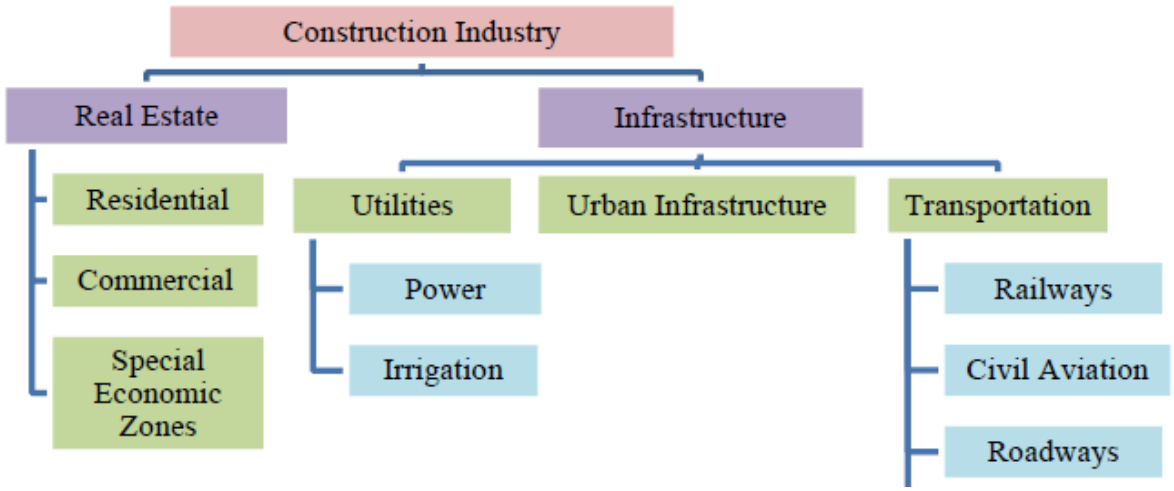

Figure 1: The structure of the Real Estate & Construction Industry

Source: Customized from RDB, 2021

2.2.2 Contribution of Real Estate & Construction Sector to GDP

The construction sector is one of the industrial branches making Rwandan economy and displays a strong relationship with the general rate of economic growth and specifically with the growth rate especially between the year 2004 and 2008. And this was due to demand in private construction under as placed in EDPRS1. This is basically, because of their backward and forward linkages other sectors of the economy since the sector use raw materials either from Industries or the Mining Sector (mainly quarrying). Therefore, an increase in the construction activities stimulates the demand for other construction materials leading to high production in the Industrial and Mining Sectors, hence enhancing the country's GDP. Also, construction results in adequate infrastructure, both social and economic, which later attracts different economic activities and subsequently stimulating the growth of other critical sectors of the economy including Agriculture, manufacturing and Services (RDB: 2021).

The Real Estate and Construction sector is a big contributor to the economy and is currently attracting investors like never before. Investment in the real estate sector has grown from Us$ 100 million to Us$ 480million in the last decade, driven by population growth, an emerging and growing middle class, increased Diaspora investment in Rwandan property markets and the government investment in infrastructure expansion and modernization of urban and rural infrastructure.

As per Rwanda Development Board (RDB, 2021), the construction sector includes civil buildings activities as well as the construction of bridges and roads. However, despite the sector being an important activity that is to drive Rwanda's economy, it is yet to develop an extensive network of infrastructure and estate assets. The construction sector has been growing at over 10% per annum for the last 20 years apart from a few years when construction did not do well and the poor performance is attributed to the global recession. Enormous infrastructure investment by the government to facilitate development plans and a rapid rise in housing demand stimulated massive private sector investment in commercial buildings. Also, Foreign Direct Investment (FDI) inflow into the sector has been increasing tremendously since 2010.

Rwanda has also earmarked six secondary cities (Rusizi, Rubavu, Musanze, Huye, Muhanga, and Nyagatare) to foster their growth and economic development. The secondary cities present enormous opportunities especially; in real estate and infrastructure development, manufacturing and Agro-processing. The construction sector contributed to the country's industrial GDP with 30.2% output in 2019.

It is estimated that he construction of buildings contributes to an estimated 60% of the entire construction sector and the main sections involve but not limited to own households' building with locally sourced and manufactured building materials, advanced complex constructions who often outsources micro-contractors or sub-contractors, small-scale developers targeting middle-upper income groups and these uses both locally produced and imported materials. There are also larger and locally-based developers carrying out more extensive (often government-

supported) housing projects for the upper-income segment and they usually use internationally acquired materials and professional services as giant international construction corporations that implement major public works and large housing developments targeting the Rwandan upper class as well as the expats and they in most cases use imported materials and skills and labour (RDB, 2021).

On the other hand, the road construction activities vary significantly depending mainly on the terrain and soil conditions, road standards, machine and labour costs including their set skills. The machine-related and labour activities that are in the road construction include surveying, staking the alignment and clearing right of way, the formation of roads, rock blasting, drainage facilities (ditching, culverts), crushing gravel, gravelling, grading and compacting, environment protection construction works (bridges, retaining structures and soil stabilisation works), as well as various work like transport, delivery and minor earthworks their servicing related costs.

2.2.3 Sub-Sectors of Real Estate & Construction Sector

The Rwanda's Real Estate and Construction sector comprise of five (5) main sub-sectors as highlighted in figure 1 below including construction of building, roads & bridges, Real estate, drinking water supply, Dams, Marshland and Hillside Development (**see figure 2**).

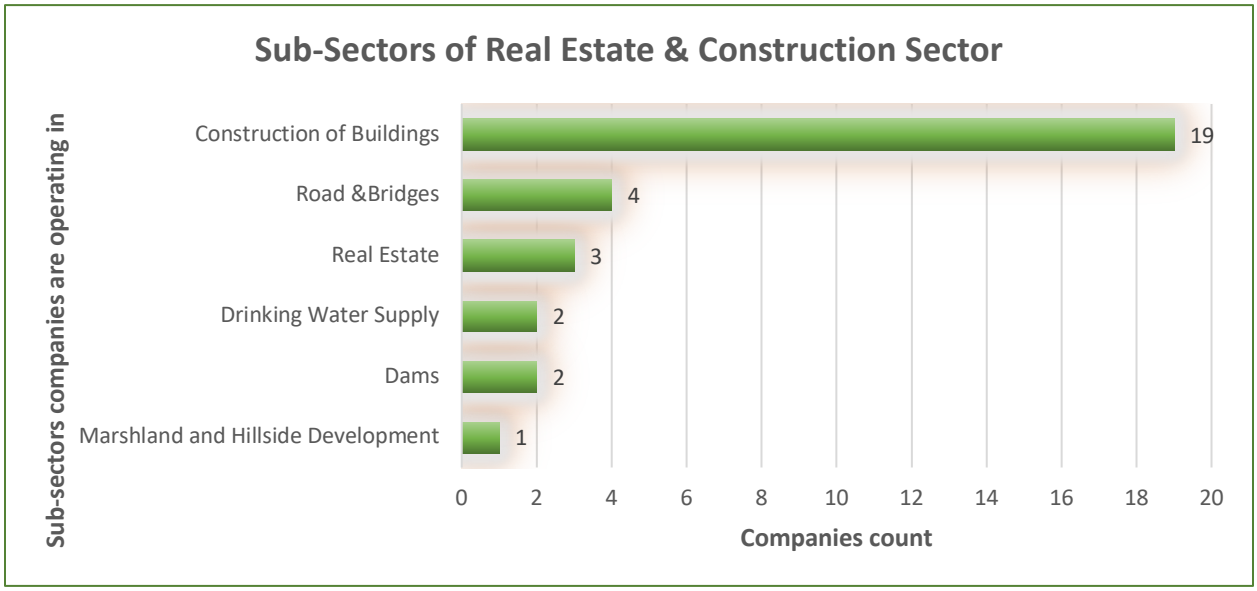

Figure 2: Subsectors in Real Estate & Construction Industry

Source: Customized from primary data collection, 2020

According to Fortune of Africa, Real estate sector is a key sector and a potential driver of future economic growth because of a high demand for both residential and commercial buildings. It is estimated that the annual demand for residential houses increases at a rate of 25,000 every year because of population growth. Despite huge investment in the sector that has grown from US$ 100 million to US$ 480million in the last 13 years there is still huge gap in the affordable hoses.

Also, the World Bank in collaboration with the Rwandan Development has invested an amount worth US$ 150 million and not forgetting an emerging and growing middle class, increased Diaspora investment in Rwandan property markets and the government investment in infrastructure expansion and modernization of urban and rural infrastructure. Nevertheless, rent fees are still high because supply is far behind demand, prices of plots of land and houses are influenced by the type of infrastructure developments in a particular area and the demand for the services, and yet land for development is readily available, availability of one-stop centre to facilitate investors, as well as package of tax and non-tax investment incentives is available to investors. Therefore, the demand for real estates in Rwanda in greater than its supply and the estimated housing gap in excess of 400,000 houses. This therefore, leads to the following investment opportunities for the Rwandan Real Estate Sector.

- Development of low cost and middle-income housing estates
- Development of warehousing, office buildings, and malls
- Investment in construction of apartments and hotels
- 186,168 housing units are still needed to cater for the growing population
- A youth sport centre
- Office Blocks in Kigali City and other urban areas
- Development of housing estates or blocks for high-income class
- Brick and Tilemaking factory
- Manufacturing of construction finishing materials
- Commercial complexes and shopping areas
- Development of entertainment centres
- Training and certification of key services: Architects, engineers, plumbers

2.3 Real Estate & Construction Sector Occupational Profile

According to RDB, (2021), the construction sector constitutes one of the priority sectors in Rwanda since it creates a foundation for implementing the Government's development plans for the country in terms of modernisation, rapid and extensive urbanisation. Therefore, public investments seek to increase the availability of infrastructure for both the domestic and urban population environment with an intension of supporting other sectors that attract foreign visitors particularly the Tourism & Hospitality sector requiring buildings that can host luxury tourists and visitors and high-level events, such as the Commonwealth conferences. Also, these sectors facilitate domestic and foreign investments where most of the private investments are in the field of real estate, hotels & accommodation, recreation facilities and commercial buildings. However, decentralisation, sustainability, inclusiveness and accountability are simultaneously on the Government's agenda. This calls the government investments and activities to be coordinated into a coherent fabric of strategic planning and policy-making.

Rwanda Labour Market Information System (LMIS), the points out that the Construction establishments in the private sector in Rwanda have 13 principal activities, with most of them

doing more than two activities. The main activities in the construction sector include site preparation, construction of buildings, construction of utility projects, electrical installation, building completion and finishing, real estate and construction of other civil engineering projects to mention but a few. The principal activity that most establishments participate in is site preparation with a proportion of 29.4%, electrical installation 10.6%, and building completion and finishing 7.1%. The sector is dominated by medium establishments, which account for 44.6% of the entire establishments. While large establishments account for 33.7%, small and micro establishments have a proportion of 10.8% each.

Furthermore, the employment in the sector as in table 4 below whereby the total sector's employment by the sector level for real estate and construction are presented. It is clear that while the real estate share of employment dropped to 4,098 in 2020 from 4,260 in 2019, that of construction rose from 315,022 in 2019 to 435,720 in 2020 showing resistance despite the negative impacts of the global Covid-19 pandemic. It should also be pointed out that the male employees still dominate their female counterparts for both real estate and construction sectors and study period (as per the labour force survey datasets of November 2020).

Table 2: The Real Estate and Construction Sector's Occupational profile

Employed population	2019			2020		
	Total	Male	Female	Total	Male	Female
	3273921	1838353	1435568	3460860	1938268	1522592
Agriculture, forestry and fishing	1225151	563414	661737	1399907	650361	749546
Mining and quarrying	71205	64553	6652	57379	50842	6537
Manufacturing	208956	109653	99304	201555	119607	81947
Construction	315022	261402	53619	435720	351559	84162
Wholesale, retail trade, repair of motor vehicles, motorcycles	485871	230492	255379	466569	212858	253711
Transportation and storage	170913	165498	5416	146260	139343	6917
Accommodation and food service activities	96982	49085	47896	91495	45034	46461
Information and communication	11515	7923	3592	8962	6697	2265
Financial and insurance activities	35051	18869	16182	35728	20503	15225
Real estate activities	4260	3641	619	4098	2918	1180
Professional, scientific and technical activities	27111	18324	8787	21249	15698	5551
Education	118626	60497	58129	107624	55189	52435

Source: Customized from NISR Data, 2020

CHAPTER THREE: DRIVERS OF CHANGE AND THEIR SKILLS IMPLICATION

This chapter discusses the main drivers of change in the Real Estate and Construction industry. The SSA Report identified a number of key drivers that will impact on the demand for employment and skills in the future construction over the medium term (as well as immediately and in the long-run). In addition, the recent COVID 19 Pandemic has had adversely affected the sector and the recovery presents a number of challenges to all parts of the sector.

2.1 Introduction

The construction industry plays a significant role in economic development, especially for developing nations. It generates new job opportunities and offers solutions to address social, climate, and energy challenges. It has a direct connection with other sectors and, consequently, has a major impact on the GDP and, thus, economic development. For example, the GDP of the United States from construction averaged about USD 630 billion from 2005 to 2019, and the GDP of the United Kingdom from construction averaged around GBP 23,884 million from 1990 to 2019. In addition, political decision-makers wield the construction sector as an important tool to boost the economic development process due to the positive relationship between per capita national income and construction demand.

Successful project management must strongly emphasise the efficient utilisation of Labor, material, and equipment in construction projects in order to deliver a successful project on time, within the budget, and as per the defined quality standards. Construction is a labour-intensive industry, and Labor productivity has a profound impact on construction management. In most countries, Labor cost in construction represents 30% to 50% of the overall cost of the project, which means that Labor productivity is a prime contributor to the efficiency and the success of the operation. Thus, it is crucial to investigate the different influences that affect Labor productivity to minimise and eliminate the negative effects in order to improve productivity levels and, consequently, increase the chance of delivering the construction project successfully.

2.2. Policy, legislation and regulation

There are long term policy trends towards improving the quality of work, reducing the environmental impact of construction and promoting sustainability of buildings. Specifically, the GoR has put sustainable alternative energy and climate change high on its list of priorities[5]. There are a vast number of initiatives to promote green technologies[6] that do not contribute to climate change. This means businesses have to change their business models to promote the green economy by embracing environmental friendly construction materials and other equipment used in different buildings.

[5] Republic of Rwanda, National Strategy for Transformation (NST1)

[6] Republic of Rwanda, Rwanda Green Growth and Climate Resilience: National strategy for climate change and low carbon development, 2011

After Kigali Amendment of the Montreal Protocol entered into force, Rwanda developed National Cooling Strategy[7] and this has also integrated cooling roofs. The recently gazetted "Rwanda Green Building Minimum Compliance System[8]" gazetted in April 2019, to be applied on commercial, office, schools, health facilities and assembly buildings, took in consideration the cool roofs measures to reduce the heat inside the buildings. The green building code is expected to help out to reduce global warming gas emissions.

The above-mentioned policy and regulations instruments have significant implications for construction activity and hence for the sector's demand for skill. Legislative changes and policy initiatives influence the demand for skills in the real estate and construction sector in order to comply with regulations and legislation and thus to remain competitive in the presence of increased regulation. In the case of environmental-related regulations, there is a need for greater understanding of low carbon and zero carbon technologies in particular thus demand for higher skills.

Most construction employers consulted have shown willingness and readiness to comply with various environmental and sustainability requirements and some firms have been winning regional contracts and taking part in international partnership that have strengthened their business leverage in terms of market expansion, experience, skills and technology transfer. The role of higher skills and in particular, management and supervisory capabilities are vital in ensuring growth of the real estate and construction sector in response to these challenges and others.

2.3. Urbanization

Regarding the drivers of change in the sector**,** Östring, Aalto, and Kuosa, (2017), pointed out that, the most significant driver of change in the real estate and construction sector is the tidal wave of urbanisation. This is a result of the speed and significance of the change that is visible given the fact that approximately 200,000 people migrate from rural to the urban areas daily. Basically, this entails that, every six weeks the world's cities see an increment in population equivalent to the New York City population number who need affordable houses and appropriate services. And this is a call to real estate and construction sector business community to satisfy the rising number in our cities as quick as possible. Urbanisation is likely to affect the probability of a person having a job. Therefore, urbanisation should provide a better understanding of the dynamics influencing of the employment outcome of persons depending on the degree of urbanisation where the person lives hence their relevant skills (Havemann, & Kearney, 2010). In other words, one can briefly confirm that urbanization attracts other amenities that positively affect skills development. Henderson, (1986), postulated that in less developed nations of which Rwanda is among, urbanization is highly related to educational attainment of the local population.

[7] Ministry of Environment, National Cooling Strategy, 2019
[8] Republic of Rwanda, Official Gazette no. Special of 16/04/2019, Annex 3 Rwanda Green Building Minimum Compliance System

As per Harty and Laing, (2009), Building Information Modelling (BIM), is helping in transforming design and construction to achieve greater industrial-type procurement and both general contractors and reluctantly sub-contractors have started to adopt both BIM and Integrated Project Delivery (IPD) so as to improve their performances and reduce wastage due to poor information ranging from inaccuracies, delays, misplacement, inconsistencies and incoordination right through all construction phases.

2.4. Digitalization and Development of Science and Technology

According to, Östring, Aalto, and Kuosa, (2017), real estate and construction sector have adopted digitization as a business venture in this industry. Information and data that were initially forsaken have become more and more practical as information systems and linked to one another for production and evidence-based decision-making purposes. It has been also proven that automation and other digital technology enhance services provision as well as improving cost efficiency. For example, it is possible to guide on-site personnel from a distant place in tests, repairs, or other operations. Additionally, the Internet of things (IoT) is helpful towards a smart and interactive built environment and there is a possibility that IoT will start combining buildings, people, processes, information, and equipment, for transformation. Without forgetting things like speech recognition, robotisation, and artificial intelligence that enable new services and continuous improvements resulting from technologies, such as AR/VR. Given the importance of digitization especially in cost efficient and general production processes, there is need for specific skills development for Rwanda to realize its ambition of becoming an ICT regional hub.

2.5. Evolution of Customer Needs and Demand

Following the pace on how organizations change and their business acceleration, the need for flexibility in the use of spaces and buildings becomes ever more important. More so, the length of commitments is expected to be shortened in employment contracts, leases, and service agreements. This is because both customers and user's expectation are constantly becoming more challenging as life and the everyday turn into digital form. More and more of work and customer activity is becoming unrestricted by time or location, which should translate into improved utilization rates and overbookings. These have a direct impact on the demand for physical spaces and their qualities in terms of skills requirement (Kuosa, et. al. 2017). Also, Östring, Aalto, and Kuosa, (2017), explained that, as technology, methods, and organisational activities change, and their competition to attract the best competences tightens, it is necessary to often keep developing work environment and improve the management and working culture.

2.6 Servicification, New Concepts and Business Opportunities

Kuosa, et. al. (2017), points out that, given the growing importance of user experience and rapidly changing user needs, accompanied by digitalisation and new technologies, spaces and their use into services becomes important. The sharing economy, for instance, is an indicator of this, and one of the growing trends countering the underuse of real estate and construction assets.

The combination of these two changes, both an increasing demand in user experience and the advent of the sharing economy, means that the real estate and construction businesses has the possibility to develop at an accelerating pace into a mix of ownership and rental that finds flexible solutions in the platform economy. One company taking advantage of this, for example, is Liquid space. These changes bring forth new, flexible service-based business models that redefine who pays, what is paid for, and who finances them, their operations and roles of stakeholders change. Therefore, this is a call for specialized skills in this area (Kuosa, et. al. 2017).

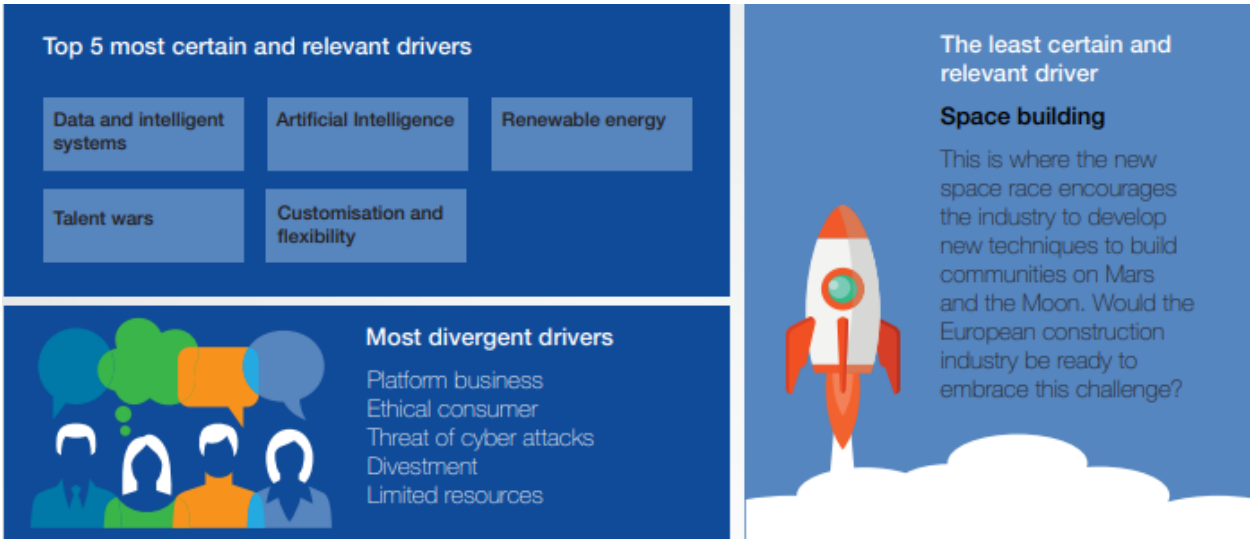

Figure 3: Top 5 most certain and relevant drivers of change in real estate and construction

Figure 3 above, other equally important drivers of change include but not limited to data and intelligent systems, Artificial intelligence, Renewable energy, talent wars as well as customization and flexibility**.**

For example, talent wars increase the use of digital and data driven solutions within the construction industry causing a gap between the skills in the construction industry need to operate daily against the skills and expertise possessed by the workforce (today and into the future). Workers such as coders, game developers, UI and UX specialists etc. are also in high demand from other sectors. As a result, they can ask for higher wages, are easily poached by others and have greater freedom to choose the sectors and jobs they think are most attractive to them.

However, from all the interviews we did and our literature review it is not clear of how many people have all the above-mentioned set of skills in Rwanda thus, we do not have to just attract these new types of workers with such skills, the industry is facing a skills shortage and finds it hard to recruit workers with traditional skills. Could these issues be resolved by techniques such as offsite construction and automation and autonomous working? And will they be adopted fast enough before the trades skills shortage becomes critical? This is something that is uncertain.

Currently, an inability to attract the right workers will prevent companies from being able to carry out projects in the manner in which they do today. However, looking forward, a failure to attract new types of talent such as tech and data workers, will prevent businesses from realising new opportunities and make them vulnerable to new market entrants, who can offer services the industry cannot. For contractors being unable to attract new types of workers would mean that they cannot make the transition from asset builders (working to low margins) to companies that build and offer additional value through asset data services; a new offering for clients with higher margins and revenue streams that will grow in importance as more companies embrace data, intelligent systems and AI.

This study also not only found out that, there is kills shortages thereof, there was overheated market, an aging workforce, hardship in retaining staff, failure to outsource skills due to their high costs, work culture challenges, limitedness in innovation, quality reduction during the design/planning and estimation phases, as well as inability to win work tenders.

The building movement and real estates have shifted from 'push' to 'pull' with markets increasingly demanding no less than development of the township and their buildings. By promoting greater efficiencies for energy and water, and land management floor buildings lower building costs while conserving the earth's precious resources and population growth management. This powerful combination of built-in payback with environmental stewardship creates a new value proposition that is accelerating floor building in all regions of the globe.

2.7. Implications of drivers of change on future skills demand

The key drivers of change in real estate and construction sector, as discussed above, have a variety of implications of skills demand in the sector. Meeting low carbon requirements, adopting new technologies and satisfying various regulations requires particular specific skills and alters the importance of particular occupations.

The interplay of the various key drivers means that there is a degree of uncertainty over future skills demands, which can be problematic in encouraging employers to invest in skills development. Amongst the key drivers, complying with regulatory changes, has been found to be the most likely to stimulate demand for new skills and knowledge. Remaining competitive in the face of increased regulation is a key challenge for employers in the real estate and construction sector. This will require the employers to develop skills that enable them to comply with regulatory demands as discussed in the below section about the building codes and standards. Whether employers are able to be pro-active in meeting the demands posed by other key drivers of skills development, such as technological change and globalization, remains a key question for construction firms needing to meet a wide range of market demands.

CHAPTER FOUR: SKILLS STATUS IN REAL ESTATE & CONSTRUCTION SECTOR

This chapter shows the skills status in Rwanda but considering the sector skills specifics (current skills demand against skills supply and their specific future economic implication, and an anticipated demand and skills gaps by 2030 as well as their related barriers to closing the skills gap.

4.1Introduction

It is under the National Skills Development and Employment Promotion Strategy (NSDEPS) that the vision on how to optimise skills and employment ecosystem to foster long-term economic transformation is defined. The country's aspiration under this condition therefore is to have no gap between the supply of skills and demand that is to say, the required talents and innovations by the business community will be readily available in the economy in both quality and quantity. A fully equipped talent base, in turn, is also a net job creator through entrepreneurship since SMEs will be fully equipped hence their ability to maximise job creation and subsequently enhancing the overall Rwandan economic growth.

4.2 *Current Skills Demand and their Economic Implication*

According to World Bank report (2021), there is need for the Rwandan private sector to increase their infrastructural financing to bridge the existing gap hence making the nation achieve its desired sustainable development goals. If one talks about infrastructure financing, the development of the required skills in the sector (real estate and construction) is paramount.

As per RDB, (2021), the required skills in the sector vary greatly depending on the type and level of construction activity. In the building's construction, supervisors, engineers and architects, masons are required. While administrative, residential and commercial buildings with the exception of industrial buildings, hazardous buildings, and health facilities, skills in designs especially from architects and plans, and civil engineers are required. More so, building like residential and commercial including warehouses but not industrial, hazardous, and health facilities buildings, also need architects and plans skills from civil engineers.

On the other hand, towers and antennas, and all other types of buildings require specific skills from experienced and certified engineers. This applies to other buildings including but not limited to sports and leisure facilities, social, cultural, assembly and religious, health facilities, educational, memorial sites for the Genocide against the Tutsi, industrial, and hazardous. One should not forget buildings, like those that do not require a building permit, and others like those specifically for national security excluding social, residential and commercial, and temporary shelter for returnees, refugees and internally displaced people.

In Rwanda, highly skilled professionals are trained at university-level, Integrated Polytechnic Regional Centres (IPRCs) and the mid-level skills are acquired in Vocational Training Centres (VTCs) as well as Technical Secondary Schools (TSSs) (RDB 2012: 77).

From the survey, this study found out that the most important and required skills in the coming ten years, within the real estate and construction sector, are technical skills particularly in the project management, development of building project, architectural design skills, structural design, building completion and finishing, estate management, construction of roads and railways, as well as skills in trades occupations also being significant. These technical must be complemented with strong soft skills. This is because consulted firms in this sector emphasised the need for management skills especially in project management, strategic management, business communication skills since they improve quality standards within the sector (**see figure 4**).

Figure 4: Required Skills to meet Building Quality Standards

Source: Customized from primary data collection, 2020

Furthermore, regarding the desired skills to comply with Building Code and Regulations, evidence from the study's consultation with industry stakeholders and firm level interviews, highlights skills like architectural design, construction compliance, building codes and regulation skills, structural design, public health safeguard and other general welfare safety skills, communication and electrical installation, land scape, and parking, as important as in figure **5** below.

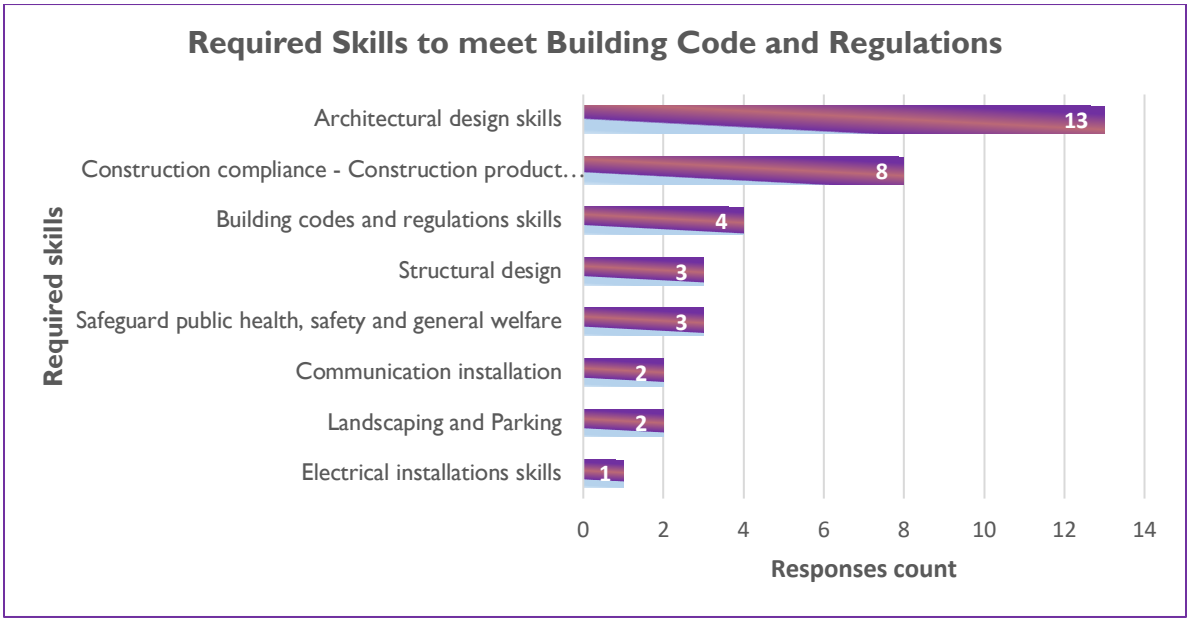

Figure 5: Desired Skills to comply with Building Code and Regulations

Source: Customized from primary data collection, 2020

In addition, companies consulted reported there is a need for researcher and development (R&D) skills that are relevant to and innovation. R&D and Innovation is considered to have a number of important benefits to construction firms including maintaining their competitiveness as well as supplying more service-based products to both the domestic and global markets with lower costs but with higher quality standards. The firms that compete in different markets often are required to develop more skills and capabilities to innovate.

4.3 Skills Supply and their Economic Implication

The World Bank report (2021) pointed out that increasing the private sector investment in infrastructure will be essential to obtain sufficient resources for the country. Talking about increasing private sector infrastructural investment, skills development should not be isolated so as, supply the relevant skills in the sector (real estate and construction).

According to RDB, (2021), despite the supply of the low-level workers being abundant, it is believed that skilled professionals are very much sought after. This is attributed to the fact that formal education and training related to the real estate and construction sector have only recently

become available in Rwanda, since the first civil engineers graduated in 2005 and architects in 2014. It is believed that between the year 2013 and 2018 the total number of these professionals amounted to about 2,236 (two thousand two hundred thirty-six).

4.3.1 Provision of Real Estate and Construction Related Education and Training

Although the construction industry is popularly associated with manual labor, real estate and construction now requires workers with advanced science, technology, engineering, and mathematics (STEM) skills. Construction firms also need skilled technical workers to operate increasingly complex machinery, offering many opportunities for those without a traditional university education.

Rwanda has significantly promoted STEM education across all levels of study. For example, in 2019, Rwanda introduced the newly developed education curriculum referred to as the "New Competence-Based Curriculum" for pre-primary up to upper secondary education. This new curriculum underpins building a knowledge-based and technology-led economy through well-adjusted STEM and Information, and Communication Technology (ICT) led education[9]. Rwanda's Ministry of Education has partnered with technology-enabled companies such as Microsoft, O'Genius Panada, Zora Robotics and Class VR, and the Keza Company, among others, towards incorporating STEM and ICT-enabled educational system[10]. For example, this programme allows for the utilization of ICT and other technologies to promote transferable skills such as critical thinking, problem-solving, and creativity.

The Microsoft Technology teaching methodology utilizes robotics to improve students' hands-on engagement and activities.[11] These include students' exposure earlier on to computer programming and developing students computational and logical thinking to solve real-life problems. This is accomplished by modelling problems and designing solutions. Furthermore, Rwanda's One-Laptop-Per-Child (OLPC) flagship programme has encouraged ICT-enabled primary school education. Besides, the Rwanda Coding Academy flagship programme has prepared Rwandan youth into future software developers and cyber security systems experts.

In addition to developing a technology-enabled education curriculum, the Rwandan education system has been designed such that it allows for extended time allocation for STEM-related subjects relative to arts-related subjects. Further to this, Rwanda has significantly invested in essential STEM-related iinfrastructure such as laboratory equipment and accompanying material necessary for teaching STEM subjects. For example, in the past 25 years, Rwanda has equipped approximately 380 secondary schools with modern science laboratory tools[12]. Even though there is still more work to be done, Rwanda's STEM outputs are progressively improving[13].

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[9] https://www.mineduc.gov.rw/fileadmin/user_upload/Mineduc/Publications/POLICIES/Education_Policy
[10] https://allafrica.com/stories/202002140099.html
[11] https://news.microsoft.com/wp-content/uploads/prod/sites/43/2018/06/Transforming-Education-eBook
[12] https://www.cio.co.ke/stem-education-prioritised-in-rwandan-schools
[13] Kizito Ndihokubwayo, Investigating the status and barriers of science laboratory activities in Rwandan teacher training colleges towards improvisation practice, Rwandan Journal of Education - Volume 4 No 1 (2017)

Within higher education, there has been a significant increase in enrolments from 2011/12 to 2019/2020 in Science, Technology and Engineering disciplines relevant to the construction sector. According to 7 Years Thematic Statistical Report[14], Total enrolment for the period 2013-2020 provides proportions of 45% students registered in Non-STEM and 55% students registered in STEM areas[15]. Students' enrolment for academic year 2019/2020 shows a total number of 25,084 with 36% Females and 64% Males respectively. Areas of registration show 64% registered in STEM versus 36% in Non-STEM Programmes. Therefore, an increased outflow of STEM graduates to the labour market can be expected in the coming years due to various Centres of Excellence established during the period of seven years (2013-2020). Total enrolments in STEM stand at just over 16,000 in 2020. Both science and engineering programmes experienced similar rates of increased enrolments. There have been strong increase enrolments, particularly in ICT related programmes, electrical engineering and mechanical engineering.

Enrolments at master level in University of Rwanda (UR) mainly relate construction, architect; computing and electronics and engineering categories. There have also been strong increases in enrolments in construction and environmental related programmes, reflecting the increasing influence of the environmental agenda.

Since 2013 provision relevant to the construction sector has been expanded through the introduction of the STEM initiative, which strategically targets funding of STEM higher education courses in areas where there are identified labour market skills shortages or employment opportunities. Under seven years period (2013-2020) almost 23,254 people have been being provided on courses in areas relevant to the advanced technology and construction. A further expansion of the STEM initiative has been announced in 2020 with the official launch of STEM power Centre to boost science awareness in Rwanda.

Rwanda's education policy emphasizes training teachers enhanced teaching pedagogy on lesson delivery that links classroom learning with the local environment. The curriculum framework incorporates teacher's capacity building that includes continuous professional development in school leadership, management, improvement planning, coaching, and mentoring. These capacity-building frameworks are put in place in Rwanda to address the barriers hindering the STEM uptake. In this way, Rwanda can address the limited number of qualified STEM teachers and STEM teachers' inability to localize STEM teaching. Such measures have somewhat improved the STEM education uptake in Rwanda.

With robust STEM education infrastructure, students can easily perform experiments independently and improve their problem-solving skills as needed by the knowledge-based economy. RP/TVET and Universities are urged to update their programs to localize the STEM education and make it more practical to accommodate efficient methodologies of teaching science in schools and colleges. Finally, Construction firms need also to be encouraged to significantly invest in the country's STEM education.
While the common thread permeating construction sector hires is STEM, employers are looking for experts across many fields and with diverse educational backgrounds. The assessment found

[14] University of Rwanda, 7 Years Thematic Statistical Report, 2020
[15] University of Rwanda, 7 Years Thematic Statistical Report, 2020

out that as firms seek workers to operate and maintain advanced machinery , a wide variety of skilled technician positions are opening for those without traditional university degrees. These jobs include professions such as construction machinery mechanics and maintenance workers. Like many other technical positions, this job requires only a high-school diploma with most training done on-the-job or through apprenticeships.
Technical and vocational education and training (TVET), Higher education institutes universities committed to produce more and better-trained graduates since 7 years. The Government, through TVET Board, sponsors programs to support short- and long-term professional training targeting Rwanda's key industries.

However, according to National Skills Development and Employment Promotion Strategy (RDB, NSDEPS: 2019), TVETs have not been fully effective in preparing students for the workforce: Employers rank programs poorly-only 60 percent of employers found TVET graduates with satisfactory skills. According to Africa Growth Initiative, the unemployment rate among TVET graduates amounted to 17 percent[16] in 2018; moreover, roughly half of TVET graduates reported that they were not satisfied with their skills development in the National Tracer Survey for TVET and Higher Education Graduates and Employer Satisfaction (MINEDUC: 2019). This situation can be attributed to two elements: insufficient private sector involvement in curriculum design and implementation, and nascent performance tracking especially for TVET institutions and labor market outcomes. Collecting and disseminating information on the quality of skills supply and the returns to different skills would improve quality and encourage participation in high-return programs.

In summary, increasing the human capital of construction workers has two components- boosting technical and advanced conceptual skills. Even as Rwanda increases time in school, it has to continue to improve educational outcomes if the country is to achieve its high growth aspirations. It has to upgrade its vocational and educational training systems. The country may benefit from further reforms to its tertiary school system and universities.

In contrast, despite lack of information on the number of private TVET schools as well as clear number graduates from them, these institutions that offer relatively lower skills level yielded high numbers of graduates. By end of 2019, their total was 1,690, with the highest number being dominated by men with 1,532 (91.7%) while female accounted for approximately 9.3% of the entire professional (158).

A significant number of construction firms consulted indicated that, in general were concerned about the supply of technical workers especially skilled trades or technician level that combines civil engineering, mechanical, electrical, electronic and digital technologies. The companies consulted also highlighted a shortage of people with plumbing, electrical, masonry, carpentry, painting, drywall, concrete, roofing skills. The concerns in industry about the supply of mechanical-electronic technicians and trades appear more diffuse. These skills are important in

[16] Richard Newfarmer and Anna Twum, Employment creation potential, labor skills requirements and skill gaps for young people. A Rwanda case study, February 2022

the context of computer-automated technologies (CAT) for example computer aided design, electrical engineering as earlier alluded. Evidence show that in 2017 and 2018, the Ministry of Education (MINEDUC) closed several colleges due to sub-standard practice allegations. However, the Rwanda Workforce Development Authority sponsors programs to support both short and long-term professional trainings targeting key industries in Rwanda. Carnegie Mellon University opened a campus in Kigali in 2012 -its first in sub-Saharan Africa–and currently offers a Master of Science in Electrical and Computer Engineering and Master of Science in Information Technology.

4.4 Skills Gaps, Anticipated Skills Demand, and their Policy Interventions by 2030

Interviews and consultations, from construction companies across all sectors reported skills issues as shown in figure **6**. These do not necessarily imply a headcount shortage but can indicate a shortage of relevant skills externally that they expect would affect them if they had to recruit and/or a deficiency of skills within the workforce. Firms consulted reported that these deficiencies in skills lead to poor performance of employees in real estate and construction sector:

Figure 6: Skills gaps leading to poor performance in Construction Industry

Source: Customized from primary data collection, 2020

In a minority of cases, stakeholders pointed out that it is hard-to-fill vacancies as shown in figure **7**, especially in Project Management engineers and construction researchers/scientist occupations were the most frequently mentioned in both skills shortages and deficiencies in skills. Constructions skilled trades were the next most frequent skills shortage mentioned, closely followed by real estate and and building maintenance occupations. The skills shortages mentioned most frequently are architects, bidding engineers, construction project manager, real

estate manager, construction project/real estate engineers, building control surveyor, mechanical engineers, environmental engineers, skilled building & construction trades.

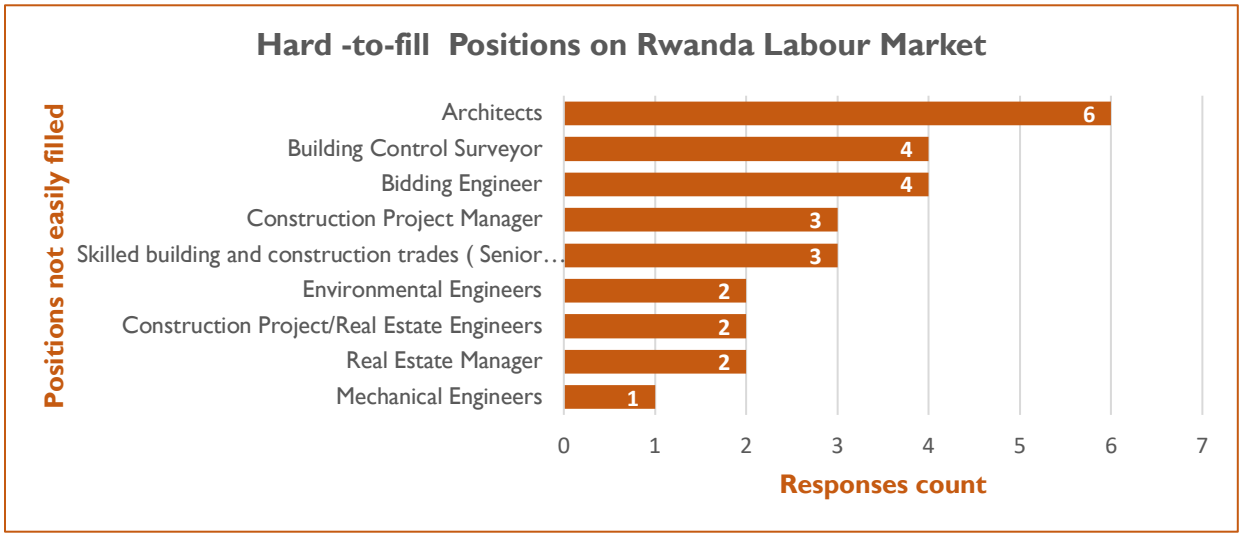

Figure 7: Hard-to-fill positions in Construction Industry

Source: Customized from primary data collection, 2020

Firms surveyed were asked about the occupational areas where pursuing opportunities or strategic objectives are most likely to impact on employment numbers or on skills requirements. All of the main occupational categories were mentioned, but most mentions were for civil engineering or construction project management, innovation, research and development occupations as may be seen in the above figure **7**. This suggests that, if firms succeed in pursuing these opportunities and objectives, the share of employment accounted for by civil engineering, real estate and project management occupations will rise.

Also, the consulted stakeholders, indicated that the long-term skills can be seen in the figure **8** below. They include; quality control, the construction of roads and railways skills, construction project management, development of building projects, architectural design skills, landscaping and parking, demolition and site preparation, environmental management, entrepreneurial skills, among others.

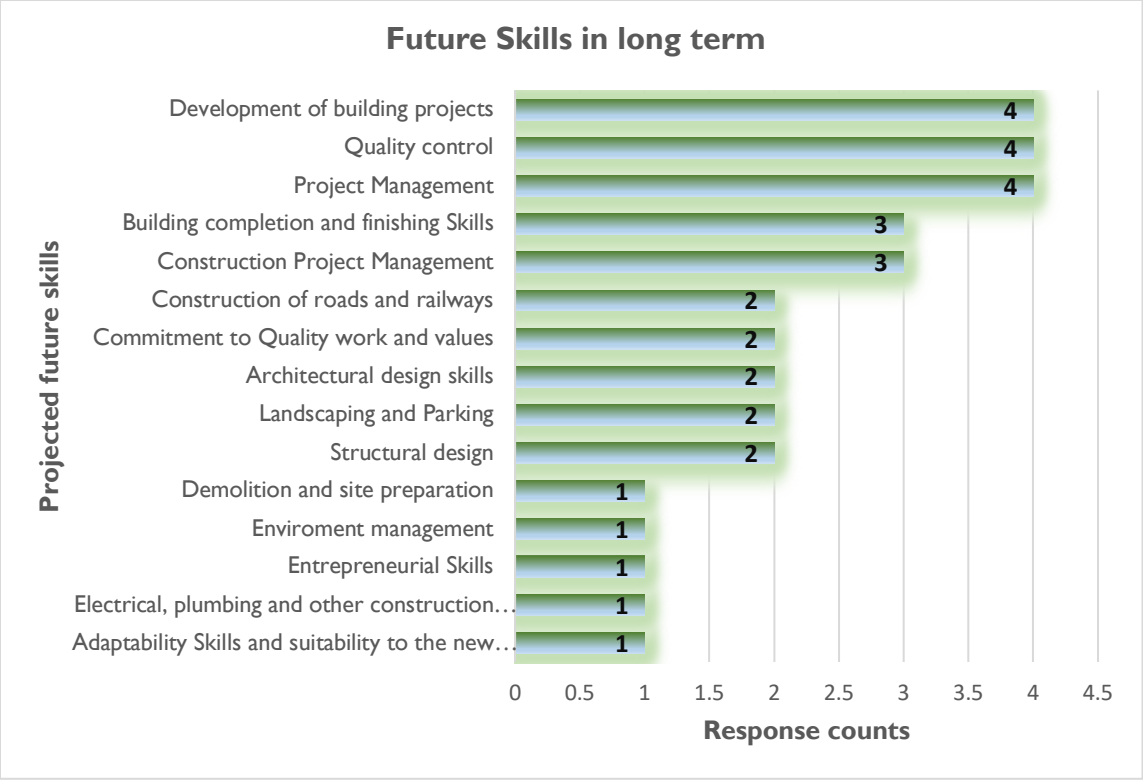

Figure 8: Projected Future Skills to achieve Business Strategies

Source: Customized from primary data collection, 2020

4.5 Main barriers to the closing skills gap

According to the consulted stakeholder, the main barriers to closing skills gap mentioned-above by individual companies were:

- finding the 'right fit' for the organisation,
- the length of time it took to 'grow your own' skills,
- budgetary constraints on training costs,
- the time which needed to be taken out of workplace for training and,
- the effect of location on attracting new skills.

Based on the evidence from interviews and stakeholder consultation, a number of approaches are proving successful in closing skills gaps through mentoring and coaching, training and education provision. However, one of the difficulties in addressing skills gaps mentioned by firms consulted has been the weak alignment between real estate & construction industry and higher education institutions. Many SMEs, in particular, say that they find it difficult to engage with third level institutions, but that Institutes of Technology tend to engage more proactively than universities. The most of the reported causes of why employers do not build capacity of their staff are captured in the figure **9** below.

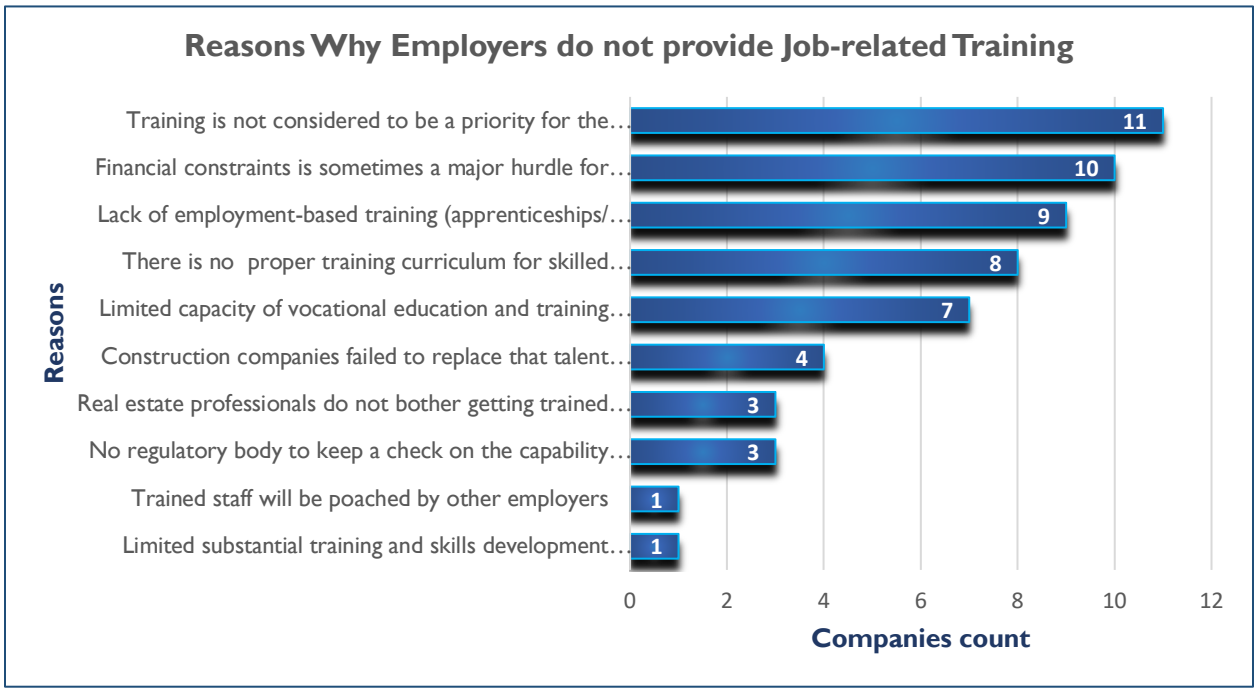

Figure 9: Reasons for capacity gaps

Source: Customized from primary data collection, 2020

CHAPTER FIVE: SECTOR SKILLS RESPONSE TO ADDRESS THE IDENTIFIED SKILLS GAP

5.1 Introduction

Looking at Rwanda's revised national employment policy, the working age population by levels of education shows that 49.7% has not attended or finished primary school, 29.6 % has finished primary school, 8% has finished low secondary education, 8% has finished secondary education and 4% has finished university studies. This is a clear indication that a big number of Rwandans have no formal qualifications yet the government aspires to transformation the country from a predominantly agrarian-based, low-income economy to an industrial upper middle-income nation by 2035.

5.2 Ways to Bridge the Skills Gap

Enterprises use a variety of strategies to address skills gaps. The interview survey asked about what they do in three broad areas: Upskill and training existing employees and recruiting newly skilled in Rwanda, and recruiting abroad. In overcoming the highlighted issues, firms use a variety of strategies to address skills gaps and the proposed solutions thereof include but not limited to the following (**see figure 10**);

- hiring mentors or coaching specialist that can build their capacities at workplace,
- increasing the provision of training,
- On-the Job- Training to encouraging the transfer of know
- Development of employment-based training and construction certification courses
- Tailor-made training courses to meet the specific needs and requirements of the company
- Developing in-house training that engages a multi-generation workforce
- Bolstering apprenticeship programs

Figure 10: Ways to bridge skills gaps

Source: Customized from primary data collection, 2020

Finally, several firms proposed that the relationship between education providers and industry should be much closer. The rate of technology change has accelerated and any 'time lag' by education providers will be exacerbated in the future. While there are many examples of positive links between HEIs and construction industry, the quality of the relationship appears to vary by institution and companies expressed their concern that this is not consistent or well structured (**see figure 11**).

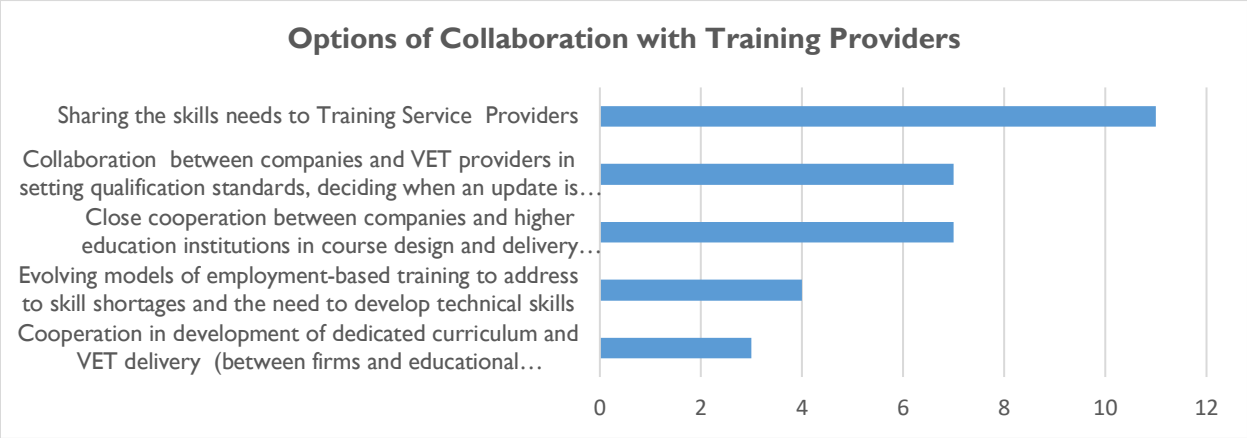

Figure 11: Ways to bridge skills gaps

Source: Customized from primary data collection, 2020

Based on the evidence from interviews and stakeholder consultation, some ways prove successful in bridging skills gaps through training and education provision. However, one of the difficulties in addressing skills gaps mentioned by consulted enterprises has been the weak alignment between construction and higher education institutions. Many SMEs, in particular, say that they find it challenging to engage with third-level institutions, but Rwanda Polytechnic college and Institutes of technology tend to engage more proactively than universities.

Several firms proposed that the relationship between education providers and industry should be much closer. The rate of technological change has accelerated, and any educational providers' "time lag" will be worsened in the future. While there are many examples of positive links between HEIs and the construction industry, the quality of the relationship appears to vary by institution, and companies expressed their concern that this is not consistent or well structured.

The evidence from KIIs indicate that the ways to bridge the skills gaps are to:

- Investing more in development of science, technology, engineering and mathematics with a focus on specialized skills supply in STEM: With robust STEM education infrastructure, workers can easily perform experiments independently and improve their problem-solving skills as needed by the knowledge-based economy. RP/TVET and Universities are urged to update their programs to localize the STEM education and make it more practical

to accommodate efficient methodologies of teaching science and engineering in schools and colleges. At the same time, real estate and construction firms need also to be encouraged to significantly invest in the country's STEM education. While the common thread permeating real estate and construction sector hires is STEM, employers are looking for experienced people with right skills and with diverse educational backgrounds. Technical and vocational education and training (TVET), Higher education institutes universities are required to produce more and better-trained graduates for the coming years. The Government, through TVET Board, must continue to sponsor the programs that support short-and long-term professional training targeting construction's industries; and invest more industrial Research &Development which is stimulating demand for highly skilled graduates and increasing collaboration between research centres and construction industries;

- Increase on On-the-Job- Training to encouraging the transfer of knowledge: the assessment found out that as firms seek workers to operate and maintain advanced machinery, a wide variety of skilled technician positions are opening for those without traditional university degrees. These jobs include professions such as industrial machinery mechanics and maintenance workers. Like many other technical positions, this job requires only a high-school diploma with most training done on-the-job or through apprenticeships.
- Provide tailored training programs with market relevance: increasing the human capital of construction workers has two components - boosting technical and advanced conceptual skills. Even as Rwanda increases time in school, it has to continue to improve educational and upgrade the vocational and educational training systems. This require strong cooperation in the development of dedicated curriculum and VET delivery (between firms and educational institutions) and align VET programs to the real estate and construction labour market

5.4 Lesson for Real Estate & Construction Sector

Singapore

Information and technology have produced large changes to construction industry and leads to innovative nations globally. Building Information Modelling (BIM) is one of the IT platforms to rely on the process of planning, design, construction, and operation of a building in 3D dimension to promote collaborative and integration between the parties in the construction projects environment. BIM is defined as a parametric modelling to support project life cycle through relevant data and information shared among project stakeholders. BIM roadmap is a strategic plan by the government of Malaysia to ensure a wider adoption of BIM embraced among industry players. However, despite the existence of strategic implementation plan recently developed by the Government of Malaysia through CIDB, the implementation plan has less emphasis on strategic analysis elements (i.e., capacity, support, and value). Hence, the objective of this paper is to incorporate the strategic analysis elements (i.e., capacity, support, and value) in the existing

Malaysia BIM roadmap pillars based on the lesson learnt from Australia, Singapore and Hong Kong. A qualitative research technique was employed in the form of document analysis for the establishment of Malaysia's BIM roadmap, while a formal workshop with experts from representatives of Public Work Department and Ministry of Health (directly involved in the first BIM Malaysia's pilot project of National Cancer Institute) for the establishment strategic analysis elements (i.e. capacity, support, and value) to be embedded in the roadmap. The findings suggest that the strategic analysis elements (i.e., capacity, support, and value) to be incorporated in the existing Malaysia's BIM roadmap has seven pillars (i.e., standards and accreditation, collaboration and incentives education and awareness, national BIM library, BIM guidelines, special interest group (SIG); research and development (Hadzaman, Takim, & Nawawi, 2015).

Taiwan

Nowadays, a growing number of companies are starting their corporate social responsibility (CSR) implementation and consider CSR as a kind of business strategy. To understand the current CSR implementation levels in construction industry and identify relatively easy-to-achieve CSR targets for companies interested in CSR, this study is conducted by analysing the CSR reports of some large-sized companies in Taiwan's construction industry and by conducting a questionnaire survey on large-sized and reputable companies in construction industry to find out the CSR implementation levels of these construction companies and the differences between contractors and real-estate developers in their implementation measures. It found that even if a company in construction industry is interested in CSR implementation or CSR report issuance, it is driven by purposes such as business transformation or investment attraction. Moreover, different types of companies in construction industry have different focus in their CSR implementation dimensions. The contractors focus more on their environmental influence, carbon emissions and impact on biodiversity at their construction sites while the real-estate developers focus more on the pre-construction environmental evaluations of the construction sites and green building designs (Huang, et ela. 2017).

According to Ren, Shen, and Xue, (2013), Construction method selection, implementation, and improvement (CMSII) is a crucial and difficult task for construction projects, especially for large and complex projects, which often face constraints such as complex project environment, lack of information, and uncertainties caused by new technologies. Despite its importance, few research projects have been conducted in this field, especially from both technical and management points of view. Although cases of project failure caused by inappropriate construction methods are reported from time to time, studies of the detailed causes and lessons learned are rare. This research developed a CMSII workflow model and discussed the CMSII process in a drainage project that suffered multimillion-dollar losses due to problems associated with CMSII. By investigating the details of the CMSII, this study identifies the key technical and management issues to be considered in each CMSII stage, reveals the problems, and, most importantly, summarizes the lessons learned.

Indonesia

The Covid-19 pandemic, which has hit Indonesia for 1 year, has an impact on almost all sectors of life, including the construction sector. The existence of restrictions on human activity and gathering as well as all policies that arise such as budget refocusing has caused several construction projects to be delayed and several others cancelled. Until now the number of cases exposed to Covid-19 has reached more than 1 Million cases. Seeing the magnitude of the impact caused by the Covid-19 pandemic and the lack of studies in Indonesia related to this is the background for this research to find out how the impact of the Covid-19 pandemic is on construction projects in Indonesia. The finding of this study reveals that supply chain in project construction as one of the sectors that has significant effect to Covid-19. The result of this study is one of few beginning endeavours to evaluate the impacts of the Covid-19 and to give the input in managing the transition for sustainability construction in Indonesia (Susanti, Fauziyah, & Pramesti, 2021).

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

Given that this study's main was to assess the skills requirements of the Real Estate and Construction Sector in Rwanda over the period 2020-2030, and to formulate policy recommendations to ensure that the future skills requirements in the sector can be addressed out to the end of NST1.

It was clear that Rwanda's real estate and construction sector displays a high level of informal employment, volatile employment relationships and a low level of payment. Working conditions within the sector are generally classified in four categories that is i) the Engineers, Architectures & other professionals, ii) specialised finishers, iii) the Masons and iv) the Casuals workers. However, the fourth category, are subjected to the worst working conditions and with very limited protection against on-the-job risks. It is clear that casual workers perceive jobs as a means to survive rather than an initial step on the sector's ladder. This means that it is not only hard, but also the pay is poor with no written employment contracts, and even the little paid delays to reach their hands.

Following the above-mentioned employment categories in the sector, it should be noted that each category requires relevant skills and knowledge to accomplish the work thereof.

6.2 Recommendations

The consulted stakeholders highlighted that the required skills in the real estate and construction sector are supervisors, engineers and architects, masons are required. While administrative, residential and commercial buildings with the exception of industrial buildings, hazardous buildings, and health facilities, skills in designs especially from architects and plans, and civil engineers are required. More so, building like residential and commercial including warehouses but not industrial, hazardous, and health facilities buildings, also need architects and plans skills from civil engineers

On the other hand, towers and antennas, and all other types of buildings require specific skills from experienced and certified engineers. This applies to other buildings including but not limited to sports and leisure facilities, social, cultural, assembly and religious, health facilities, educational, memorial sites for the Genocide against the Tutsi, industrial, and hazardous. One should not forget buildings, like those that do not require a building permit, and others like those specifically for national security excluding social, residential and commercial, and temporary shelter for returnees, refugees and internally displaced people.

Therefore, this study recommends for the skills development at different qualification levels given its critical importance towards encouraging innovations in the sector. This is because of the identified skills shortages persisting, particular at the level of highly skilled specialists. Attaining a better understanding of those young professionals' career paths in the different sub-sectors of

the real estate and construction sector enables to know better the causes and ramifications of different skills gaps affecting the development of this sector. This can be attained by introducing and strengthening of the young professional programme in the sector through mainstreaming the overall programme's cost right away from project planning processes. The costs will be covering or subsidising the remunerations (salary) of these young professionals (especially fresh graduates of engineering-related courses in sector) to help them get a pathway to find a first stable job.

This study as commends both the government and the private sector to adopt an on-the-job. Despite its importance, it was found out that companies or contractors do not invest in 'on-the-job' training especially in the ongoing projects where lower-skilled category workers exist due to the nature of contracts between the employee and the employer, hence limiting skills development thereof. The study also found out that there is informal recruitment of specialised by sub-contractors, indicating that employers has no obligation to invest in upskilling of these workers. This therefore calls for specific intervention to upskill workers in this sector by the government since private companies are reluctant thereof.

The study also commends for the evaluation of the skills development and knowledge transfer mechanism in this sector because according to the Occupations on Demand List (ODL) and Labour Market Testing (LMT), all experts hired through this mechanism are subjected to mandatory skills transfer to their Rwandan counterparts. This is because it was found out to be missing especially before the expiry or renewal of these work's permit. The study also points out lack of a proper monitoring mechanism of skills and knowledge transfer to Rwandan junior engineers working on the same project these experts hired through ODL or LMT.

In additional, the study recommends that the private sector involvement in TVET and Higher Education offering construction-related courses should be increased. This is an initiative that will promote and bring on board all the key players in sector to offer motivational speeches, teach specific courses in TVET and higher institutions offering construction courses, or even participate curriculum development. This will definitely lead to the production of relevant and required skills on the Rwandan labour market as well as affecting the entire job creation value chain.

More so, the study recommends the need for skills diversification in areas that have ties with the construction sector, enabling alternative employment in the field of facility maintenance or landscaping and introducing saving associations among workers on big projects as well as offering them entrepreneurship courses.

In developing recommendations, it is clear that the skills need in the Real Estate and Construction Industry are broad and, in some instances, complex. Addressing skills needs, the assessment recommended the actions in Table below: PSF will spearhead implementation of these recommendations by coordinating all stakeholders relevant looking at their roles:

Table : *Recommendations*

No	Recommendations	Responsible	Timeframe
1	Exploring the specific nature of the gap between the cognitive and transferable skills of graduates from courses related to the construction sector and the skills requirements of the companies in the different sub-sectors.	RP/TVB, MINEDUC, RDB, MINIFRA, Real Estate and Construction Firms	Medium – term
2	Setting up centrally coordinated upskilling programmes in stable long-term public projects (a combination of theoretical and practical modules), offering work opportunities abroad for young engineers to gain experience, developing practical refresher courses for TVET teachers as well as organizing practitioner lectures at TVET schools is very critical	RP/TVB, Real Estate and Construction Companies, RDB, MIFOTRA, Rwanda Institute of Architects	Short –term
3	Investing more in the development of STEM graduates and ensure that technology skills are embedded at the heart of a wide range of STEM-related programs	MINEDUC, RP/IPRCs/ TVET, Universities, other Training providers	Medium – term
4	Setting up a clear national framework for skilled trades level training and review the National Framework of Qualifications accordingly	MINEDUC, RP/IPRCs, RDB, RTB	Medium Term
5	Developing and Delivering tailored made modules/training courses, accredited work placements, or amending the curriculum within the education and training system to ensure that graduates produced and TVET leavers have relevant industry skills	MINEDUC, RP/IPRCs/TVETs, RDB, RTB	Medium Term
6	Establishing an accredited continuing learning system for professionals' qualifications, such as Chartered Institute of Building (CIOB) qualification, Construction Manager Certification Institute (CMCI);	MININFRA, Rwanda Institutes of Architects, RHA, RDB,	Medium Term
7	Institutionalize continuous professional development (CPD) and work-based learning programs	RDB, Construction Firms, MININFRA, RHA, CST	Long term

No	Recommendations	Responsible	Timeframe
8	Linking TVET/RP and Higher education provisions to industry needs	MINEDUC, MININFRA, RDB, RHA,	Long term
9	Institutionalise research and innovation development in advanced construction technologies	RP/TVB, CST, NIRDA, MININFRA, RHA	

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ANNEXES

Annex1: Companies sampled for Construction Sector Skills Assessment

N°	Name of Companies	Location/HO
1	AZIZA CONSTRUCTION LTD	Kigali, Nyarugenge
2	GM Engineering	Kigali, Gasabo
3	ABCD Ltd	Nyarugenge, Kigali
4	ESEC LTD	Kigali, Kicukiro
5	EMICORWA	Musanze, Northern Provine
6	Fair Construction Ltd	Gasabo District,
7	Murenzi Supply Company Ltd	Kicukiro, District
8	DND Developers	Gasabo District
9	UDL Ltd	Nyarugenge District
10	Huye Multi-Business Company Ltd	Huye, South Province
11	TECOS Ltd	Gasabo District, Kimihurura
12	NPD COTRACO Ltd	Kicukiro District
13	Horizon Construction	Gasabo District
14	Strong Construction Ltd	Nyarugenge District
15	ROKO Construction Rwanda Ltd	Kicukiro/Gikondo
16	SMEC Construction Company, Rwanda	Gasabo District
17	Kayonza General Supply and Construction Ltd	Kayonza, Estern Province
18	Horizon Construction	Gasabo Distirct
19	Water and Sanitation Corporation/ WASAC	Nyarugenge District
20	One and All Love Karongi Ltd	Karongi,Western Province
21	COFORWA	Muhanga District
22	Bems Duhange	Nyarugenge Kigali
23	Real Contracts	Kigali
24	Civil Engineering Works - Ngoma Ltd	Ngoma Estern Province
25	Urbcon Consultancy	Kigali
26	Thomas & Piron Grands Lacs	Kigali, Gikondo
27	China Road & Bridge Corporation Limited	Gasabo,Kigali
28	Swift Construction Aand Supply (Rwanda) Ltd	Nyarugenge Kigali
29	Ecosec (Musanze) Ltd	Musanze, Northern Province
30	China Geo-Engineering Corporation (C.G.C)	Kigali
31	Entreprise Mubirigi Paul	Nyarugenge,Kigali
32	Hydro Engineering Ltd	Nyarugenge Kigali
33	2020 Construction Ltd	Gasabo Kigali
34	Gakenke General Construction Ltd	Gakenke, Nothern Province
35	Entreprise Generale De Constructions (E.G.C)	Gasabo Kigali
36	EPOS	Kigali, Gasabo
37	GENESIS \GILGAL	
38	SAM Construction	Kigali, Gasabo
39	BIZIMANA CONSTRUCTION Ltd	Nyarugenge, Kigali
40	Sinco Ltd	
41	BETRA	Kigali, Gasabo
42	SOCOSE	Kigali, Gasabo
43	ENTRECOF	Kigali, Gasabo
44	Unique general supply	Kigali, Nyarugenge

N°	Name of Companies	Location/HO
45	RIHICO LTD	Muhanga
46	Loanne Supply Ltd	Gasabo
47	Rwanda Institute of Architects	Gasabo District
48	St Joseph Polytechnic	Nyarugenge, Kigali
49	IPRC	Kicukiro Nyaruygenge
50	University of Rwanda	Nyarugenge, Kigali
51	Chamber Construction	Gasabo, Kigali

ANNEX 2: Response rate as per category of Key Informants Interview

N°	Names of Companies	Expected Institutions/companies	Response Rate (%)
1	SOCOSE Ltd	1	100
2	Ultimate Developers Ltd	1	100
3	UDL	1	100
4	TECOSE	1	100
5	AZIZA CONSTRUCTION LTD	1	100
6	SMEC	1	100
7	AZIZA CONSTRUCTION LTD	1	100
8	GAKENKE ENGENEERING	1	100
9	GENESIS \GILGAL	1	100
10	EPOS	1	100
11	ABCD Ltd	1	100
12	BIZIZIMANA CONSTRUCTIION LTD	1	100
13	GM ENGINEERING	1	100
14	MURENZI SUPPLY	1	100
15	BETRA	1	100
16	DND DEVELOPERS	1	100
17	SAM CONSTRUCTION	1	100
18	ENTREC OF	1	100
19	DELTA	1	100
20	Unique general supply	1	100
21	ESEC LTD	1	100

22	RIHICO LTD	1	100
23	BEMS DUHANGE	1	100
24	EMICORWA	1	100
25	Sinco Ltd	1	100
26	Loanne supply ltd	1	100
27	AEBTP	1	1
28	Horizon	1	100
29	Fair Construction Ltd	1	100
30	St Joseph Polytechnic	1	100
31	Private School Association	1	100
32	IPRC Kigali	1	100
33	Rwanda Polytechnic	1	100
34	EGC Ltd/ Entreprise Generale de Constructions	1	100
35	One and All Love Karongi Ltd	1	1
36	Chamber Construction	1	100
37	Civil Engineering Works		
38	Industry Chamber /Chairperson	1	100
39	NPD Cotraco	1	100
40	Rwanda Institute of Architects	1	100
41	WASA Corporation	1	100
42	2020 Construction Ltd	1	100
43	General Supply and Construction Ltd	10	100
	Total	43	100