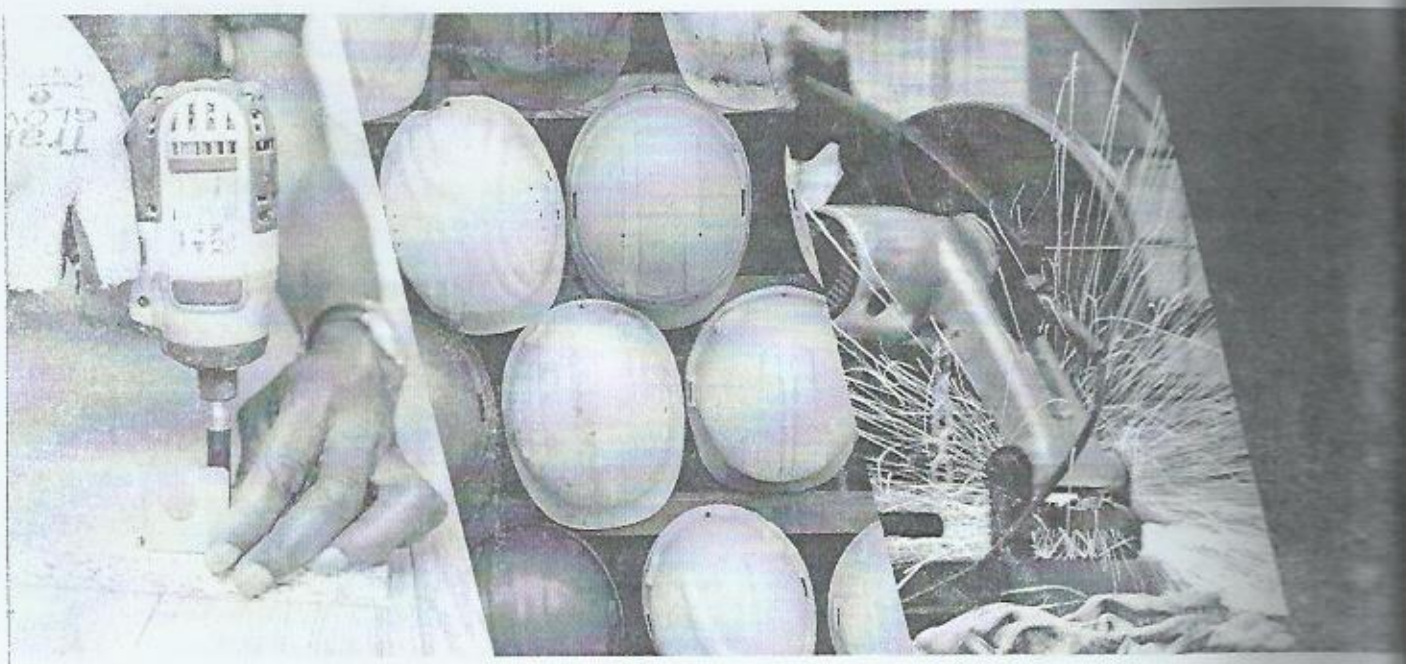
DUT DURBAN UNIVERSITY OF TECHNOLOGY



PROCEEDINGS OF THE CONSTRUCTION BUSINESS & PROJECT MANAGEMENT CONFERENCE

THEME: Conceptualising challenges and opportunities in the construction industry

24 - 25 JUNE 2021

UCT GRADUATE SCHOOL OF BUSINESS, ACADEMIC CONFERENCE CENTRE
CAPE TOWN, SOUTH AFRICA

Proceedings of the Construction Business and Project Management Conference
Cape Town, South Africa, 24 – 25 June, 2021.

First published: June 2021, Cape Town, South Africa

Published by:
Department of Construction Economics and Management
University of Cape Town, Cape Town, South Africa
Rondebosch,
7701,
Cape Town, South Africa

ISBN - 978-0-620-91653-0

Correspondence:
All correspondence relating to the Construction Business and Project Management Conference should be addressed to:

Professor Abimbola Olukemi Windapo (Chair)
University of Cape Town, South Africa
Abimbola.windapo@uct.ac.za

Dr Ayodeji Olatunji Aiyetan (Co-chair)
Durban University of Technology, South Africa
Ayodejia@dut.ac.za

DECLARATION

Eighty-one submissions were received for the Conference from 30 Universities, Polytechnics and Organisations located in Australia, Ghana, India, Malaysia, New Zealand, Nigeria, South Africa, the United Kingdom and Zambia, out of which 41 full papers were accepted. All full papers in this publication went through a double-blind peer-review process which involves abstracts assessment by the scientific committee, feedback to authors on abstracts submitted, submission of full papers for the accepted abstracts, review of full papers by the scientific committee and panel of reviewers, feedback to authors on full papers submitted which included a decision on acceptance and evaluation of the revised papers by the scientific committee and reviewers to ensure the quality of content.

CBPM 2021 Conference Stats

Abstract/Full Paper	Full Paper	
Institutional Affilliation	**Count of Affiliation**	**Affiliation (%)**
Durban University of Technology	4	7.02%
Ahmadu Bello University, Zaria	4	7.02%
University of Cape Town	4	7.02%
Nelson Mandela University	3	5.26%
University of South Africa	3	5.26%
Federal University of Technology, Minna	3	5.26%
Moshood Abiola Polytechnic, Abeokuta	3	5.26%
Obafemi Awolowo University, Ile-Ife	3	5.26%
Univerisity of Ilorin	3	5.26%
Univerisity of Kwa-Zulu Natal	3	5.26%
University of Johannesburg	2	3.51%
University of The Free State	2	3.51%
Kingston University, London	2	3.51%
Walter Sisulu University	2	3.51%
Niger State Polytechnic, Zungeru	1	1.75%
Curtin University	1	1.75%
Kwame Nkrumah University of Science and Technology	1	1.75%
Denel	1	1.75%
Akwa Ibom State Polytechnic, Akwa Ibom	1	1.75%
Olabisi Onabanjo University, Ago-Iwoye	1	1.75%
Department of Science and Innovation, South Africa	1	1.75%
Stellenbosch University	1	1.75%
Modibbo Adama University, Yola	1	1.75%
University of the Witwatersrand	1	1.75%
University of Manchester	1	1.75%
Waziri Umaru Federal Polytechnic, Birnin Kebbi	1	1.75%
Darik Homes Limited, Abuja	1	1.75%
The Federal Polytechnic Ilaro	1	1.75%
Bayero University, Kano	1	1.75%
The Oke-Ogun Polytechnic Saki	1	1.75%
Grand Total	**57**	**100.00%**

SCIENTIFIC COMMITTEE / REVIEW PANEL

Abimbola Windapo	University of Cape Town, South Africa (Chair)
Abdullateef Olanrewaju	Universiti Tunku Abdul Rahman (UTAR), Malaysia
Adewumi Babafemi	Stellenbosch University, South Africa
Afolabi Dania	University of Westminster, United Kingdom
Ankur Singh Bist	Govind Ballabh Pant University of Agri. and Tech., India
Balimu Mwiya	University of Zambia, Zambia
Charles Kahanji	University of Zambia, Zambia
Chikezirim Okorafor	Durban University of Technology, South Africa
Chinedu Adindu	Federal University of Technology, Minna, Nigeria
Das Dillip	University of KwaZulu-Natal, South Africa
Ephraim Munshifwa	The Copperbelt University, Kitwe, Zambia
Erastus Mwanaumo	University of Zambia, Zambia
Fidelis Emuze	Central University of Technology, South Africa
Francesco Pomponi	University of Cambridge, United Kingdom
Franco Muleya	The Copperbelt University, Kitwe, Zambia
George Ofori	London South Bank University, United Kingdom
Henry Deacon	University of the Free State, South Africa
Ikechukwu A. Diugwu	Federal University of Technology, Minna, Nigeria
Iruka Anugwo	Durban University of Technology, South Africa
Jack Goulding	Northumbria University, United Kingdom
James Rotimi	Massey University, New Zealand
Jan Wium	Stellenbosch University, South Africa
John Smallwood	Nelson Mandela University, South Africa
Kathy Michell	University of Cape Town, South Africa
Kenneth Lawani	Glasgow Caledonian University, United Kingdom
Lindelani Matshidze	University of the Witwatersrand, South Africa
Makgopa F Tshehla	University of South Africa, South Africa
Mochelo Lefoka	University of Cape Town, South Africa

Nicholas Chileshe	University of South Australia, Australia
Nofiu Musa	Obafemi Awolowo University, Ile-Ife, Nigeria
Oluwole Olatunji	Curtin University, Australia
Ruben Ndihokubwayo	Walter Sisulu University, South Africa
Samuel Chikafalimani	Durban University of Technology, South Africa
Sunday Odediran	Obafemi Awolowo University, Ile-Ife, Nigeria
Tariq Umar	A'Sharqiyah University, Oman
Tunde Oladokun	Obafemi Awolowo University, Ile-Ife, Nigeria
Yewande Adewunmi	University of the Witwatersrand, South Africa
Zakari Mustapha	Cape Coast Technical University, Ghana
Zakheeya Armoed	Durban University of Technology, South Africa

PROGRAMME

Construction Business and Project Management Conference, 24-25 June 2021
Venue: UCT Graduate School of Business, Cape Town/Online
Theme: Conceptualising Challenges and Opportunities in the Construction Industry

Day 1 - Thursday, June 24th			
2021-06-24	8:30-09:00	**Registration and Welcome (Prof Bheki Twala)**	
2021-06-24	09:00-09:30	**Keynote Address 1**	
	09:00-09:30	S1	**Dr Kgosientso Ramokgopa. Contextualizing Infrastructure Delivery and Management in South Africa**
2021-06-24	09:30-11:10	Session 1: Day 1: Session A. Session Chair - Prof. Abimbola Windapo	
	09:30-09:48	2	Kehinde Alade and Abimbola Windapo. A leadership and strategic decision framework for construction company survival.
	09:48-10:06	36	Luyanda Ngomane and Nthatisi Khatleli. Rethinking Resilience: A review of the infrastructure management capability maturity levels in South African category B4 municipalities: The Case of Nyandeni Local Municipality
	10:06-10:24	58	Oluwole Olatunji and Ephraim Osaghae. Dynamic Capabilities in Multicultural Project Teams: Conceptual Review, Framework Analysis, and Practical Implications
	10:24-10:42	61	Tselane Chicks and Makgopa Tshehla. Procurement Innovation and Transformation in Commercial State-Owned Enterprises (SOES) – Infrastructure Projects
	10:42-11:10	81	Amit Rambaruth, Jamila Khatoon Adam and Suresh Babu Naidu Krishna. Strategic Management in construction firms with focus on small and medium enterprises: A case study of eThekwini, South Africa
2021-06-24	11:10-11:30	Session: Tea Break	
2021-06-24	11:30-13:00	Session 2: Day 1: Session B. Session Chair - Dr Ayodeji Aiyetan	
	11:30-11:48	18	Chinedu Adindu, Chioma Okoro, Ikechukwu Diugwu and Saheed Yusuf. Prospects of Multi-skilling as Strategic Construction labour response to Covid-19 Pandemic: A Study of selected Projects in the Federal Capital Territory area councils, Nigeria.

Table of Contents

Prospects of Multiskilling as a Construction Labour Deployment Strategy during Covid-19 Pandemic Post-lockdown Era in Nigeria: A Study of Selected Projects in Abuja Municipal Council

Adindu, Chinedu Chimdi[1]*; Okoro, Chioma Sylvia[2]; Diugwu, Ikechukwu A.[3] and Yusuf, Saheed Olanrewaju[4]

[1,3,4]Department of Project Management Technology, Federal University of Technology, Minna, Nigeria.

[1,3,4]Email: chinedu.adindu@futminna.edu.n; i.diugwu@futminna.edu.ng; so.yusuf@futminna.edu.ng

[2]Department of Finance and Investment Management, University of Johannesburg, Johannesburg, South-Africa

Email: chiomao@uj.ac.za

Abstract:

Construction labour constitute critical resource in nation's infrastructure delivery. Management of some construction organizations during the post-lockdown era in Nigeria's federal capital territory (FCT), adopted multiskilling as a strategic response to the ravaging effects of COVID-19 on site labour-force, by minimizing their number of tradesmen without loss of planned productivity, continuity and quality targets. This study examined the extent to which multiskilling of construction tradesmen led to achievement of planned productivity levels, continuity of operations, and extent to which output quality of multiskilled tradesmen compared with traditional single trades. Descriptive survey research methodology was adopted with structured questionnaire as research instrument administered to a sample of 210 respondents selectively chosen from a study population of 380 project site administrators in six towns of Abuja municipal council. Study's results showed that adoption of multiskilling at the project sites achieved high productivity (0.76), ensured high continuity (0.77), and produced comparably high-quality standards (0.74). From the findings, a legislation of construction trade multiskilling would serve as a strategic response to site-level human capacity planning and scheduling of tradesmen, towards maintenance of planned productivity, continuity, quality performance, and workmen safety during post-lockdown era of COVID-19 pandemic in Nigeria.

Keywords:

Construction tradesmen, COVID-19 pandemic, multi-skilling, post-lockdown, Nigeria

1 Introduction

Wuhan, China, sometime in December 2019, experienced an outbreak of the novel Coronavirus. This disease was said to have killed over 1,800 and infected 70,000 individuals within the first 50 days of the epidemic (Sheeran, et al., 2020). The disease was spread mostly through person-to-person contact, and the virus responsible was named Covid-19, by Chinese researchers. The World Health Organization (WHO) declared the Covid-19 outbreak a pandemic on March 11, 2020 as the virus continued to spread across countries and continents. By late November, 2020, the WHO recorded over 61.8 million confirmed cases globally with

over 1.4 million reported deaths since the start of the pandemic (WHO, 2020). The pandemic led to consequential adverse impact on social-economic activities globally, as such, Nigeria was not spared. Gamol & Alhager, (2020) identified the most significant consequences of COVID-19 pandemic on the construction industry as suspension of projects, labour impact and job loss, time overrun, cost overrun, and financial implications.

Unlike many other sectors, the construction industry requires nearly all categories of workers to perform or monitor work activities to ensure effective project delivery (Gamol & Alhager, 2020). Hence, during the pandemic, construction firms faced more challenges and had to seek for flexible ways to maintain workflow, site productivity and output quality without exposing the workforce to the dangers of COVID-19 virus, by adopting a physical distancing, non-pharmaceutical labour deployment strategy known as multiskilling. The opportunity for flexible working is a distinguishing feature of modern construction industry work culture. It is considered beneficial to both employers and employees. For the employee, it gives room for leveraging on skills, hence, the ability to go undertake tasks beyond immediate roles. Multiskilling is part of an organization's deliberate change strategy, with the objective of improving efficiency, competitiveness, reducing costs, improving quality, and increasing production (Horbury & Wright, 2001). Chapman, (2020) states that multiskilling is particularly ideal during unpredictable business climate, where need for downsizing of labourforce arise, and in situations that necessitate a freeze in recruitment. The theory of labourforce down-sizing in the wake of unpredictable business climate occasioned by COVID-19 pandemic, necessitating physical distancing, a non-pharmaceutical prevention measure, constitutes the fundamental premise in which this study on 'multiskilling' is underpinned.

1.1 Problem Statement and Justification of the Study

The construction industry is labour-intensive and its activities made-up of several crafts (Lill, 2009) with labour costs constituting a critical component of the overall development cost, despite improved level of mechanization of activities in recent years (Gunduz & Abu-Hijleh, 2020; El-Gohary & Aziz, 2014). The industry requires nearly all categories of workers to perform or monitor work activities to ensure effective project delivery. This, under the new normal is not feasible due to the Covid-19 pandemic. Also, the growing demand for environmentally sustainable construction imply that traditional practices must change. These are issues that require new ways of thinking, necessitating new approaches to established conventions to maintain tempo of activities without loss of productivity, while meeting contractual obligations of time, cost, and functionality (Kalirajan & Babu, 2019).

Multiskilling is an innovative labour planning and scheduling strategy by which few workmen each with multi-skills are deployed on activities and processes to maintain required workflow and productivity. Unfortunately, COVID-19 pandemic does not occur regularly in the course of human existence, as such, pioneering researches are scarce and to a large extent non-existent especially as it relates to construction labour management. Construction firms can exploit this innovation to boost productivity level, quality, safety, and improve project management (Maskuriy et al., 2019), as well as competitive advantage (Aghimien, 2019).

1.2 Aim of Study

This study explores multiskilling, a flexible labour planning and scheduling strategy, that deploys tradesmen with capability to perform two or more roles, without compromise to site productivity targets and as a non-pharmaceutical strategic response that promotes physical

distancing with the aim of substantially minimizing the numerical strength of traditional workforce, to guard against the spread of COVID-19 during the post-lockdown era.

1.3 Objectives of the Study

1. to examine the extent to which multiskilling of construction tradesmen achieved planned productivity levels during COVID-19 post-lockdown era
2. to assess the extent to which multiskilling ensured continuity of operations during COVID-19 post-lockdown era
3. to evaluate the extent to which output quality of multiskilled tradesmen compared with traditional single trades during COVID-19 post-lockdown era

2 Literature Review

2.1 Global Overview of the Construction Industry and Multiskilling Technique

The construction industry plays a strategic role in infrastructure provisioning (Soe & Cho, 2014) and in general economic development of a nation (Gunduz & Abu-Hijleh, 2020). Majority of industrial sectors including the construction sector are now considering new ways of increasing productivity, optimizing resources, raising profits and reducing costs (Bojarska & Wińska, 2019; Livotov et al., 2019; and Craveiro et al., 2019). Wright, (1996) case studies on 'Business re-engineering and health and safety management' revealed that multiskilling was used by eight out of the ten companies studied. The study observed that the multiskilled companies were from various economic sectors, namely: railways, aircraft industry, chemical manufacturing, and power generation.

The core elements of multiskilling flexible production system include- training of multiskilled workers and job rotation, characteristic of many Japanese steel plants in the late 1950s and early 1960s. Various researches corroborate the growing adoption of this flexible production systems in many Japanese corporations, involving broad skills and decentralization of specialization (Aoki, 1988; Lincoln & Kalleberg, 1990, Kagono, et al., 1985).

Andersen & Ankerstjerne, (2010) views multiskilling as a system of job design that enables an individual to perform two or more traditionally separate job functions. In doing this, some degree of training is required to help a multiskilled worker function effectively. On the contrary, multitasking though similar, do not necessarily involve training of any kind. Andersen & Ankerstjerne, (2010), identifies three dimensions of multiskilling, namely:

1. Vertical multiskilling – The employee is given a managerial function, involving supervision, an administrative task, leading or coordinating a self-managed team. By so doing, the employee develops his managerial skills and trust.
2. Horizontal multiskilling – The employee embarks on additional task(s) that are at the same level with his or her normal task.
3. Depth multiskilling – The employee acquires a set of complex skills within the main job function to enable him offer a more comprehensive, qualitative and value-added service to the client.

The practice of multiskilling eventually found its way into other industrial sectors including construction in the post-war period. Ejohwomu et al., (2006) citing Burleson et al., (1998) empirical study, revealed multiskilling as having the following benefits, in US construction sector - 5-20% savings in labour cost, 35% reduction in labour requirement, a 47% elongation of workers' average employment period, and an increase in workers' earning potential. Horbury & Wright, (2001), state that multiskilling impacts organizations' performance in several ways, including- task continuity, task supervision and coordination, resource flexibility, team deployment, staff morale, and job satisfaction. Chapman (2020), declared that to the service providers, 'multiskilling resulted in better project deliverables and also enhanced productivity'.

3 Research Methodology

This empirical study involved descriptive survey research design in which structured questionnaire was administered to a sample size comprising 210 project site administrators purposively selected from a study population of 380, working on ongoing public and private building projects in six towns of Abuja Municipal Council (AMC) area, namely- Asokoro, Garki, Wuse, Maitama, Wuye, and Utako. The projects were undertaken by medium to large sized building construction firms, each with operational experience spanning over 10 years, and pre-COVID-19 labourforce ranging between 150-250 workers, with large stock of construction plant/ equipment holding, and a capital base each, in excess of N5Billion. 210 out of the 380 active project sites in the municipality practice multiskilling as a deliberate construction labour strategy of physical distancing, a non-pharmaceutical measure, aimed at minimizing the numerical strength of construction personnel in the ardent effort to guard against the contact and spread of COVID-19 amongst the workforce during the post-lockdown era.

A total of 176 responses were received out of the 210 questionnaires issued to different project site administrators whose nomenclatures varied depending on the site of works, namely-project managers, site agents, contract managers, site managers, other site administrators amongst the above six stated towns of Abuja municipality, thus, representing 83.31% response rate. Study revealed that 86.53% of the project site administrators were involved in site-level human resource management, especially in the areas of construction labour recruitment, selection, placement, scheduling, deployment, training and development, health and safety, discipline, promotion, demotion, and withdrawal/termination of services.

The trades that practiced several combinations of multiskilling, majorly 2-4 skills per tradesman, included block/bricklaying, masonry, carpentry, joinery, fitters, tilers, painters, plumbers, electricians, roofers, concreting, and helpers. The study adopted factor analysis (FA) approach in the analysis of Table 3 (Objective-1), Table 4 (Objective-2), Table 5 (Objective-3), and Table 6 (Objective-4). Likert 5-point scale was adopted as response metric for items of survey, in descending order of scale, viz; TGE-to a great extent (5); TCE- to a considerable extent (4); TME-to a moderate extent (3); TLE- to a low extent (2); and TNE- to a no extent (1), thus, following the path established by several scholars and researchers in the social sciences. This research was conducted for a period of 22 weeks, specifically between mid-September, 2020 and end of February, 2021.

4 Findings and Discussion

Table 1 shows that a majority of the respondents were male site administrators (89.21%) while a few were females (10.79%). The distribution of educational qualification of the respondents are as follows: PhD (1.14%); MSc/MTech (18.75%), BSc/BTech (28.98%), HND/OND (44.32%), and others (6.81%); hence, a majority of the project site administrators possessed between HND/OND - BSc/BTech (73.30%). The job experience of respondents was as follows; below 10 years (7.95%), 11-15years (38.07%), 16-20 years (40.43%), over 20 years (13.55%); hence a majority of the project site administrators had a minimum job experience of 11years (78.50%). Adjudging from the results of the studies, it can be deduced that majority of the respondents (project site administrators) attained reasonable education level, and also possessed considerable wealth of industry experience. As such, their responses would be considered a fair sense of judgment on issues raised by the survey.

Table 1. Descriptive Statistics of Respondents (Project site administrators)

Demographics	Categories	Frequency	Percent (%)
Gender	Male	157	89.21
	Female	19	10.79
	Total	176	100.00
Education Level	PhD	2	1.14
	MSc. /MTech.	33	18.75
	BSc. /BTech	51	28.98
	HND/OND	78	44.32
	Others	12	6.81
	Total	176	100.00
Job experience in years	Below 10years	14	7.95
	11 – 15 years	67	38.07
	16 – 20 years	71	40.43
	Over 20 years	24	13.55
	Total	176	100.00
Designation/Job position	Project Manager	29	16.48
	Site Agent	47	26.71
	Contract Managers	38	21.59
	Site Manager	33	18.74
	Othersite Administrators	29	16.48
	Total	176	100.00

Source: Authors' Field Survey, 2020-2021

Table 2 shows that a total of 210 questionnaires were issued as follows: Asokoro-32, Garki-33, Wuse-38, Maitama-34, Wuye-37, and Utako-36. A total of 176 valid responses were received from different designations of project site administrators across the six selected towns in Abuja Municipal Council, namely: Project managers (16.48%), Site agents (26.71%), Contract managers (21.59%), Site managers (18.74%), and other site administrators (16.48%). The distribution of the return rates according to the selected towns are as follows: Asokoro (81%), Garki (76%), Wuse (95%), Maitama (82%), Wuye (92%), and Utako (75%). Results show that each of the towns had a relatively high response rate when compared with the number issued.

Table 2. Descriptive Statistics of Questionnaires distributed and responses received from different site administrators in selected towns of Abuja Municipal Council (AMC) during COVID-19 post-lockdown era.

Selected towns in AMC	Project Managers (16.48%)			Site Agents (26.71%)			Contract Managers (21.59%)			Site Manager (18.74%)			Other Site Administrators (16.48%)			Total Nr Issued/ Returned		
	NI	NR	%	NI	NR	%	NI	NR	%	NI	NR	%	NI	NR	%	NI	NR	%
Asokoro	3	2	67	9	8	89	3	2	67	10	9	90	7	5	71	32	26	81
Garki	5	3	60	7	6	86	7	6	86	10	8	80	4	2	50	33	25	76
Wuse	9	9	100	12	11	92	5	5	100	2	2	100	10	9	90	38	36	95
Maitama	4	3	75	7	5	71	8	7	88	6	6	100	9	7	77	34	28	82
Wuye	8	8	100	8	7	88	13	12	92	5	5	100	3	2	67	37	34	92
Utako	6	4	67	13	10	77	7	6	86	4	3	75	6	4	67	36	27	75
TOTAL	35	29	85	56	47	84	43	38	88	37	33	89	39	29	74	210	176	83.81

NI = Number of Questionnaires issued; NR = Number of Questionnaires returned; % = Percentage of Questionnaires Returned

Source: Authors' Field Survey, 2020-2021

Objective 1: To examine the extent to which multiskilling of construction tradesmen achieved the planned productivity levels during COVID-19 post-lockdown era

Table 3, measures the extent to which multiskilling achieved planned productivity levels in construction trades during COVID-19 post lock-down era. The results show a weighted agreement factor of 0.75 for Asokoro, 0.72 (Garki), 0.74 (Wuse), 0.81 (Maitama), 0.79 (Wuye), and 0.77 (Utako). The weighted agreement factors for achievement of planned productivity (APP) construct in the six towns was relatively high. The average agreement factor (AAF) for APP construct is 0.76, and well above 0.70. This high result aligns with the study of Kalirajan & Babu, (2019), which stated that new approaches to conventional construction practices were necessary without loss of productivity. Study results also averred with the researches of Bojarska & Wińska, (2019); Livotov et al., (2019); and Craveiro et al., (2019), which stated that majority of industrial sectors including the construction sector are now considering new ways of increasing productivity, optimizing resources, raising profits and reducing costs.

Table 3. Extent to which multiskilling of construction tradesmen achieved the planned productivity levels during COVID-19 post-lockdown era

S/No	Town in Abuja Municipal Council (AMC)	No of Multiskilling sites studied in the Town	No of Multiskilling sites that responded	% response	Responses TGE.....TNE					Weighted Agreement Total (WAT)	Weighted Agreement Factor (WAF)
					5	4	3	2	1		
1	Asokoro	32	26	81	8	10	3	3	2	97	0.75
2	Garki	33	25	76	9	9	4	2	1	90	0.72
3	Wuse	38	36	95	11	15	6	4	2	133	0.74
4	Maitama	34	28	82	13	8	4	2	1	114	0.81
5	Wuye	37	34	92	10	16	5	3	-	135	0.79
6	Utako	36	27	75	7	14	3	1	2	104	0.77
	TOTAL	210	176	83.81	58	67	30	15	8	673	4.58/6 AAF=0.76

Weighted Agreement Total (WAT); Weighted Agreement Factor (WAF); Average Agreement Factor (AAF)

Source: Authors' Field Survey, 2020-2021

4.2 **Objective 2:** To assess the extent to which multiskilling ensured continuity of operations during COVID-19 post-lockdown era

Table 4. Extent to which multiskilling ensured continuity of operations during COVID-19 post lock-down era

S/No	Town in Abuja Municipal Council (AMC)	No of Multiskilling sites studied	No of Multiskilling sites that responded	% response	Responses TGE..... .....TNE					Weighted Agreement Total (WAT)	Weighted Agreement Factor (WAF)
					5	4	3	2	1		
1	Asokoro	32	26	81	11	8	5	2	-	106	0.82
2	Garki	33	25	76	7	10	4	3	1	94	0.75
3	Wuse	38	36	95	12	9	7	5	3	130	0.72
4	Maitama	34	28	82	9	10	6	2	1	108	0.77
5	Wuye	37	34	92	10	13	8	3	-	132	0.78
6	Utako	36	27	75	8	11	4	2	2	102	0.76
	TOTAL	210	176	83.31	57	61	34	17	7	672	4.60/6 AAF=0.77

Weighted Agreement Total (WAT); Weighted Agreement Factor (WAF); Average Agreement Factor (AAF)
Source: Authors' Field Survey 2020-2021

Table 4, measures the extent to which multiskilling ensured continuity of operations in construction trades during COVID-19 post lock-down era. The results show a weighted agreement factor of 0.82 for Asokoro, 0.75 (Garki), 0.72 (Wuse), 0.77 (Maitama), 0.78 (Wuye), and 0.76 (Utako). Similarly, the weighted agreement factors for achievement of continuity in operations (ACO) construct in the six towns was relatively high. The average agreement factor (AAF) for ACO construct is 0.77, and well above 0.70. This result aligns with Horbury & Wright, (2001), which stated that multiskilling impacts organizations' performance in several ways, including- task continuity amongst others.

4.3 **Objective 3:** To evaluate the extent to which output quality of multiskilled tradesmen compared with traditional single trades during COVID-19 post-lockdown era

Table 5: Extent to which output quality of multiskilled tradesmen compared with traditional single trades during COVID-19 post-lockdown era

S/No	Town in Abuja Municipal Council (AMC)	No of Multiskilling sites studied	No of Multiskilling sites that responded	% Response	Responses TGE.....TNE					Weighted Agreement Total (WAT)	Weighted Agreement Factor (WAF)
					5	4	3	2	1		
1	Asokoro	32	26	81	10	7	4	3	2	98	0.75
2	Garki	33	25	76	8	9	5	2	1	96	0.77
3	Wuse	38	36	95	12	11	8	3	2	136	0.76
4	Maitama	34	28	82	7	13	4	2	2	105	0.75
5	Wuye	37	34	92	9	12	7	4	2	124	0.73
6	Utako	36	27	75	8	9	7	2	1	94	0.70
	TOTAL	210	176	83.31	54	61	35	16	10	653	4.46/6 AAF=0.74

Weighted Agreement Total (WAT); Weighted Agreement Factor (WAF); Average Agreement Factor (AAF)
Source: Authors' Field Survey, 2021-2021

Table 5, measures the extent to which output quality of multiskilled tradesmen compared with traditional single trades during COVID-19 post lock-down era. The results show a weighted agreement factor of 0.75 for Asokoro, 0.77 (Garki), 0.76 (Wuse), 0.75 (Maitama), 0.73 (Wuye), and 0.70 (Utako). Similarly, the weighted agreement factors for achievement of single trades output quality (SOQ) construct in the six towns was relatively high. The average agreement factor (AAF) for SOQ construct is 0.74, and well above 0.70. The result of the study aligns with that of Chapman (2020), which stated that to the service providers 'multiskilling resulted in better project deliverables (quality output) and also enhanced productivity'.

5 Conclusions and Further Research

The most significant impacts of COVID-19 pandemic on the Nigerian construction industry included suspension of projects, labour downsizing and job losses, construction time and cost overruns, and several others. In view of these challenges, construction firms had to seek for flexible ways to maintain workflow, site productivity and output quality without exposing the workforce to the dangers of COVID-19 virus, by adopting a physical distancing, non-pharmaceutical labour deployment strategy known as multiskilling.

This study examined the extent to which multiskilling of construction tradesmen during COVID-19 post-lockdown era, led to achievement of planned productivity levels; ensured continuity of operations; and the extent to which output quality of multiskilled tradesmen compared with traditional single trades. Descriptive study research methodology was employed and the research instrument involved structured questionnaire administered to 210 project site administrators working in Asokoro, Garki, Wuse, Maitama, Wuye, and Utako towns of Abuja Municipal Council, representing 83.81 response rate. Data obtained from study's results was analysed using factor analysis statistical technique. The studies showed that multiskilling of tradesmen achieved high productivity (0.76), ensured high workflow continuity (0.77), and attained comparably high-quality standards (0.74). From the findings, government legislation of construction trade multiskilling would serve as a strategic response to site-level human capacity planning and scheduling, in ensuring productivity, continuity, quality performance, and workmen safety at construction sites during COVID-19 pandemic post-lockdown era. The study recommends a further research on 'the level of awareness and degree of adoption of multiskilling' in construction firms in Nigeria's North-central geo-political zone.

6 References

Aghimien, D. (2019). Digitalization as a Veritable Option for Construction Organizations to Achieve competitive advantage. *Proceedings of the International Conference on Innovation, Technology, Enterprise and Entrepreneurship – ICTTEE 2019 Kingdom of Bahrain*. pp 429-436

Andersen, M.K & Ankerstjerne, P. (2010), Multiskilling and Job Satisfaction in Outsourcing, *AspectorISS White Paper*, August, 2010.

Aoki, M. (1988), *Information, Incentives, and Bargaining in the Japanese Economy*. Cambridge University Press, Cambridge, 1988.

Bojarska, A.T & Wińska, E. (2019), Digitization in Construction; *Builder Science*. DOI: 10.5604/01.3001.0013.3421

Burleson, R., Haas, C., Tucker, R., & Stanley, A. (1998). Multiskilled Labour Utilization Strategies. *Journal of Construction Engineering and Management*, ASCE, 124(6), 480-9

Chapman, T (2020). Multiskilling (www.businessballs.com).

Craveiro, F., Duarte, J.P., Bartolo, H., & Bartolo, P.J. (2019) Additive manufacturing as an enabling technology for digital construction: A perspective on construction 4.0. *Automation in Construction*, 103, 251–267.

Ejowhomu, O A., Proverbs, D G., & Olomolaiye, P (2006) Multiskilling: a UK Construction and Building Services Perspective. In: Boyd, D. (Ed) Proes 22nd Annual ARCOM Conference, 4-6 September 2006, Birmingham, UK. Association of Researchers in Construction Management, 885-894.

El-Gohary K.M & Aziz, R. F (2014) "Factors Influencing Construction Labor Productivity in Egypt," Journal of Management in Engineering, Vol.30(1), pp. 1-9.

Gamol, Y., & Alhagar, A. (2020). The Impact of pandemic Crisis on the Survival of Construction Industry: A case of COVID-19. *Mediterranean Journal of Social Sciences*. Vol. 11 No 4, page 122-128

Gunduz, M., & Abu-Hijleh, A. (2020), Assessment of Human Productivity Drivers for Construction Labour through Importance Rating and risk mapping. Sustainability 2020, 12, 8614; Doi:10.3390/12208614.

Horbury, C., & Wright, M (2001), Development of a Multiskilling Life Cycle Model. *Contract Research Report 328/2001 for Health and Safety Executive*, Green Street Berman Ltd.

Kagono, T., Nonaka, I., Sakakibara, K., & Okumura, A (1985), Strategic vs. Evolutionary Management: A U.S.-Japan Comparison of Strategy and Organization, North-Holland, Amsterdam.

Kalirajan, S., & Babu, M. S. (2019). Digitalization in Construction. Smart Materials and Techniques for Sustainable Development. *(SMTS-19)*. Available online: https://www.researchgate.net/publication/333746431 [Accessed 25/01/2021] Page 91-105

Lill, I. (2009), Multiskilling in Construction- a Strategy for Stable Employment. *Technological and Economic Development of Economy*, 15 (4):540-560. DOI:10.3846/1392-1392-8619.2009.15.540-560

Lincoln, J. R., & Kalleberg A. L. (1990), *Culture, Control, and Commitment*. Cambridge University Press, Cambridge.

Loosemore, M., Dainty, A., & Lingard, H (2003), *Human Resource Management in Construction Projects: Strategic and Operational Approaches*, London: Spon press.

Livotov, P., Sekaran, A.P.C., Law, R., Reay, D., Sarsenova, A., & Sayyareh, S. (2019). Eco-innovation in Process Engineering: Contradictions, Inventive Principles and Methods; Elsevier Ltd.: Amsterdam, The Netherlands, Volume 9.

Maskuriy, R., Ali, S., Kherun, N. A., Maresova, P., & Ondrej, K. (2019). Industry 4.0 for the Construction Industry-How Ready is the Industry? *Appl.*, 9, 2819; doi:10.3390/app9142819

ReportLinker (2019), Global Construction Outlook to 2023-Q4 2019 Update https://www.reportlinker.com/p05751454/Global-Construction-Outlook-to-Q4-Update.html

Sheeran, M. A., Khan S., Kazma, A. Bashir, N. & Siddique, R. (2020) Covid-19 Infection: Origin, Transmission and Character of Human Coronavirus. *Journal of Advanced Research*, Vol 24 pp. 91-98.

Soe, N.C., & Cho, A.M (2014), Current Practices on Labour Management in Building Construction Projects, International Journal of Scientific Engineering and Technology Research Volume.03, Issue No.10, May-2014, Pages: 2017-2021

WHO (2020), COVID-19 Weekly Epidemiological Update

Wright, M (1996) Business Re-Engineering, Health and Safety Management Case Studies, 125/1996, HSE Books.