An in-depth exploration of the challenges and opportunities faced by software developers in Somaliland

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***Abstract*—This study explores the challenges and opportunities that software developers in Somaliland face, aiming to improve understanding and propose strategies for industry enhancement. The study begins by identifying key barriers and significant opportunities in the software development field. Using a mixed-methods approach involving both quantitative cross-sectional surveys and qualitative interviews, data was collected from individual developers and industry stakeholders through questionnaires and structured interviews, respectively, therefore the findings highlight several challenges, including a widespread lack of skills among developers, difficulties related to government outsourcing practices, and communication issues with clients. However, the study also identifies promising opportunities such as a growing market demand and increasing job opportunities within the sector and based on these findings, recommendations are provided for government officials and policymakers to effectively address these challenges and create a supportive environment for the software development industry in Somaliland. This thesis contributes valuable insights into understanding the dynamics of the local software development sector, offering practical guidance for stakeholders interested in harnessing its potential for economic and technological growth.**

***Index Terms*—software, software developer, software industry, Somaliland, challenges, opportunities.**

I. Introduction

Software development plays a crucial role in driving economic growth through innovation and productivity enhancements. It enables the creation of new products and services, improves efficiency in various industries, and fosters technological advancements that contribute to overall economic development (Mohamed *et al*., 2022). Software is the interface between humans and computers. Software development refers to the ability to adapt quickly to changes in products and procedures, together with technological advancement and innovation (Binuyo, 2020).

The term "software" was first used as a practical joke in the early 1950s, though it was not used in print until the 1960s. Beginning in the 1960s, the software industry grew rapidly after the introduction of computers into the mainstream market. The demand for software was generated by businesses, governments, and universities(Aithal, Shenoy, and Neelam, 2015).

Software development is fast-growing industries, producing high value products and services that can provide an edge in competing with developed countries and bring about comparative advantages (Binuyo, 2020). During the past few years, software development has become more and more popular (Casado-Lumbreras et al., 2014).

After a detailed study using surveys, interviews, and job market analysis, a big gap was found between the skills recent graduates have and what the growing software industry in many African country's needs. This shows that schools need to update their courses, and businesses should offer practical experience. This way, workers will have the advanced technical skills and understanding of both local and global technology that employers in the African software industry are looking for (E. Scott, 2004; M. Korpela, 2006).

Namibia's software development industry faces big challenges. One major problem is a lack of specialized skills, making it hard to do complex projects well. Another issue is that senior managers do not give enough support and guidance, which is crucial for creating an environment that allows innovation and progress. Poor communication within the industry also adds to the troubles, leading to misunderstandings, delays, and poor teamwork. These combined factors led the Namibian government to outsource software develop-

ment projects, recognizing the need for specialized knowledge, strong leadership support, and clear communication channels (Nehemia-Maletzky and Iyamu, 2018).

Ekanem and Peter (2020) found that in the Nigerian Software Industry, 36% of respondents identified poor software quality as a major hindrance to growth. Additionally, 41% believed that insufficient developer skills contribute to the industry's slow progress. Liebenberg, Huisman, and Mentz (2014) discovered a notable disparity between formal education for software developers and the industry's actual needs.

The global software industry has experienced rapid growth in the past two decades, expanding access to computer software and services worldwide. This sector holds potential to become one of the leading technological fields globally, despite its uneven distribution. Developing nations especially benefit from its low entry barriers, high value, rapid growth, and knowledge-intensive nature. However, these countries face challenges, particularly the least developed ones, in establishing robust software industries. Aithal (2015) notes that only a few developing nations have successfully transitioned to mature, self-sustaining growth in this sector.

Research by Montandon et al. (2020) examined the top hard skills IT companies seek in new hires, based on analysis of 20,000 job postings. Programming languages emerged as the most desired skills across various developer roles, emphasizing the need for tailored resumes to match specific job requirements.

Similarly, Xia et al. (2019) explored industry perspectives on coding proficiency, underscoring the importance of technical skills in software development roles. Litecky et al. (2010) complemented this by analysing IT job postings from 2007-2008, highlighting the enduring demand for skills like C/C++, SQL, and Java over time.

Although another study argued that there is a scarcity of software developers, there is a mismatch between the education that software developers receive and the knowledge that they require to operate effectively and efficiently in a legitimate software development industry (Liebenberg, Huisman, and Mentz, 2014).

In Somaliland "Dhaweeye software" is a successful software project, it has employed 6,000 drivers and youth people, its services are taxi and food delivery services; and it is one of the creative ideas that have been implemented in this country. That indicates the growing software development and opportunities we are going through. Although many young people have developed software, they have not yet achieved the expected progress because of many challenges faced by the software-developing entrepreneurs (Dhaweeye 2024).

However, there is a gap in examining the challenges and opportunities faced by software developers in Somaliland. This is delaying the development of the country's economy as well as technology. Software industry companies will not grow if the problems are not addressed, so it is important for researchers to research this sector.

Hence, the aim of this research is to investigate the challenges and opportunities encountered by software developers in Somaliland. The study intends to provide a comprehensive understanding and will contribute valuable insights to policymakers, educational institutions, and industry stakeholders. Bridging this gap empowers software developers and drives Somaliland to become technologically and economically advanced.

II. Methodology

A. Research Area and Design

The study was conducted in Hargeisa, the capital city of the Republic of Somaliland, located in the Horn of Africa. Somaliland has a population of approximately 4 million, with Hargeisa hosting about 1 million residents as of 2016. It serves as the seat of the parliament, the presidential palace, and government ministries (Hersi, 2017).

This study employed a mixed-method research approach with a cross-sectional design to investigate the challenges and opportunities in Somaliland's software development sector. A cross-sectional survey collects data from the target population at a single point in time, making it suitable for studying large populations (Oso, 2013). This method facilitates the identification of trends and relationships within the software industry (Johnson and Christensen, 2020).

B. Target Population, Sample and Sampling

The study focused on software development companies and individual contractors in Somaliland. There are 10 licensed software companies in Hargeisa, the capital of Somaliland (Ministry of Trade and Tourism).

The exact number of registered individual software contractors is not officially recorded, but an estimated 92 contractors were accessible through local incubators. To determine the sample size for individual software developers, Slovin's formula is used, resulting in a sample of approximately 75 individuals, assuming a 95% confidence level and a 5% margin of error.

The selection of the actual sample employed a combined approach of convenience and purposive sampling methods. Convenience sampling is utilized to select participants based on their availability, whereas purposive sampling targeted individuals possessing specific insights (Braun and Clark, 2013).

The sample size for software development companies was determined based on saturation, which entails reaching a point of informational redundancy where no new significant information is likely to emerge, ensuring a comprehensive representation of the sector's perspectives and practices.

C. Data Collection Tools and Techniques

The study employed a self-reporting technique of data collection where participants provided direct responses regarding their experiences and perspectives.

Data were gathered from individual software developers through a semi-structured online questionnaire administered to 75 participants, facilitating a comprehensive exploration of challenges and opportunities within the field of software development.

Additionally, insights from software development companies were obtained via in-depth, one-on-one interviews with the CEOs of five companies, offering qualitative perspectives on the challenges and opportunities present in software development.

D. Quality Control

Validity of the instruments was ensured through expert evaluation, resulting in a content validity index (CVI) of 0.78, indicating that the instruments measured intended constructs effectively.

Reliability was established via the test-retest method, demonstrating a high correlation coefficient of 0.84 between scores at two different time points, indicating consistency.

E. Data Analysis

The data analysis encompassed both quantitative and qualitative methodologies. Quantitative data obtained from the questionnaires were analysed using descriptive statistics in SPSS to summarize sample characteristics and key variables pertaining to challenges and opportunities in software development.

Concurrently, qualitative data gathered from interviews underwent thematic analysis to identify prominent themes associated with these aspects of software development.

The integration of these analyses yielded a comprehensive understanding of the software development landscape in Somaliland.

F. Ethical Considerations

Ethical considerations were carefully addressed throughout the study. Prior to data collection, informed consent was obtained from all participants, with an emphasis on ensuring confidentiality and anonymity to safeguard their privacy. Researchers introduced themselves using a letter from the Ministry of ICT and provided a clear explanation of the study's purpose to participants.

Data collection procedures were conducted strictly within the parameters outlined in the study protocol, ensuring that all collected data were used exclusively for research purposes.

III. Results and findings

A. Demographic Characteristics of Respondents

This section provides insights into the individuals who participated in our survey. We gathered information on their gender, age, education level, marital status, employment status, and work experience. Using percentages, we analysed these factors to understand the profile of our survey participants. The findings from this analysis are detailed in subsequent sections, offering a comprehensive view of the demographics of our survey respondents.

TABLE I
Demographics

Variable	Category	Freq(N=80)	Percentage
Gender	Male	63	79%
	Female	17	21%
Age	20-24 Years	34	43%
	25-29 Years	40	50%
	30-34 Years	1	1.%
	35-39 Years	5	6.%
Education	Diploma	6	8%
	Bachelor	65	81%
	Master	8	10%
	PhD.	1	1%
Marital	Single	70	88%
	Married	9	11%
	Divorced	1	1%
	Widowed	0	0
Employment	Employed	34	42.5%
	Un-Employed	30	37.5%
	Self-Employed	16	20%
	Retired	0	0
Experience	Less Than 1 Year	27	34%
	2 To 5 Years	40	50%
	5 To 7 Years	6	7%
	More Than 7 Years	7	9%

In TABLE I, the demographics from 75 respondents in the software development sector reveals several key insights. Most respondents are male (77.3%), highlighting a significant gender imbalance in this field. In terms of age, the largest group is aged 25-29 (52%),followed closely by the 20-24 age group (45%), indicating that the sector is predominantly young.

Educationally, a significant majority of respondents (85.3%) hold bachelor's degrees, suggesting that a bachelor's level education is the most common entry point into the profession. This is followed by a small number of respondents with diplomas (8.0%) and master's degrees (6.7%).

Regarding marital status, the overwhelming majority (92.0%) of respondents are single, reflecting a demographic that is primarily unmarried. This may suggest that many individuals in this field are early in their careers and may prioritize professional development over personal commitments at this stage.

In terms of employment status, 45.3% of respondents are currently employed in the industry, which is a substantial portion but also highlights that a significant number (40.0%) are actively seeking employment. Additionally, 14.7% are self-employed, indicating a notable entrepreneurial spirit within the sector.

Finally, the experience levels show that 53.3% of respondents have 2 to 5 years of experience, representing the largest group. This indicates a mid-level experience range, suggesting that many developers are in the early to mid-stages of their careers, gaining experience and potentially advancing within the industry.

These insights collectively highlight that the software development sector is dominated by young, educated, and predominantly single males, with a significant portion employed or actively seeking employment and a notable presence of mid-level experience professionals. This demographic profile

suggests a dynamic and evolving field with opportunities for growth and development.

B. the challenges faced by software developers

The purpose of this study was to determine the challenges and opportunities faced by software developers in Somaliland.

To realize this purpose, the study pursued these objectives: to analyse key challenges faced by software developers in terms of infrastructure, skill gap among them, whether there is funding, investment and patronage and the availability of policies of the government to enhance the eco system of software development. On the other hand, in terms of market receptiveness, job opportunities and freelancing.

Each respondent was requested to react several statements intended to assess the status of each subordinate variable by indicating Strongly Agree, Agree, Neutral, Disagree and Strong Disagree as the below table demonstrates.

TABLE II
Challenges

Perceived challenges	The number of frequency and Percentage (N = 75)				
	S.D	D	N	A	S.A
Limited infrastructure hinders the production of software developers	3 (4%)	6 (8%)	11 (14.7%)	24 (33.3%)	30 (40%)
Skill gap among software developers make them less effective	1 (1.3%)	1 (1.3%)	10 (13.3%)	19 (25.3%)	44 (58.7%)
There is lack of professional training	1 (1.3%)	4 (5.3%)	7 (9.3%)	24 (32%)	39 (52%)
There is lack of funding and patronage available for software developers	2 (2.7%)	2 (2.7%)	2 (2.7%)	22 (29.3%)	47 (62.7%)
There are no government policies enhancing the software eco-system of Somaliland	2 (2.7%)	6 (8%)	2 (2.7%)	22 (29.3%)	43 (57.3%)

C. Skill Gap Among Software Developers

A notable majority, 84% (agree and strongly agree combined), recognize a skill gap among software developers, potentially impacting their effectiveness. This highlights a critical area for improvement in enhancing skills and capabilities within the workforce.

Similarly, software companies face significant challenges due to a shortage of skilled labor, which makes it hard for them to find qualified professionals in the industry. This shortage creates obstacles in their recruitment processes and affects their ability to meet operational needs efficiently. An interviewee in the software industry said as follows:

As a company, we frequently encounter the challenge of finding skilled full-stack developers. It is quite difficult to locate highly qualified staff. To address this, we conduct assessments during the hiring process, including coding challenges, and evaluate how candidates solve real-world problem (KII CEO, 02).

Another one said:

One of the challenges we have in terms of staff is that since IT is always changing and everyone who works in IT must update themselves, we are experiencing that the students who graduate from universities are not well trained and not updated. Another challenge is that it is difficult for many employees to trust companies with their data for fear of their own responsibility (KII CEO, 01).

Other companies emphasize the importance of software developers gaining experience through internships, acknowledging that this process can be time-consuming and challenging for the company.

One of the challenges faced by us is finding qualified, capable youth developers who know what to do. Nowadays, every young person who applies to our company needs to gain experience and enter an internship phase. This poses a challenge for companies, despite ongoing changes (KII CEO, 04).

These statements demonstrate the existence of a skill gap among software developers, clearly showing that software companies are experiencing a shortage of highly skilled developers.

D. Lack of Professional Training

Over 84% (agree and strongly agree combined) perceive a lack of professional training opportunities for software developers. This underscores the need for initiatives to provide relevant and effective training programs to bridge skill gaps and improve workforce readiness.

E. Lack of Funding and Patronage

. A significant majority, 92% (agree and strongly agree combined), believe there is inadequate funding and patronage available for software developers. This indicates a crucial need for increased financial support and investment in the sector to foster growth and innovation

F. Government Policies on Software Eco-System

More than 86.7% (agree and strongly agree combined) feel that there are insufficient government policies enhancing the software eco-system in Somaliland. This reflects a perceived gap in supportive regulatory frameworks and initiatives that could stimulate industry.

Overall, the data highlights critical areas where strategic interventions can lead to substantial improvements in Somaliland's software development sector, potentially unlocking its full economic and technological potential.

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G. Customer related challenges

A common challenge faced by software companies is that customers may not fully comprehend the quality standards of software applications or how those standards align with their specific needs. This lack of understanding can hinder the company's ability to deliver high-quality products that meet market standards, particularly when customers prioritize price over quality, as one of the companies interviewed said.

Another challenge we face is customers who lack understanding of application quality and the differences between them and their own needs. This limits the quality of what we offer and what remains competitive in the market, especially when price becomes the deciding factor (KII CEO, 01).

Another one said:

One of the challenges we encounter from our customers is that they don't know most of the contracts you signed, what you are entitled to, and what they owe you, and they don't respect the contracts (KII CEO, 01).

This statement points out a challenge related to contract management and customer relations. It suggests that customers may not be fully aware of the contractual agreements they enter into with the company, leading to misunderstandings about rights, obligations, and proper contract fulfillment. This lack of clarity and respect for contractual terms can strain business relationships and operations.

Challenges are arising from the customers' employees lacking the necessary qualifications to use the systems or software designed for them. It underscores the importance of user training and support to ensure efficient system operation. Such challenges can lead to operational inefficiencies, user frustration, and increased support needs.

T*he primary challenge we face from the customer's employees is lacking the qualifications necessary to effectively operate within the system designed for them. This circumstance has resulted in numerous difficulties and raised numerous questions (KII CEO, 01).*

There is an impact of client uncertainty or a lack of clarity regarding their own requirements during the development or implementation of systems. It emphasizes the substantial time and effort invested by the company in gathering comprehensive project requirements and conducting thorough analysis. Misunderstood or evolving client needs can lead to project delays, increased costs, and challenges in delivering a satisfactory solution.

A challenge arises when the client you're working with or developing a system for doesn't fully understand their own needs.This becomes a significant burden on the company, as 70% of the effort is spent on investigating and gathering all necessary information from the client, followed by analysis. This process consumes a considerable amount of time (KII CEO, 04) .

Communication and trust-building between customers and service providers are vital. It suggests that customers should actively participate in understanding project changes, updates, and ongoing progress to maintain alignment with project goals and outcomes. Clear communication helps manage expectations and fosters a collaborative approach to project delivery. One of the CEOs of the interviewed companies highlighted:

Customers need to invest time in building trust and ensuring people understand the changes before and after, as well as the ongoing progress (KII CEO, 05).

Each of these quotes reflects different aspects of challenges faced in software development and customer relations, highlighting areas where clarity, communication, and mutual understanding are crucial for successful outcomes.

H. Outsourcing challenges

Local software industries in Somaliland face challenges when governments choose to outsource projects to foreign companies instead of utilizing capable local firms. Despite the local industry's confidence in meeting project needs and understanding local contexts well, international advertising and past project failures may lead governments to favor foreign firms with perceived experience and success.

There is a call for greater recognition and support for local companies to compete and contribute effectively to national projects. All the interviewed companies shed light on this and said as follows:

Foreigners typically undertake projects in our country, yet there are capable citizens who can perform these tasks (KII CEO, 03) .

I am confident that companies in Somaliland can meet all the country's needs. The issue lies in giving projects to foreign companies (KII CEO, 03) .

International advertising of projects from abroad often leads to foreign companies winning these projects due to their extensive experience and successful track record, overshadowing local companies capable of performing the same work (KII CEO, 03).

In 2016, a Kenyan company was tasked with developing a system for the Bank of Somaliland. When they were unsuccessful, we were approached and successfully completed the project because local companies understand the local context exceptionally well (KII CEO, 03).

When a well-funded large project comes up, it's often given to an outside company instead of our capable local industry (KII CEO, 02).

The government may choose outsourcing because local companies have failed in projects, possibly due to insufficient confidence from the government. However, our local companies are capable of successfully completing these projects (KII CEO, 02).

The companies interviewed believe strongly in Somaliland-based firms' ability to handle national projects well. They point out times when local expertise was essential, especially when foreign companies had problems. However, they are worried that big, well-funded projects often go to foreign companies instead of supporting local businesses.

I. The Opportunities in The Software Developing Sector

The data shows how respondents perceive different opportunities within the software development sector. Here's a breakdown of the findings:

TABLE III
Opportunities

Perceived opportunities	The number of frequency and the percentage (N = 75)				
	S.D	D	N	A	S.A
There is a local receptive market	0	6 (8%)	12 (16%)	23 (30.7%)	34 (45.3%)
There are growing job opportunities in this sector	4 (5.3%)	7 (9.3%)	5 (6.7%)	36 (48%)	23 (30.7%)
There are freelancing and remote working opportunities	5 (6.7%)	14 (18.7%)	17 (22.7%)	21 (28%)	18 (24%)

J. Local Receptive Market

A large majority, 75.3% (combined agree and strongly agree), believe there is a good market locally for software development. This suggests that most respondents feel there is demand and acceptance for software services in their area. Somaliland's software sector is witnessing significant developments driven by digital transformation, increased demand post-pandemic, and governmental modernization efforts. These factors are creating new opportunities for local companies to innovate and provide solutions tailored to emerging market needs.

One of the opportunities available is our country's digital transformation, with people increasingly embracing digital platforms. Businesses are digitizing operations—like receiving notifications at home when products are sold or restocked. Even when traveling abroad, email keeps them connected to their business (KII CEO, 02).

There is ongoing digital transformation in Somaliland, where there is a growing adoption of digital platforms and technologies among businesses. It points out how businesses are leveraging digital tools to streamline operations, such as receiving real-time notifications and staying connected via email even when traveling. This trend underscores opportunities for software solutions that support digital operations and enhance business efficiency. *Following the coronavirus outbreak, the demand for software in our country was officially recognized, leading to a significant response. Consequently, the number of companies providing solutions in this sector is increasing (KII CEO, 04).*

There is increased demand for software solutions in Somaliland in response to the COVID-19 pandemic. The recognition of this demand has spurred a notable increase in the number of companies offering software solutions. It reflects how crises can drive technological advancements and opportunities in the software sector to address emerging needs and challenges.

The systems revolution or e-government system began around 2013 and 2014, highlighting a growing demand for responsive systems that simplify work processes (KII CEO, 03).

The initiation of the e-government system in Somaliland around 2013-2014, indicate a significant shift towards digitalization in government operations. It underscores the increasing demand for responsive systems that streamline administrative processes and improve efficiency within government agencies. This trend presents opportunities for software developers to create tailored solutions for public sector modernization.

The agreement between Somaliland and Ethiopia will create significant demand for logistics facilitation systems, which are currently needed by companies in the country (KII CEO, 03).

An opportunity is emerging resulting from an agreement between Somaliland and Ethiopia. It suggests that this agreement will generate considerable demand for logistics facilitation systems in Somaliland.

This presents a specific market need for software solutions that can enhance logistics operations and facilitate cross-border trade, indicating potential growth opportunities for software companies specializing in logistics technology.

These statements collectively illustrate various opportunities in Somaliland's software sector, driven by digital transformation, increased software demand post-pandemic, government modernization efforts, and international agreements fostering specific industry needs. They indicate potential avenues for software companies to innovate, develop tailored solutions, and contribute to the country's technological advancement and economic growth.

K. Growing Job Opportunities in the Sector

Over three-quarters, 78.7% (combined agree and strongly agree), think there are increasing job opportunities in software development. This indicates optimism about the sector's potential to create more jobs, likely due to advancements in technology and higher demand for software skills.

L. Freelancing and Remote Working Opportunities

About half, 52% (combined agree and strongly agree), see opportunities for freelancing and remote work in software development. This shows recognition of flexible work options, though not everyone is equally positive or aware of these opportunities.

M. Implications

Market Acceptance: High agreement on a local receptive market suggests favourable conditions for software developers aiming to serve local needs and establish themselves in the market. Job Growth: Strong agreement on increasing job opportunities indicates confidence in the sector's ability to offer more jobs, which is crucial for career growth and economic stability. Freelancing and Remote Work: Mixed responses on freelancing and remote work opportunities highlight varying perceptions within the software development community about these flexible work options. These findings provide insights into how software developers perceive opportunities in their field. Positive views on market acceptance and job growth suggest a promising outlook, while recognition of freelancing and remote work options reflects the evolving nature of work

in the software industry. Addressing challenges and capitalizing on these opportunities could further enhance the sector's role in economic growth and innovation.

IV. Discussion

The first objective of the study was to identify and analyze key challenges faced by software developers in Somaliland. One of the most significant barriers identified was the skill gap among software developers. A notable 84% of participants highlighted the lack of skills, indicating that many developers lack the necessary expertise to develop competitive software products. This skill gap is partly due to the inadequate professional training opportunities available in the region. In fact, 84% of respondents strongly agreed that there is a significant shortage of professional training programs and workshops, which are crucial for continuous learning and skill enhancement.

Lastly, the absence of supportive government policies was highlighted as a critical issue. A significant 86.6% of respondents agreed that there are no effective government policies to enhance the software development ecosystem in Somaliland. The lack of regulatory support stifles the industry's growth and discourages potential investors and entrepreneurs.

Despite these challenges, the study identified several potential opportunities for software developers in Somaliland. The local market was shown to be highly receptive to new software products, with 76% of respondents indicating a growing demand for innovative software solutions. This suggests a fertile ground for developers to introduce new products and services that can meet the needs of various sectors within the local economy.

Job opportunities within the tech sector were also observed to be on the rise, with 78.7% of respondents acknowledging the increasing availability of positions for software developers. This growth is likely driven by the expanding use of technology across different industries, creating a demand for skilled developers who can support and enhance these technological initiatives. However, opportunities for freelancing or remote work were less robust, with only 52% of respondents acknowledging their prevalence. To capitalize on remote work, efforts must be made to improve internet infrastructure, provide better access to global freelance platforms, and offer training on remote work best practices.

The literature review and research findings in this study are strongly interconnected, reinforcing each other's insights about the impact of skills and education on software development quality and industry effectiveness.

Firstly, the literature review highlights the importance of skilled coders in producing high-quality software. According to Justin Beaver and Guy Schiavone (2006), teams with experienced and knowledgeable developers tend to create superior software, while less skilled members can negatively impact product quality. This aligns with the research findings, where 84% of respondents acknowledged a skill gap among software developers, underscoring the necessity for enhanced skills and capabilities in the workforce to maintain high standards in software quality.

Additionally, studies by Liebenberg, Huisman, and Mentz (2014) revealed a significant misalignment between formal education and industry requirements. They emphasized the need for curricula updates to bridge this gap, which resonates with the research finding that software companies face challenges in finding qualified professionals. The shortage of skilled labour identified in the findings reflects the industry's struggles with this educational misalignment, indicating a pressing need for education systems to adapt more closely to industry needs.

Further, Lethbridge (2007) and Kitchenham (2005) identified specific gaps in technical knowledge areas such as user interfaces, real-time system design, and project management. These gaps mirror the research findings, where a lack of skilled labour hinders companies from meeting operational needs efficiently. The research supports the literature's call for updating software development curricula to include current industry trends and technologies, which would help mitigate these skill shortages.

Keil et al. (2013) emphasized the need for non-technical skills like leadership and communication for IT project managers. This aligns with the findings that highlight a critical skill gap, suggesting that addressing both technical and non-technical competencies in education could better prepare developers for the industry. Furthermore, incorporating real-life projects and up-to-date curricula, as recommended by Liebenberg et al. (2014), would provide practical experience and relevant skills, potentially alleviating the challenges identified in the research.

the literature review supports the research findings by providing a theoretical framework that explains the skill gaps and their impact on the software industry. Both emphasize the urgent need for educational reforms and enhanced training to align with industry demands, ultimately aiming to reduce the skill gap and improve the effectiveness of software developers. The literature review and research findings highlight similar challenges in the software industry, particularly regarding funding, government policies, and support for local development.

(Asuquo Ekanem and Asuquo Peter, 2020) found that 79% of respondents in Nigeria identified low funding for locally developed software as a significant barrier. This mirrors findings in Somaliland, where over 86.7% of respondents noted insufficient government policies as a major issue. Both regions suffer from a lack of regulatory support that could stimulate industry growth.

Additionally, only 20% of software used by Nigerian government agencies is locally developed, often sold at low prices. Similarly, Somaliland faces challenges as local software companies struggle due to government outsourcing to foreign firms. Both studies highlight poor government policies as a key obstacle, with 78% of Nigerian respondents and many in Somaliland identifying this issue.

Both the literature and findings emphasize the need for better funding, supportive government policies, and recog-

nition of local software industries. Addressing these issues could significantly enhance the software sector's growth and potential in both regions.

The literature review and research findings highlight the opportunities and challenges of the software industry in developing regions, focusing on market demand, infrastructure, and economic impact.

Kumar et al. (2005) suggests that software services boost productivity and innovation more than GDP, benefiting sectors broadly but relying heavily on specialized labour, which may lead to inequality. This aligns with Somaliland's findings, where 75.3% of respondents see a strong local market for software, indicating demand and acceptance. However, the reliance on specialized professionals could exacerbate inequality.

Aithal (2015) notes the rapid growth and global spread of the software industry, offering significant opportunities for developing nations due to low entry costs and high value. This perspective mirrors Somaliland's experience, where digital transformation and governmental modernization are creating new opportunities for local firms. These sources emphasize the role of software in enhancing productivity and innovation. Addressing labour specialization and market demand issues could help regions like Somaliland maximize their software sector's potential, driving economic and technological growth.

A. Strengths and Limitations

One notable strength of this study was the willingness of companies to collaborate with us. As a government institution, we had the privilege of securing interviews with various companies due to their respect for our position and their readiness to provide any necessary assistance. This cooperation facilitated comprehensive data collection and enriched the quality of our findings.

However, the study faced several limitations. A significant constraint was the lack of previous research in this sector, which hindered our ability to cite and compare our findings with existing literature. This gap underscores the need for further research in this area to build a robust body of knowledge. Future studies should aim to expand on our findings and explore additional aspects of the software development sector to provide a more comprehensive understanding.

B. Conclusion and recommendations

Throughout this study, the interconnected insights from the literature review and research findings have provided a comprehensive understanding of the challenges and opportunities facing software developers in Somaliland. The research objectives, aimed at identifying challenges and exploring opportunities, have been effectively addressed through the synthesis of existing knowledge and empirical investigation.

Firstly, the literature review underscored the pivotal role of skilled coders in producing high-quality software, a finding corroborated by the research which highlighted an 84% acknowledgement of a skill gap among developers in Somaliland. This emphasizes the critical need for enhanced skills and capabilities within the workforce to maintain high standards in software development.

Moreover, the literature review highlighted a significant misalignment between formal education and industry requirements, resonating with the research's identification of challenges in finding qualified professionals. The shortage of skilled labour identified in the findings reflects the industry's struggle with this educational gap, signalling a pressing need for educational institutions to closely align curricula with industry needs.

Additionally, gaps in technical knowledge identified in the literature, such as user interfaces and project management, parallel the research's findings on the inefficiencies faced by companies in meeting operational needs due to a lack of skilled labour. The call for updating software development curricula to integrate current industry trends and technologies emerges as a crucial recommendation from both the literature and research.

Furthermore, the emphasis on non-technical skills by Keil et al. (2013) underscores the importance of a holistic education approach that prepares developers not only with technical expertise but also with leadership and communication skills. This finding supports the broader call to incorporate practical, real-life projects into educational frameworks, as recommended by Liebenberg et al. (2014), to bridge the gap between academia and industry.

This study holds significant relevance for the software development landscape in Somaliland by addressing critical challenges and suggesting pathways for improvement. By highlighting the need for enhanced skills, aligned education, and updated curricula, the findings provide actionable insights for educational institutions, policymakers, and industry stakeholders. Addressing these challenges can foster a more robust and competitive software industry in Somaliland, capable of meeting local needs while contributing to broader economic growth and technological advancement.

As we move forward, it is imperative to prioritize investments in education that align with industry demands. Educational institutions should collaborate closely with industry stakeholders to update curricula, integrate practical experiences, and foster a workforce equipped not only with technical proficiency but also with the leadership and communication skills essential for innovation and growth. By doing so, we can empower software developers in Somaliland to seize emerging opportunities and contribute effectively to the global digital economy.

C. Recommendations

Here are some things that should be done to make software development better in Somaliland:

1) The skill gap: 1.Somaliland should establish specialized training programs and workshops to improve technical skills like user interfaces, real-time system design, and project management.

2.Developers should be encouraged to stay current with new technologies through certifications, online courses, and partnerships with industry experts.

2) Make Education Match Industry Needs: 3.Educational institutions should collaborate closely with companies to update software development courses to teach the latest technologies and best practices.

4.Practical experience should be emphasized through internships, apprenticeships, and hands-on projects.

5.Foster stronger partnerships between educational institutions and industry stakeholders through joint research projects and advisory boards.

6.Regular dialogue and knowledge sharing should be encouraged to ensure that educational programs meet industry needs.

3) Support Innovation: 7.Somaliland should provide grants and funding opportunities for software development innovations that address local challenges.

8.Support should be given to incubators, accelerators, and tech hubs to foster the development of new software products and services.

4) Supportive Government Policies: 9.Policies should be advocated for that promote the growth of the software industry, such as incentives for local software development and tax breaks for software startups.

10.Streamlined bureaucratic processes related to software development and increased public-sector investment in local software solutions should be encouraged.

5) Improve Tech Access: 11.Ensure that educational institutions and tech companies have reliable internet access, technology infrastructure, and necessary software development tools.

12.Partnerships with telecommunications companies and international organizations should be explored to expand digital infrastructure across Somaliland.

13.Implementing these recommendations should improve the software development ecosystem in Somaliland, creating a skilled workforce capable of driving innovation and economic growth while addressing local challenges.

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