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Digital Skills and the Use of Digital Platforms in the Informal Sector: A Case Study Among Jua Kali Artisans in Nairobi in Kenya

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Abstract

Context: For many businesses, one of the key indicators in their management is the adaptation of Information Technology in their operations. In Kenya, there has been a phenomenal growth in access to mobile phones, by June 2023, over 66 million mobile phones were connected to various telecommunication operators of which 58.3% were smart phones constituting 67.1% of internet connections. There are many digital technologies which can be adapted to facilitate the processing, dissemination, and access of information. The modern world has become competitive due to the uptake of Information Technology as one of the main business management skill, with the availability of smart phones and many applications that are easily available and easy to use. One of the main beneficiaries of Information Communication Technologies (ICTs) is the Jua Kali artisans who are a key player in the Kenyan economy. Entrepreneurial competencies help the growth of businesses along the dimension of innovation. Kenya intends to entrench the use of Information Technology for public service delivery, business, skills, and innovation. The Jua Kali sector cannot be ignored, it contributes more than 80% of the total employment in Kenya.

Approach: This research was carried out in the Eastlands of Nairobi, Kenya. Data were collected using a questionnaire, an interview and observation schedule. The study used an

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interview schedule to collect data from Jua Kali artisans carrying out their artisan businesses in the Eastlands of Nairobi and a questionnaire survey to collect data from a sample of identified Nairobi residents who had engaged an artisan to work for them six months prior to the research.

Findings: The research established that most Jua Kali artisans acquired their skills in the Jua Kali sector by apprenticeship (86.3%) while a small percentage (12.7%) trained in Technical Vocational Education Training (TVET) institutions while a further one percent were trained by their former employers. Most of the artisans had attained the basic formal education qualifications i.e. primary education (27.9%) and secondary education (47.6%). The Chi-square (χ^2) test was used to test the relationship between use of the basic social media digital platforms in business management and the formal education attained by artisans owning artisan businesses.

Conclusion: At 0.05 level of significance (α) the research established that there is a significant relationship between the adaptation of digital platforms in business management and the formal education attained by the artisans.

Keywords: Informal Sector, Small and Medium Size Enterprises, Jua Kali, Digital Skills and Digital Platforms, Kenya, VET, Vocational Education and Training

1 Introduction

The *"Jua Kali"* concept is ever present in the entrepreneurship literature in Kenya. It is commonly used to refer to micro enterprises and other associated actions of production, which are not registered nor regulated, under the formal tax system. In Kenya, the term Jua Kali is synonymous with the informal sector. The Organization for Economic Co-operation and Development (OECD) and the International Labour Organisation (ILO) (2019, p. 155) define the informal economy as *"all the economic activities, excluding illegal activities, by workers and economic units that are in law or practice either not covered or insufficiently covered by formal arrangements"*. Worldwide, the informal sector as a phenomenon is prevalent in large cities and encompasses slightly more than half of the global workforce and more than 90% of Small and Medium Enterprises (SMEs) (Ohnsorge & Shu, 2022; United Nations Economic and Social Council, 2022). In Kenya the *Jua Kali* sector comprises all those economic activities whose production is generally destined for the market with the aim of making a profit, but they are not formally recognised as producers of goods and services as distinct from the owner use production of the owner-operators' household (United Nations [UN], 2022). The word *Jua Kali* in a literal sense in the Kenyan purpose means working under the "hot sun" in Swahili and is commonly used in reference to the informal sector traders and micro-entrepreneurs

who own enterprises of all sorts, small shops and workshops on the roadsides and in open market spaces. The *Jua Kali* sector in a nutshell is a collection of traders and artisans in possession of a wide array of skills, among them are; metal work, carpentry, plumbing, fabrication, tailoring, shoe repair, automobile repair, and many other skills. Most school dropouts join this sector because of the easy of entry to gain skills by apprenticeship and the various affordable goods and services which are produced targeting the local market (Kidenda, 2021).

The ILO estimates the rate of poverty among workers to be two percent in Europe, 16% in the Americas, and 21% in the Arab states. But in Africa, the estimates are deplorable, as 33% of working people live in poverty. One of the reasons why there is a high rate of poverty among working people is that there is a lot of informality. Working poverty and informality combined puts workers across Africa in a very precarious situation (ILO, 2023; Common Market for Eastern and Southern Africa [COMESA], 2022). The Jua Kali sector is majorly characterised by low productivity when compared with the formal sector. The workers in the informal sector have low skills and earn lower wages, they lack access to finance and the safety of social networks that workers in the formal sector have access to (Ohnsorge & Shu, 2022). Informality relates to low productivity, poor remuneration of workers because of their low skills (Loayza, 2018). Subsistence informality is prevalent in low-income countries and is associated with low-skilled technology and remuneration of workers below subsistence levels (Elgin et al., 2021). Informality is often the cause of development challenges especially in Emerging Market and Developing Economies (EMDEs). This is because of relying on labour intensive activities that employ unskilled workers who are poorly remunerated and don't have fiscal resources (Chen, 2023; Ohnsorge & Shu, 2022).

1.1 The Importance of the Informal Sector in Kenya

The *Jua Kali* sector plays a key function in Kenya's economy, in terms of employment, it constitutes up to 80% of the overall employment in Kenya (Kenya National Bureau of Statistics [KNBS], 2023). A study by the Mercy corps, estimates that the informal sector makes up 83.6% of the Kenyan economy and employs 14.9 million people out of the total working population (Mercy Corps, 2019). The government of Kenya estimates the *Jua Kali* sector's employment opportunities to be approximately 77% of the total manpower in Kenya. Most of the people working in the informal sector are young people, data from recent surveys show that 60% are within the age bracket of 18 and 35 years, women constitute 50% of the total number of people working in the informal sector. Estimates indicate that there are more than 1 million *Jua Kali* artisans, majority of them work and sell their wares on the roadsides (Republic of Kenya, 2019; United Nations Development Programme [UNDP], 2018). These craftsmen/women artisans are highly entrepreneurial, talented and create goods on demand, they came from all walks of life. The informal sector creates employment opportunities, plays

a role in production, and generation of income for many Kenyans (Federation of Kenyan Employers [FKE], 2021).

The Kenya National Bureau of Statistics (KNBS) survey in 2020 on the Informal Sectors Skills and Occupations Survey (ISSOS) found out that there are five million enterprises in Kenya, 64.9% are in the urban arears (KNBS, 2020). The main industry within the informal sector is wholesale trade, repair of motorcycles and motor vehicles (62.2%), the manufacturing sector is the second highest in the number of informal businesses after accommodation and food services at 12.5% and 9.7% respectively. Wholesale trade, motor vehicle and motorcycle repairs trade are the dominant industry both in urban and rural areas at 59% and 63.9% respectively. The issue of skills, financing and technology are crucial for the *Jua Kali* sector, they can be improved by developing a dynamic curriculum that will include topics on digital, technical, marketing and management skills (Krishnan & Te Welde, 2019). The Micro Small and Medium Enterprises (MSME) survey carried out in 2016 found out that the informal sector contributes 50% towards Kenya's Gross Domestic Product (GDP), and employs approximately 83.5% of Kenya's total workforce and is home to 95% of all the businesses in Kenya (KNBS, 2016, 2021).

1.2 Significance of Digital Skills to the Jua Kali Sector

In the modern business landscape, many digital platforms have become a necessity and an essential part of business management and are no longer the domain of digital natives. The digital platforms advance an efficient cooperation between end-users and producers to dealt with each other (Gill, 2022). Any business in this modern technological space needs some online presence. With the advancement in Information Technology (IT), the internet has become the first place that most modern consumers go to search for products and services. Businesses that have some online presence can be reached easily by customers. It is noted by some researchers that the SMEs and the *Jua Kali* sector hardly have any online presence. For instance, the OECD (2023) observes that many small firms lag behind in the take up of digital technologies, they face a challenge in technical skills and knowledge gaps.

There is a knowledge gap concerning the use of digital technologies especially the ability to communicate using email, mobile phone applications, cloud computing etc to enhance productivity. Few SMEs have managed to exploit the opportunities advanced by the current digital technologies. There are barriers that the digital technologies have cleared for an average SME especially the ability to reach a variety of financial services and digital transformation and entrepreneurship (Osano, 2023). Some of the *Jua Kali* artisans have smart phones and can easily download most of the digital applications for free and customise them to their business management. The spread of digital technologies will enable informal businesses to reach wider markets. Digital connection may be achieved by mobile money digital

applications, but the mobile money digital applications may be limited in the sense that the infrastructure required to develop other innovations on it may be out of reach of informal businesses. Skills acquisition in the informal apprenticeships, is largely thorough "on-the-job training" by observation, trial and error, systematic assessment is not common (ILO, 2018; Momanyi et al., 2022; Njenga, 2023).

Digital skills have become essential in everyday work activities, and it is expected that most workers should be able to use, find, share, create content using digital devices such as smart phones, tablets, and computers. Adoption of low-skill-biased digital technologies may compliment the productivity potential of informal sector workers by reducing the poverty trajectory in Sub-Saharan Africa. Digital technologies can offer informal workers opportunities for employment, by creating more job opportunities (Nguimkeu & Okou, 2021). Digital skills are essential in addressing the opportunities and the challenges necessary to face the new demands for changing economies in the purpose of new technologies and globalisation. By the year 2040, estimates show that 40% of the global economy will be backed by digital platforms thus redefining the very notion of work (African Development Bank [AfDB], 2013). The Micro Small and Medium Enterprises Micro (MSME) survey of 2016, established that in Kenya only 15% of the informal enterprises that have access to internet use it in business management. In another survey it was established that only 14% of the informal enterprises had incorporated ICTs in their operations (FKE, 2021).

The training programmes offered by TVET training institutions and the apprenticeship scheme programme prevalent in the *Jua Kali* sector seem to lay more emphasis on the acquisition of technical skills forgetting that digital skills are part and parcel of business skills (Momanyi et al., 2008; Momanyi, 2014). Most businesses in the informal sector stagnate and do not grow into formal businesses, most of them collapse by the 6th year from their inception (Kahando et al., 2017). There is a shortfall of skilled workers who can evaluate and enforce technological inventions necessary for SMEs to catch up with the quick changing reality of the global economic landscape (Information and Communications Technology Council [ICTC], 2015). While it is possible to change the attitude of the *Jua Kali* artisans towards using digital platforms in business management, efforts have to be put in place in the training of artisans to change this attitude as observed by Ryder and Machajewski (2017). The artisans need appropriate design and planning skills to be able to contribute to Kenya's vision 2030. One of the suggestions on how to bridge the current skills gap is through the Digital Design Training Intervention (DDTI) model through m-learning to enable the artisans in designing products and displaying them online for visibility (Kidenda, 2021).

1.3 Business Branding

Business branding is a strategic process of creating a notification to potential customers what a business is all about. A business brand distils everything about what a business does into a unique, remarkable entity that people will always think of and stay associated with. Digital branding is the designing and building of a business' brand on the digital space through websites, social media, apps, videos and more. Branding a business digitally combines digital marketing and branding on the internet with the aim of growing a brand on the digital space (Robertson, 2019). Branding a business digitally is not the same as digital marketing of a business. The aim of digital marketing is to get more consumers for a product and thus generate more revenue for a business whereas the aim of digital branding is to create loyalty and brand awareness. Digital branding promotes user connections that help a business speak directly to its customers through digital platforms in their day-to-day experiences on the digital sites they are already on (Tartsah, 2021).

1.3.1 Digital Branding and Marketing

The Harvard business review of July-September 1996 as quoted by Musumali (2019, p. 5), states that for *"a business to succeed, the product or service it provides must be known in the community and have communication with its customers readily available, the company needs at least marketing strategies to create product or service awareness"*. The KNBS in 2016 estimated that the level of innovation in the Jua Kali sector is at 35%, 85% of the enterprises could not market their products online which is below expectation in view of the numerous efforts (KNBS, 2016). One of the modern ways of marketing by use of the social media digital marketing where products or services are marketed using digital platforms mainly on the internet using smart phones, display advertising screens and other digital media. Online marketing is the catching of the attention of potential customers for business through banners, articles, videos, flash animation images etc. Follow-up publicity is an excellent way to present products to customers using digital platforms (Saura, 2020).

Branding is the creation of a strategic process of notifying potential customers what a business is all about. A brand distils everything about what a business does into a unique, remarkable entity that people will always think of and stay associated with. Digital branding is the designing and building of a business' brand on the digital space through websites, social media, apps and videos. Digital branding is an integration of digital marketing and internet branding with the aim to grow a brand on the digital space (Jeandri et al., 2019). Digital branding is not the same as digital marketing. Digital marketing aims at getting more consumers of a product to generate more revenue for a business whereas digital branding creates value and encourages loyalty and brand awareness. A brand is how the audience perceive a certain business; branding promotes user connections that help a business speak directly to

its customers through digital platforms in their day-to-day experiences on the digital sites they are already on (ILO, 2023). Modern branding needs a diversification of digital platforms to cement online presence.

1.3.2 Digital Skills Project Management and Planning

Project management is necessary for all technical projects, it demands complex systems and programs which are not easily mastered. The *Jua Kali* artisans don't need sophisticated digital skills, they should be able to use basic ICTs for day-to-day management of their artisan businesses. Digital skills are not only necessary for time, data, budget tracking and data back up in project management and planning, but also for tracking financial and non-financial indicators of a project's success. Artisans with basic digital skills should be able to track the success of each project they undertake. The artisans should be able to monitor the number of people interested in the products digitally. Project execution factors have a substantial determination on the accomplishment of *Jua Kali* empowerment. Njue et al. (2019) recommend that *Jua Kali* empowerment programmes should be implemented in such a way that they are effective in the realization of project deliverables through project planning skills such as technical, financial management, technology, and workforce planning skills.

1.3.3 Basic Book Keeping and Business Records

In this research the digital platforms that are referred to are mobile money payment and social media platforms. The mobile money applications that are common in Kenya are; Mpesa, Equitel, T-cash, Airtel money, Orange Money and Y-cash. In Kenya there are 38.43 (73.8%) million mobile money subscriptions while mobile data subscriptions are 47.96 million (Communications Authority of Kenya [CAK], 2023). Unlike formal business enterprises which conduct their businesses management practices over the internet and use mobile applications for business transactions, estimates show that only 48% of the *Jua Kali* artisans use mobile money for their business payments (FKE, 2021; Financial Sector Deepening [FSD], 2020).

2 Theoretical Framework

The human capital theory posits that education and training are investments, they increase people's productivity. Accordingly, this theory states that the return to investment in education and training is calculated by the net benefit in a lifetime income that accrue from investment in education or training (Becker, 1994). This is supposedly true for the informal sector in Africa and Kenya in particular where the sector constitutes 95 percent of all businesses and

contributes three percent to the GDP (World Bank, 2016). Digital and other complimentary skills can enhance this sector's productivity and improve their human capital, their value increases in the economy as they bring on board more expertise, and are more effective in their jobs. On the other hand, the performance[1] theory relates methods that design a scheme used to demonstrate performance and its progress, it can be attributed to an association in a collective endeavour or an individual performance. This theory as envisioned by Schechner (2003) considers the individual differences, situational aspects, and the performance regulation as the basis to evaluate the performance of everyone in a group. Though literature on skills formation especially for the informal sector lay more emphasis on self-employment which has become a new interpretation of human resource management and by extension, a replacement of the human capital theory (Rharade, 1997). The interpretation of the human capital theory seems to be circumscribed by job descriptions under the guise of specialised division of labour and command hierarchies which treat a skill as an attribute of the individual which he can acquire by training and in return get an appropriate return (Ashton, 1999). In a certain sense this shows that changing the education system doesn't guarantee producing people with skills, any socio-educational course will bring forth people with skills already adapted to the economic arrangements. Most policy makers around the world, accept the assumption that any investment in education and training is an investment in human capital and a means to secure higher economic prosperity and achieving equity goals (Wößmann, 2008). There seems to be an overemphasis on education and skills training as the main driver of economic expansion. For instance, Wolf (2005) in his analysis says that there is an overstatement by economists of education on the significance of human capital investments. In Wolf's view, education is a classification device and to some degree a social discriminator. This fact is also noted by proponents of the screening hypothesis who argue that the Human capital theory had failed to deliver goods and criticised the assumption that there is a correlation between education and economic growth. For instance, Marginson (1993) argues that there is a focus on the value of educational qualifications at the expense of the cognitive skills people acquire through education, educational qualifications are a criterion used by employers for selection. The educational achievement has little relevance to one's performance or earnings. Looking at the wider economic benefits, there is need for good policy formulation especially for the *Jua Kali* sector (McCall et al., 2016). It is also not clear how people who have acquired skills through apprenticeship fit in the human capital theory, as they lack certification to quantify their educational attainment in terms of training. Training is not equal to earning, labour income has many hidden factors, rise in income is skewed to one percent of the top earners besides the many inequalities between education systems, gender, race, culture and occupation (Brown et al., 2020). Perhaps a critique of the human capital theory by Brown et al. (2020)

1 Performance is the possibility for future subsequent execution of actions in order to attain the objectives and targets (adapted from Lebas, 1995).

brings it sharp focus the issue of skills and earnings. The current economic realities which have an influence on work, for instance digitisation of work in many aspects of the economy and control of work places proves the human capital theory is static is based on the golden age which may not be the case currently and in the future. Education has more benefits to society that are not measurable like obeying just laws by educated citizenry and a subserved by Sears (2003), education does not serve only the function of human capital and there may be lack of demand for the skills that people acquire.

2.1 Research Objectives

This study aims to broaden the understanding of use of digital skills and social media digital platforms in business management by the Jua Kali artisans, to support the development of skills as a critical need in business resilience and growth in the informal sector. In addition, the research aims at addressing key questions, including:

1. Do the *Jua Kali* artisans in the Eastlands of Nairobi know how to use the social media digital platforms like, WhatsApp, Twitter, Facebook, Instagram and email?

2. Do the *Jua Kali* artisans in the Eastlands of Nairobi use social media digital platforms in business management?

2.2 Research Methodology

This research adopted a Descriptive Study Design. A survey was conducted, a questionnaire, interview and observation schedule were used to collect the data. The data was analysed and presented using, frequencies, inferential statistics, charts and hypothesis testing using a chi-square (χ^2) test statistic. The sampling frame was the 481 artisans in the Eastlands area of Nairobi and 327 residents who had engaged artisans to work for them 6 months prior to the start of this research. The independent and dependent variables in the research were; the formal education qualifications by the artisans and use of social digital platforms in business management respectively. The chi-square (χ^2) test was used to establish whether there is relationship between the adaptation of social medial digital platforms in business management and the level of formal education attained by the Jua Kali artisans. Internal consistence implies a high degree of generalizability to all the items within a given test. Internal validity is the scope to which a study inquires what it is supposed to inquire. Alternatively, external validity investigates the generalisability of the results (Trafimow, 2022). A pilot study was carried out before the actual data collection. A Cronbach's alpha coefficient of 0.7 was obtained for the questionnaire and a correlation coefficient (r) of 0.8 for the interview schedule using the Spearman-Brown formula to consider the instruments valid for the research.

2.2.1 Interview Schedule

In this study, a total of 481 *Jua Kali* artisans were interviewed for the study in the Eastlands area of Nairobi, Kenya using an interview schedule. A purposeful sample technique was used to select the artisans who were interviewed for the research. This research found out that out of the 481 *Jua Kali* artisans interviewed for this study, only 251(52.2%) artisans owned artisan businesses, 112 (23.3%) of the artisans were under training (apprentices), while 77(16%) were working as casuals. Acquiring skills by apprenticeship is popular with many artisans, the study established that 415 (86.3%) of the artisans acquired their skills by apprenticeship in the *Jua Kali* sector. Some of the well-established artisans, 128 (26.6%) had apprentices training under them.

2.2.2 Questionnaire

A customer satisfaction survey is a questionnaire designed and sent to customers to help understand the customers view of the products and services. A customer satisfaction survey was done in Nairobi using a mobile survey tool to establish the Nairobi residents' satisfaction on Jua Kali artisan's products and services. The questionnaire was sent out to 1000 via a mobile survey tool. Out of 1000 people whom the questionnaire was sent to, 327 responded by indicating that they were residents of Nairobi. Out of the 327 Nairobi residents, 256 (78.29%) indicated that they had engaged a Jua Kali artisan six months prior to this research, while 71 (21.71%) had not engaged an artisan. The 256 Nairobi residents who had engaged an artisan formed the sample for the research. They ranked the artisans on a scale of 1-6 on their satisfaction with the artisan's technical, customer care, problem solving, negotiation, project management and communication skills.

2.2.3 Observation Schedule

An observation schedule was used to collect data through observation without interviewing the artisans from the 30 cluster[2] areas identified for data collection.

2 A group of Jua Kali artisans working from the same area, mostly of the same trade and some from different trades. Clusters are common as artisans work from open spaces or shared rented spaces.

3 Presentation of Results

Table 1: The Artisan's Engagement in the Jua Kali Sector (own compilation)

Engagement of the *Jua Kali Artisans*	Number of Artisans	Percentage (out of 481 Artisans)
Working as Casuals	77	16
Under Training	112	23.3
Master Trainers	128	26.6
Running Artisan Businesses	251	52.2

The summarised data in table one, show that out of the 481 artisans interviewed for this research only 251 (52.2%) owned artisan businesses, 477 (99.2%) had mobile phones, with 384 (79.8%) having smartphones. The research further established that 112 (23.3%) artisans were under training, 77 (16%) were working as causals after gaining skills while 128 (26.6%) had apprentices training under them. Only 0.01% of the Jua Kali artisan businesses had a formal recognition while the vast majority (99.99%) were not registered. The artisans are disadvantaged as they cannot apply for government tenders and other opportunities in the formal sector that require official recognition. This analysis corroborates Atiase et al. (2017) and Loayza (2018) observation that enterprises within the informal sector have abject growth rates and limited possibilities. The artisans lack basic business skills like basic book keeping. From the 30 clusters that the artisans were sampled from, it was observed that the artisans lack conceptual skills as most artisans worked individually doing all the production work alone. In this situation they can't take advantage of the economies of scale and specialise to manufacture in large numbers. The fact that 83.6% of the artisans gained their skills by apprenticeship indicates that the TVET training is not popular with the artisans. Only the artisans who trained in TVET institutions were certified for their technical skills. These results indicate that to achieve the Sustainable Development Goals (SDGs) and in particular SDG number four through the Education Agenda which aims at eradication of abject poverty will be a challenge. Informality is accompanied with a lot of challenges, it is the result of under development, lower per capita income, and greater poverty. Artisans and workers in the informal sector are often less skilled and are paid lower compared to their formal sector counterparts (Loayza, 2018).

Table 2: Means Through Which the Artisans Were Reached (own compilation)

Means of Reaching out to the Artisans	Number	%
Through referral	158	62
Business Card	17	7
Went to look for them at their workshops	75	29
Got them through another way*	6	2
Total	256	100

*They have worked for me before, walk in, someone looked for them on my behalf, He's family (summarised comments from respondents)

From the analysed data in table two, the sampled Nairobi residents who had engaged artisans within a period of six months prior to the research used various means to reach out to the artisans. The analysed data shows that 158 (62%) of the sampled residents reached out to the artisans whom they engaged through referrals, 75 (29%) went to look for the artisans in their workshops, while 17 (7%) got them through business cards and 6 (2%) got them through other ways (They have worked for me before, walk in, someone looked for them on my behalf, he's family). The artisans overwhelmingly (62%) use referrals as the main means of marketing their products and only 4.8 % of the Jua Kali artisan businesses are branded.

Table 3: Technical Skill Type and Number of Artisans Engaged (own compilation)

Type of Artisan	No. of Respondents
Painters	55
Electricians	116
Plumbers	117
Carpenters	99
Mechanics	54
Fabricators	35
Masons	30
Others (Gardener)	3

3.1 Customer Satisfaction Survey on Jua Kali Artisans' Technical Skills

Table three summarises the technical skills based on the trade of the interviewed artisans. Technical skills reflect the ability of an employee or a person with certain skills set' ability to accomplish a specific task or course of tasks in the workplace. For the Jua Kali artisans, it is the main quality they must possess to be able to perform various tasks to earn an income from the products they produce and the services they offer. Technical skills instil self-confidence in workers as they have the knowledge and competence to perform certain tasks to the best of their ability. Artisans need a diversity of skills among them interpersonal skills, people and communication skills besides technical and conceptual skills. Business skills: Technical,

interpersonal, and conceptual skills are paramount and relevant to the informal sector. Analytical skills will allow Jua Kali artisans to collect, visualize, organize, and incorporate data. These skills will enable the artisans to see models, make conclusions, and find answers that can boost their enterprises' productivity.

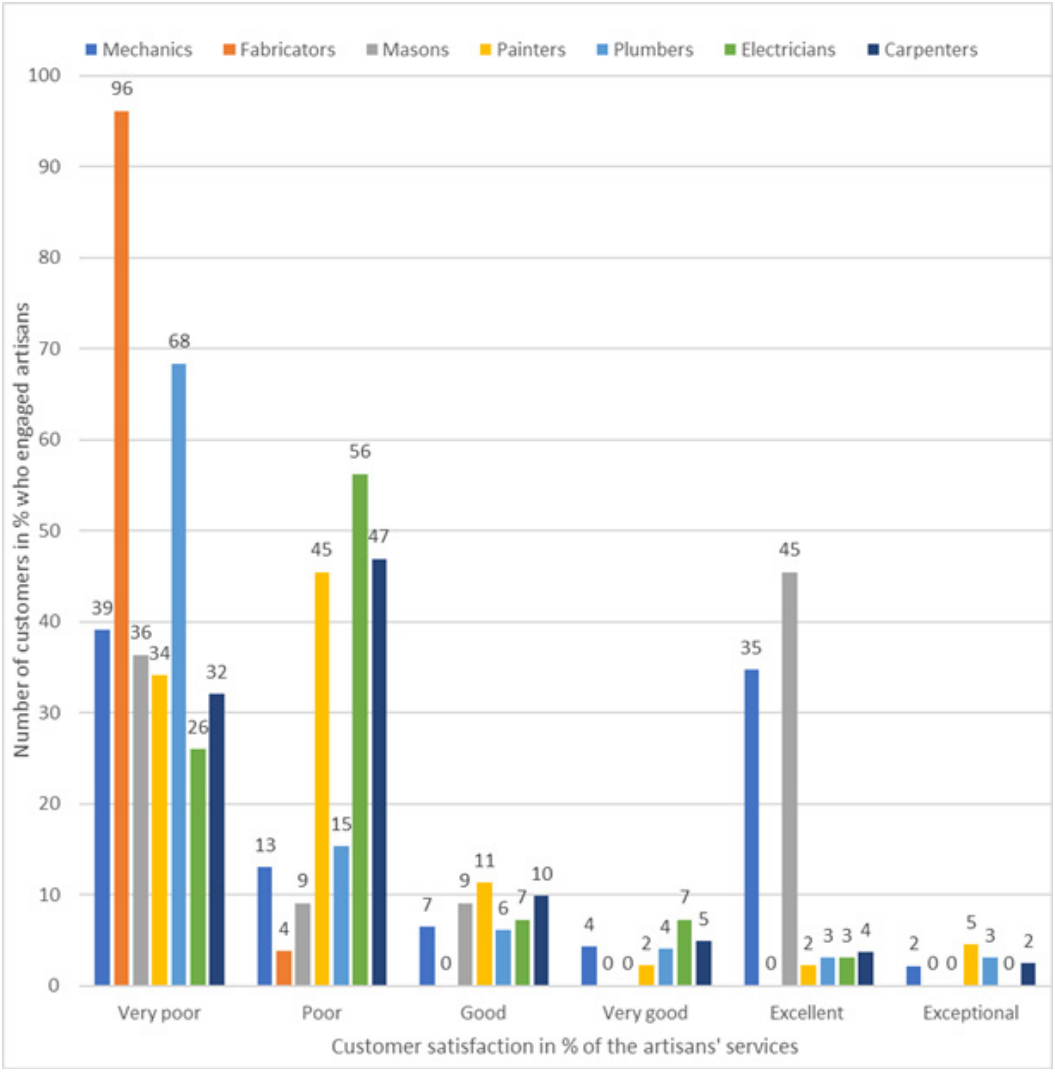

Figure 1: Customer Satisfaction Survey on Jua Kali Artisans' Technical Skills (own compilation)

From the analysed data as presented in figure one, it is clear that technical skills alone are not enough for the *Jua Kali* artisans to perform various tasks in the management of their businesses. They need refresher courses to improve on the technical skills they already have, as technology changes they also need to change with it so that they do not lag and find that the market has changed, and their skills are obsolete.

Table 4: Artisans' Technical Skills and Number of Artisans Who Own Businesses (own compilation)

Skill Type of Interviewed Artisans	No. of Artisans Interviewed	No. of Artisans who own Businesses	%
Painters	11	8	1.7
Electricians	6	3	0.6
Plumbers	2	2	0.4
Carpenters	69	46	9.6
Mechanics	140	70	14.6
Fabricators	117	58	12.1
Electric/electronic technicians	17	4	0.8
Tailors	80	48	9.9
Glass cutters	5	2	0.4
Leather workers	10	5	1
Embroidery	6	2	0.4
Others	18	3	0.6
Total	481	251	52.2

Note. Summary on the number of artisans interviewed per skill set and the number per skill set who own artisan businesses.

This research established that the surveyed artisans are not conversant with sophisticated digital skills but manifest ability to use basic ICTs for their day-to-day management of their businesses. From the data presented in table four, this research established that only 384 (79.8%) of the interviewed artisans had smart phones and a few had installed in them some of the basic social media platforms and windows applications. On further analysis, it was established that the number of artisans who use the social media digital platforms for business management is significantly low. More effort is needed to train the artisans on how to utilise social media digital platforms in business management. It is only 171 (68.5%) out of the 251 artisans who owned artisan businesses had smart phones. Even though 68.5% of the artisans who own artisan businesses had smart phones only 79 (31.5%) were using them in business management. With proper training targeting the artisans who own artisan businesses and in particular those who own smart phones. Using their phones, they can effectively use the various social media digital platforms in business management. This will have a greater impact on the *Jua Kali* artisans' businesses along with upscaling in other business management skills.

3.2 Adaptation of Digital Platforms by Artisans in Digital Marketing

The analysed data for this research show that most artisans (95.2%) mainly display their products at their promises as the main way of marketing them. Only 171 (68.5%) of the artisans who own artisan businesses have smart phones and yet only 97 (31.5%) were using them in business management. This observation means that the most artisans have not embraced social media digital platforms to market their products widely to reach a larger market. It will be easier for the artisans to reach many clients if they marketed their products and skills online using the digital platforms most of which are open source, the artisans need more training on how to use them effectively.

From a policy perspective more effort is needed to equip the artisans with basic IT skills for them to be competitive. The artisans can improve if they are trained to design their products and have them displayed digitally on digital platforms. With creativity, the artisans can design their products and display them online to reach a wider market. This research observed that some of the *Jua Kali* artisans were unaware about online marketing and selling, even though they were able to use some aspects of the digital platforms. Some artisans after referrals were able to take photos of their products and share them with their prospective clients via the WhatsApp mobile phone application.

3.3 Adaptation of Digital Platforms by Artisans in Digital Branding

From the analysed data for this research, 100% of the interviewed artisans use referrals, walk-ins, display of their products at their premises, two percent use digital platforms to market their products and 0.03% use business cards. A survey of Nairobi residents who had engaged artisans to work for them six months prior to this research revealed that 67.07% of the artisans were reached out through referrals, 4.57% by business cards, 26.92% by being looked for in their workshops and 1.44% were reached out to by other ways (they had worked for the client before, walk in, someone looked for them on my behalf). Only 4.8% of the *Jua Kali* artisan businesses were branded, while 95.2% were not branded at all. It was observed that the branded businesses were not visible on the digital space. The branded businesses had the contacts of the artisans written on a board and the name of the business in a visible location. The artisans do not need to train in complex Information Technology (IT) stuff, but basic skills on how to upload content online using their smart phones and how to respond to any comment about their business online.

The artisans lack project planning skills which is an impediment to getting big jobs that require some preparation within a given time frame. This research noticed that the mobile money accounts are not registered under the businesses' name but under the artisans' names, there is no separation between the individual artisans and the businesses

as separate entities. Any training programme meant for the Jua Kali sector should incorporate digital skills training scheme for the artisans to realize their full potential in the digital space.

3.4 Hypothesis Testing

For hypothesis testing, the data was further analysed as presented in tables five and six. Most of the artisans were found to be conversant with the common social media digital platforms and some were able to use these platforms in managing their businesses. Most of the artisans had smartphones, 79.8% of the interviewed artisans who own artisan businesses had smartphones and were able to install various open-source digital applications for use. A Chi-square (χ^2) test was done to establish whether there is a relationship between the adaptation of social media digital platforms in business management and the and the level of formal education attained by the artisans.

Variables:

- Variable 1= Level of formal education attained by the Jua Kali artisans
- Variable 2= Adoption of digital platforms in business management

H_0, there is no significant relationship between the adaptation of digital platforms in business management and the level of formal education attained by the Jua Kali artisans

H_1, there is a significant relationship between the adaptation of digital platforms in business management and the level of formal education attained by the Jua Kali artisans

Table 5: Observed Values on Adaptation of Digital Platforms in Business (own compilation)

Level of Education	Email	Facebook	WhatsApp	Twitter	Instagram	Total
Dropped out in Primary School	6	6	7	0	0	19
KCPE	34	51	54	8	6	153
Dropped out in Secondary School	14	15	11	1	2	43
KCSE	65	66	74	19	22	246
TVET	8	17	21	9	8	63
Bachelors	6	5	4	4	4	23
Totals	133	160	171	41	42	547

Table 6: Expected Values on Adaptation of Digital Platforms in Business (own compilation)

Level of Education	Email	Facebook	WhatsApp	Twitter	Instagram
Dropped out in Primary School	4.62	5.56	5.94	1.42	1.46
KCPE[3]	37.20	44.75	47.83	11.47	11.75
Dropped out in Secondary School	10.46	12.58	13.44	3.22	3.30
KCSE[4]	59.81	71.96	76.90	18.44	18.89
TVET[5]	15.32	19.69	19.69	4.72	4.84
Bachelors	5.59	6.73	7.19	1.72	1.77

From the contingency table

$$\chi^2 = \frac{(\text{Observedvalue-Expectedvalue})^2}{\text{Expctedvalue}}$$

$$\chi^2 = \frac{(O-E)^2}{E}$$

$$\chi^2 = 32.67$$

Degrees of freedom = (columns -1) (rows -1)

$$= (5-1)\,(6-1) = 4x5$$
$$= 20$$
$$\text{Level of significance } (\alpha) = 0.05$$
$$\chi^2_{\text{tabulated}} = 31.41$$
$$\chi^2_{\text{calcualted}} = 32.67$$
$$\text{since } \chi^2_{\text{calcualted}} > \chi^2\text{tabulated}$$

Therefore, the null hypothesis was rejected, and the alternate hypotheses was upheld. There is a significant relationship between the adaptation of digital platforms in business management and the level of formal education attained by the artisans. Since the difference between the tabulated Chi-square (χ^2) value and calculated Chi-square (χ^2) is small, this indicates that there is a strong correlation between the adaptation of digital platforms in business management and the level of formal education attained by the artisans.

3 KCPE – Kenya Certificate of Primary Education, awarded to pupils after completing the approved eight-year education in Kenya (by the age of 14 years)

4 KCSE – Kenya Certificate of Secondary Education, awarded to students after completing the approved four-year secondary education in Kenya (by age of 18years)

5 TVET – Technical Vocational Education and Training – Training offered at tertiary training institutions for craft courses

4 Discussion and Conclusions

From the hypothesis analysis, there is correlation between the adaptation of digital platforms and the level of education attained by the artisans. The research found out that most of the interviewed artisans knew how to use the basic social media digital platforms. However very few of the interviewed artisans were using the social media digital platforms in business management. The research observed that many of the *Jua Kali* artisan businesses were not branded and very few artisans used digital platforms to keep business records, market and communicate with clients and suppliers. The overall observation by the research is that the artisans have low digital skills which is a weakness which will not enable them earn higher wages. The research shows that the artisans are trainable and can improve their digital skills if they are trained. Further research needs to be conducted to determine which are the best methods that should be used in training *Jua Kali* artisans to improve their digital skills. At the same time determine what are the main weaknesses of the TVET curriculum in training digital skills to artisans.

For Kenya's vision to have digital skills as the backbone of the economy, the government skills training policy should address the issue of digital skills training to *Jua Kali* artisans. In order to address the digital skills gaps among *Jua kali* artisans, government policy should stipulate practical ways on how digital skills will be taught to all workers in the informal sector, they constitute the majority of workers in the economy. Further, a whole curriculum needs to be developed to target artisans on how to design their products using the many open-source digital applications. This curriculum can be adapted to teach artisans who are not enrolled in TVET training institutions since most artisans gain their skills by apprenticeship common in the *Jua Kali* sector. The Jua Kali artisans know how to use the various mobile money applications because of the publicity by the providers of these applications, the same can be replicated on how to use the social media digital platforms in business. There is need to reevaluate the TVET training by introducing a Dual Training System where artisans train in industry and in the TVET institutions as most artisans (86.3%) prefer to train by apprenticeship. There is need to introduce lifelong learning component through the web or mobile phones, and tablets. This research was not able to study in depth the official government policy documents and in particular the Kenya vision 2030 which envisions digital skills as one of the main pillar of Kenya's (Republic of Kenya, 2018). The study was not able to study the NITA curricula to ascertain to what extent it contributes to low digital skills among *Jua Kali* artisans (NITA, 2019).

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Ethics Statement

This paper did not require any approval by the Ethics Review Committee. For purposes of data collection, the National Commission for Science Technology and Innovation (NACOSTI) approval process was followed and a research licence was issued before the data collection commenced (Ref No.79788310). The research was authorised by the Ministry of (Ref.RDE/NRB/RESEARCH/1/65 VO.1).The *Jua Kali* Artisans who were interviewed for this research participated voluntarily by providing their responses. The ethical principles prescribed by the IJRVET Review Board were followed.

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