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Navigating Grassroots Innovation Journey in Tanzania: Factors Shaping Innovation

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Authors' contributions

This work was carried out in collaboration among all authors. Author MN drafted the whole manuscript. Authors MC, BI and MR supervised the study and edited the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Grassroots innovation is increasingly recognized for its potential to address localized challenges and promote sustainable development. This study addressed the factors influencing grassroots innovation journeys in Tanzania, utilizing PESTLE and SWOT analysis frameworks. A cross-sectional design was used to collect qualitative data guided by a semi-structured questionnaire from 35 grassroots innovators. 16 innovators were purposively selected from the Tanzania Commission for Science and Technology (COSTECH) innovators database, 11 were purposively selected from

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Mashindano ya Kitaifa ya Sayansi, Teknolojia na Ubunifu (MAKISATU) databases and 8 innovators were purposively selected from 2020, 2021 and 2022 and participants in the 45th and 46th Dar es Salaam International Trade Fair Exhibition (SABASABA) in 2021 and 2022. Key informant interviews and observations supplemented the collected data, identifying different prototypes according to the stages of innovation. Innovators were selected from 11 sectors: Agriculture, Information and Communication Technology, Environment, Energy, Engineering, Education, Health, Security, Transport, Industrial and Water. The findings highlight the critical role of political support, economic stability, technological access and community engagement in fostering successful grassroots innovation journeys. The study offers policy recommendations to enhance the effectiveness and sustainability of grassroots innovation initiatives in Tanzania. Emphasizing the need for stable funding, robust legal frameworks and holistic approach to address multifaceted challenges. This includes policy reforms, economic incentives, societal attitude shifts, technological support, legal clarity and infrastructural improvements. By tackling these issues comprehensively, Tanzania can create a more vibrant and inclusive innovation ecosystem, unlocking the potential of its innovators to drive sustainable development and economic growth.

Keywords: Grassroots innovation journey; grassroots innovations; PESTLE analysis; SWOT analysis; Tanzania.

1. INTRODUCTION

Grassroots innovation has become increasingly important in addressing community specific challenges and promoting sustainable development across various parts of the world. This bottom up approach, which draws on local knowledge, creativity and resources, provides tailored solutions that are deeply connected to the everyday realities of communities (Smith et al., 2021). In Tanzania, grassroots innovation holds particular promise as a catalyst for fostering inclusive socio-economic growth, especially in rural areas where formal innovation systems often fall short (Makumbe, 2020).

However, the grassroots innovation journey is fraught with challenges. According to Participate, (2018) and Barnes & Conti, (2021) innovation journey can be understood as a process which comprise of five stages namely; searching/ideation, exploring, committing, realizing and optimizing. While innovators may begin with strong ideas in the ideation stage, many struggle to progress through critical stages such as prototyping, scaling and optimization. Previous research indicates that only a few grassroots innovators in Tanzania successfully navigate the entire innovation journey, with the majority failing to advance beyond the early stages. Even those who reach the optimization stage often encounter physical and appropriate barriers that prevent them from fully benefiting from their innovations.

Studies from various contexts highlight the reflective influence of PESTLE (Political, Economic, Social, Technological, Legal, and Environmental) factors on different innovation landscapes. For instance, political stability and supportive policies have been instrumental in advancing grassroots innovations in countries like India, where government programs actively promote rural entrepreneurship (Gupta et al., 2018; Kumar & Sharma, 2023). However, Smith et al., (2021) note that the absence of formal governmental recognition often suppresses innovation growth and limits demand for locally developed innovations until supportive policies are fully implemented. Kimaro & Chambo, (2024) argue that consistent leadership and governance are essential for fostering a conducive innovation environment. Similarly, Mwamila et al., (2019) observe that innovation can persist even under unfavorable policies, as innovators often adapt by leveraging local knowledge and resourcefulness. However, as Lema, (2023) points out, high taxation and the lack of protective measures for local innovations pose significant threats. Addressing these challenges through strong Science, Technology and Innovation (STI) policies and consistent government support, as suggested by Mtenga, (2023), could unlock substantial opportunities for grassroots innovation.

Economic factors also play a crucial role in determining whether grassroots innovations can scale. Access to funding and markets is critical, as seen in grassroots initiatives in Kenya that rely on microfinancing models to sustain projects (Kamau & Otieno, 2021; Waje et al., 2024). However, innovators in Tanzania face significant hurdles, including high taxes, interest rates, and

a lack of market insights, which undermine their competitiveness (Mwamila & Swai, 2019; Kashuliza & Temu, 2021). Tailored market research and better understanding of value chains, as emphasized by Mollel & Nkwame, (2023) and Ngowi, (2024), could solve growth opportunities for grassroots innovators.

Social factors, such as community acceptance and cultural norms, further shape innovation landscape. While societal expectations, particularly regarding gender roles, can limit women's participation (Msofe & Mushi, 2022), fostering inclusivity and shifting attitudes, as proposed by Awinja & Mwakaje, (2023); Genda, (2024). Could significantly enhance support for grassroots innovators. In addition, technological constraints, including limited access to advanced tools and training, remain a significant barrier for grassroots innovators. Interventions such as technology hubs in Southeast Asia demonstrate how targeted initiatives can transform innovation outcomes (Chan et al., 2020). Strengthening networks and improving technical support are essential to overcoming these challenges (Kizito & Mollel, 2022; Roberts & Evans, 2024).

Furthermore, legal frameworks also play a crucial role in innovation landscape. For example, intellectual property rights and regulatory requirements can either facilitate or hinder innovators depending on their accessibility and clarity (Dube, 2019). Finally, environmental factors, such as infrastructure and climate conditions, profoundly affect grassroots innovation. Poor road networks and inadequate connectivity in rural areas limit innovators' market reach, emphasizing the need for improved infrastructure and accessible innovation centers (Mwangi, 2020; Chirwa, 2024).

Despite the growing recognition of grassroots innovation's significance, there is a notable gap in the literature, particularly in relation to the Tanzanian context. Existing studies on innovation ecosystems tend to focus on industrial level innovation, providing limited insights into community driven innovation processes. Moreover, while Political, Economic, Social, Technological, Legal, and Environmental (PESTLE) factors are broadly understood to influence innovation (Johnson et al., 2017; Blümel et al., 2023), little is known about how these factors specifically affect grassroots innovation journey in Tanzania.

Using both PESTLE and SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis frameworks, this study provides a comprehensive examination of the drivers and barriers grassroots innovators face. Additionally, it offers actionable recommendations to create a more supportive environment for grassroots innovation, contributing to sustainable socio-economic development in Tanzania.

2. METHODOLOGY

This study adopted a cross-sectional design to investigate the factors influencing grassroots innovation journeys in Tanzania. A combination of qualitative data collection methods was employed to obtain comprehensive insights into these factors. A total of 35 grassroots innovators were purposively selected from various sources, including 16 innovators from the COSTECH Innovators Database, 11 innovators from the MAKISATU databases for 2020, 2021 and 2022, and 8 participants from the 45th and 46th Dar es Salaam International Trade Fair Exhibitions (SABASABA) held in 2021 and 2022.

Among the selected innovators, 19 were at the realizing stage of the innovation journey and had participated in exhibitions. Of these, 8 attended the 2023 SABASABA Exhibition in Dar es Salaam, while 11 participated in the 2023 NANENANE Exhibitions. The 11 innovators from NANENANE were found in different regions: 3 in Arusha, 2 in Morogoro and 6 in Mbeya. Semi-structured questionnaires were used to interview these innovators, gathering information on the factors influencing their innovation journeys. The remaining 16 innovators, whose innovations were not at the realizing stage and did not attend the exhibitions were interviewed via phone using semi-structured questionnaires to identify the barriers and successes in their progress in the innovation journey. The innovators represented eleven sectors: Agriculture, Information and Communication Technology, Environment, Energy, Engineering, Education, Health, Security, Transport, Industry and Water. Selection was based on their progression through various stages of the innovation journey, (Table 1).

Additionally, key informant interviews were conducted with representatives from major Tanzanian innovation stakeholders involved in policy formulation, funding, incubation and technical support for grassroots innovation. Those stakeholders includes; COSTECH, MOEST, TPSF, BRELA, COSOTA, VETA, SIDO and NIT. These interviews provided valuable

Table 1. Summary of sample size composition by sectors, stages and exhibitions

Sector	Innovation Journey Stages and Non Attendees of 2023 NANENANE and SABASABA Exhibition					NANENANE 2023 Exhibition Attendees			SABASABA 2023 Exhibition Attendees
	Ideation	Exploring	Committing	Realizing	Optimizing	NANENANE Arusha Exhibition Attendees	NANENANE Morogoro Exhibition Attendees	NANENANE Mbeya Exhibition Attendees	
Agriculture					1	3	2	6	
ICT	2	1			2				4
Environment	1								
Education			1		1				2
Health	1		1						
Industrial									
Security			1						
Transport									
Water									2
Energy			1						
Engineering	1	1	1						
Total	**5**	**2**	**5**		**4**	**3**	**2**	**6**	**8**
Total Sample Size						**35**			

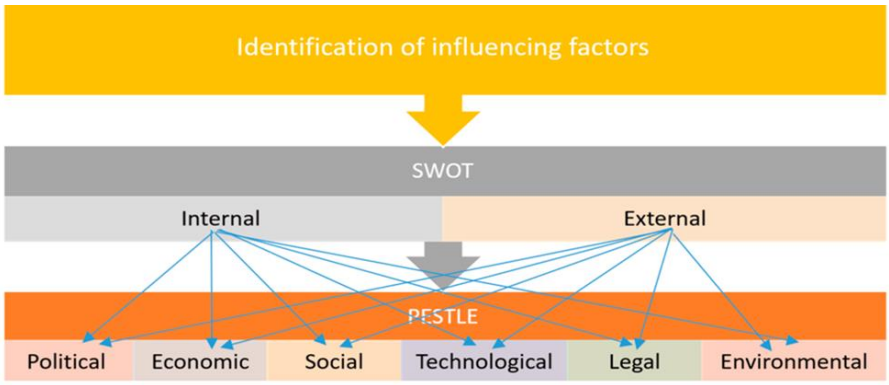

Fig. 1. Combination of SWOT and PESTLE analysis in identification of influencing factors in grassroots innovation journey

context and deeper insights into the innovation ecosystem. Observational methods were also utilized to evaluate the prototypes developed by the innovators, focusing on their development stages and practical applications. This helped identify key challenges and achievements at different stages of the innovation journey.

To capture diverse experiences and gain a comprehensive understanding of the challenges faced and factors influencing innovators across the various stages of the innovation journey, the study employed SWOT (Strengths, Weaknesses, Opportunities and Threats) and PESTLE (Political, Economic, Social, Technological, Legal and Environmental) analyses. These frameworks provided a systematic approach to examining both internal and external factors affecting grassroots innovation journeys (Fig. 1). This comprehensive approach helped provide a clear understanding of the various factors affecting grassroots innovation journeys in Tanzania.

3. RESULTS

3.1 Factors Influencing the Accomplishment of the Grassroots Innovation Journey

The PESTLE and SWOT analyses highlight a range of challenges and opportunities faced by grassroots innovators in Tanzania, with each factor contributing to the overall innovation journey (Table 2 up to Table 7).

The political landscape in Tanzania presents several challenges for grassroots innovation, primarily due to the absence of a comprehensive Science, Technology and Innovation (STI) policy, frequent leadership changes in the Ministry of Education, Science and Technology (MoEST) and delays in policy implementation as outlined in (Table 2). These factors contribute to a lack of policy support, inconsistent governance and a failure to formally recognize grassroots innovations. The high financial barriers, including excessive taxation and the lack of protective measures for local innovations, further exacerbate the situation. However, the inherent creativity and resilience of grassroots innovators serve as a strength, alongside the potential for policy reform and the integration of innovation into the STI policy, which could provide clearer guidance and more structured support. Opportunities exist in the ongoing review of the STI policy to incorporate innovation, potentially enhancing the support for grassroots innovators. Nevertheless, threats such as political instability, leadership transitions, and shifts in public spending priorities pose challenges to the sustainability and growth of grassroots innovations.

The economic factors impacting grassroots innovation in Tanzania present a mix of challenges and opportunities, as shown in (Table 3). Key challenges include high tax rates, stringent loan conditions, limited market availability, poor market research and consumer preference for imported goods. Innovators also face high-interest rates and inflation, alongside a lack of competitive awareness and poor coordination among innovators. These issues are compounded by limited access to financial resources, such as restrictive loan criteria and a lack of understanding of market needs and value chains. However, grassroots innovations have strengths, including their affordability and adaptability, especially during economic downturns. Opportunities lie in the potential for market demand growth with GDP expansion, policy reforms to encourage local innovations and a growing awareness of the importance of

local products during economic challenges. There is also potential for expanding the customer base through tailored market research and better integration of the value chain. Despite these opportunities, threats such as ongoing inflation, rising production costs and tough competition from foreign products remain significant obstacles to the sustainability and competitiveness of grassroots innovations.

The social and cultural factors influencing grassroots innovation in Tanzania present various challenges, as outlined in (Table 4). These challenges include gender biases and societal expectations, negative societal attitudes towards local innovations and difficulties faced by multi-occupation innovators in balancing multiple responsibilities. Additionally, there is a societal preference for imported products and traditional beliefs that hinder the acceptance of innovations, particularly those led by women. Despite these challenges, strengths such as the young demographic of innovators (aged 21–40) and the vocational training background, with support from institutions like VETA, provide opportunities for growth. However, gender discrimination limits women's participation and growth in innovation, and the divided focus of multi-occupation innovators, alongside negative societal attitudes towards grassroots innovations, further complicate the situation. There is an opportunity to enhance gender inclusivity in innovation and shift societal attitudes to favor local innovations, as well as expand access to financial and educational resources. The adaptability and energy of young innovators also provide significant potential. Nevertheless, threats persist, including imbedded gender biases, a preference for imported goods and distrust of women-led innovations in rural areas.

The technological landscape for grassroots innovation in Tanzania faces several challenges, primarily due to inadequate knowledge flows and networks, limited automation capabilities and reliance on artificial research methods, such as Google searches and reverse engineering as detailed in (Table 5). These challenges result in inferior service delivery compared to imported products and grassroots innovators struggle with access to advanced tools and training for automation. There is also a lack of originality in grassroots innovations, with some innovators resorting to 'copy and paste' solutions rather than developing unique ideas. Weak intellectual property protection further compounds these issues. However, there are strengths, such as the potential to leverage digital platforms like Instagram, websites and STI conferences to enhance visibility and outreach, as well as the ability to build stronger networks for support. Opportunities lie in improving knowledge acquisition through training and collaboration, alongside the possibility of building stronger networks for marketing, financial and technical support. Despite these opportunities, threats remain, including rapid technological advancements in imported products, shifting consumer preferences toward automation and the perception that imported goods are more technologically advanced. Limited access to technical support and training for grassroots innovators, along with increasing automation in the market, also makes local innovations less competitive.

The legal environment for grassroots innovation in Tanzania faces significant challenges, as outlined in (Table 6), including a lack of clear regulations and guidelines for innovation, slow STI policy development and complex Intellectual Property (IP) laws. Innovators also face limited access to legal support, complicated patent procedures and a general lack of IP knowledge. These obstacles hinder the ability to protect innovations and secure funding, as perceived high risks and inadequate legal protection discourage investment. However, there are strengths in the potential for creativity, local problem-solving capabilities and the ability of grassroots innovators to adapt to local needs. Despite these strengths, weaknesses such as inadequate legal support, costly and complex IP registration processes and a lack of novelty in innovations persist. Opportunities exist in accelerating the review and development of the STI policy to include grassroots innovation, simplifying patent procedures, increasing awareness of IP rights, and providing accessible legal guidance and support for innovators. These steps could also enhance access to financing through clearer legal frameworks. Nevertheless, threats remain, including continued delays in policy development, restrictive employment laws, high-risk perceptions from investors and the potential exploitation of innovations without proper legal safeguards.

The environmental factors affecting grassroots innovation in Tanzania, as outlined in (Table 7), include significant challenges such as poor network connectivity particularly in rural areas and inadequate infrastructure. The absence of nearby innovation hubs and limited cooperation from support institutions further exacerbates the difficulties. Additionally, innovators face

Table 2. Political and SWOT analysis of grassroots innovation journey in Tanzania

Factor	Challenges	Internal Sub-factors		External Sub-factors	
		Strengths	**Weaknesses**	**Opportunities**	**Threats**
Political	- Absence of comprehensive STI policy - Frequent leadership changes in MoEST - Delays in policy implementation due to leadership transitions - Lack of formal government recognition of grassroots innovations - Limited progression of grassroots innovations through developmental stages	- Inherent creativity and resilience of grassroots innovators	- Lack of policy support - High financial barriers - High taxation policies - Absence of import restriction regulations, exposing innovators to foreign competition	- Policy under review to include innovation component - Potential shift in public spending priorities - Potential for policy reform - Integration of innovation into the STI policy could enhance support for grassroots innovators - Structured support and clearer guidance through STI policy updates	- Ongoing political instability - Policy inconsistency - Lack of protective measures for local innovations - Excessive tax burdens limiting grassroots innovation sustainability

Table 3. Economic and SWOT analysis of grassroots innovation journey in Tanzania

Factor	Challenges	Internal Sub-factors		External Sub-factors	
		Strengths	**Weaknesses**	**Opportunities**	**Threats**
Economic	- High tax rates and tariffs - Stringent loan conditions - Limited market availability - Poor market research and understanding of customer needs - High interest rates and inflation - Consumer preference for imported goods - Limited coordination and poor teamwork skills among innovators	-Affordability of grassroots innovations - Adaptability during economic downturns	- Lack of competitive awareness - Limited access to financial resources due to restrictive criteria (e.g., age limits on loans) - Gaps in market research and poor product standards - Limited value chain awareness (suppliers and brokers) - Perceived inferiority of local innovations compared to imports	- Increased market demand with GDP growth - Policy reform to encourage local innovations - Expansion of customer base through tailored market research and better value chain integration - Rising awareness of the importance of local innovations during economic downturns	- Ongoing inflation and rising production costs - High-interest rates restricting access to finance - Consumer preference for imported goods, even during economic growth periods -Unfavorable market dynamics - Tough competition from foreign products

Table 4. Social cultural and SWOT analysis of grassroots innovation journey in Tanzania

Factor	Challenges	Internal Sub-factors		External Sub-factors	
		Strengths	**Weaknesses**	**Opportunities**	**Threats**
Social and Cultural	- Gender biases and societal expectations - Negative societal attitudes towards local innovations - Challenges for multi-occupation innovators (balancing multiple responsibilities) - Societal preference for imported products - Traditional beliefs hindering acceptance, especially for women innovators	- Young demographic of innovators (21–40 years) - Vocational training background (e.g., VETA support)	- Gender discrimination limits women innovators' participation and growth - Divided focus among multi-occupation innovators - Negative attitudes towards grassroots innovations - Limited community support for female innovators	- Enhancing gender inclusivity in innovation - Shifting societal attitudes to favor local innovations - Expanding access to financial and educational resources - Leveraging young innovators' adaptability and energy	- Persistent gender biases embedded in societal norms - Preference for imported goods undermining local innovations - Distrust of women led innovations in rural areas

Table 5. Technological and SWOT analysis of grassroots innovation journey in Tanzania

Factor	Challenges	Internal Sub-factors		External Sub-factors	
		Strengths	**Weaknesses**	**Opportunities**	**Threats**
Technological	- Inadequate knowledge flows and networks - Inferior service delivery - Limited automation capabilities - Reliance on artificial research methods (e.g., Google searches and reverse engineering) - Limited access to advanced tools and training for automation	- Potential to leverage digital platforms for advertising and outreach - Ability to build stronger networks for support	- Inadequate knowledge in innovation development - Inferior service delivery compared to imported products - Lack of originality in grassroots innovations (e.g., 'copy and paste' from Google) - Weak intellectual property protection	- Leveraging digital platforms (e.g., Instagram, websites, STI conferences) to enhance visibility - Improving knowledge acquisition through training and collaboration - Building stronger networks for marketing, financial, and technical support	- Rapid technological advancements in imported products - Shifting consumer preferences toward automation - Imported products perceived as more technologically advanced - Limited access to technical support and training for grassroots innovators - Increasing automation in the market, making local innovations less competitive

Table 6. Legal and SWOT analysis of grassroots innovation journey in Tanzania

Factor	Challenges	Internal Sub-factors		External Sub-factors	
		Strengths	**Weaknesses**	**Opportunities**	**Threats**
Legal	- Lack of clear regulations and guidelines for grassroots innovation - Slow speed in STI policy development - Complex Intellectual Property (IP) laws - Limited access to legal support -Complicated patent procedures - Lack of IP knowledge - Challenges in securing funding due to perceived high risks and lack of legal protection	- Potential for creativity - Local problem solving capabilities - Grassroots innovators' ability to adapt to local needs	- Inadequate legal support for innovators - Complex and costly IP registration processes - Lack of novelty in innovations, often due to "copy and paste" practices - Limited legal expertise among innovators	- Accelerating the review and development of the STI policy to include grassroots innovation - Simplifying and reducing costs of patent application procedures - Increasing awareness and education about IP rights - Providing accessible legal guidance and support for innovators - Enhancing access to financing through clearer legal frameworks	- Continued delays in policy development - Restrictive employment laws that hinder innovation - High risk perceptions from investors due to lack of legal protection - Risk of exploitation of innovations without proper legal safeguards

Table 7. Environmental and SWOT analysis of grassroots innovation journey in Tanzania

Factor	Challenges	Internal Sub-factors		External Sub-factors	
		Strengths	**Weaknesses**	**Opportunities**	**Threats**
Environmental	- Poor network connectivity, especially in rural areas - Poor infrastructure in rural areas - Lack of nearby innovation hubs - Limited cooperation from support institutions - Difficulty in transporting materials and devices	- Potential for unique localized solutions tailored to community needs - Strong community based problem solving capacity	- Poor infrastructure hindering innovation - Lack of innovation centers - Limited cooperation from host institutions in resource and fund management	- Improving transportation infrastructure - Enhancing network connectivity in rural areas - Establishing innovation hubs or centers in accessible locations - Encouraging cooperation between innovators and host institutions	- Persistent infrastructural inadequacies - Isolation of rural innovators from key resources - Continued challenges in effective collaboration with host institutions

challenges in transporting materials and devices. Despite these barriers, there are strengths, such as the potential for unique, localized solutions tailored to community needs and a strong capacity for community-based problem-solving. However, weaknesses remain, including poor infrastructure, the lack of innovation centers and limited cooperation from host institutions in managing resources and funds. Opportunities to address these challenges include improving transportation infrastructure, enhancing network connectivity in rural areas, establishing accessible innovation hubs and fostering cooperation between innovators and host institutions. Yet, threats such as persistent infrastructural inadequacies, the isolation of rural innovators from key resources and ongoing challenges in collaboration with host institutions remain.

4. DISCUSSION

4.1 PESTLE and SWOT Discussion's for Factors Influencing the Accomplishment of the Grassroots Innovation Journey

Political factors: Grassroots innovators in Tanzania navigate a complex political landscape that presents both challenges and opportunities. A major barrier is the absence of a comprehensive Science, Technology, and Innovation (STI) policy, which limits government support for innovation. This is in line with the findings of other studies, where a lack of formal policy support has been found to create barriers for grassroots innovation (Lema, 2023; Kimaro & Chambo, 2024; Njogu et al., 2024). This concern is boomed by a MoEST officer responsible for promoting and supporting innovators at the ministry level who explained:

> *"…It is true that MoEST has delayed in formulating and reviewing the STI policy, with the first draft prepared as early as 2018. Despite this delay, MoEST has succeeded in developing national guidelines for identifying and promoting innovations since 2018. These guidelines have raised awareness among policymakers, politicians, public servants, the private sector and civil society on how best to support grassroots innovators in Tanzania. However, the key challenge remains in advancing grassroots innovations from one stage to the next, ensuring they significantly contribute to the socio-economic development of the country..." (Key informant, MoEST, 19th July 2023).*

This implies that while progress has been made in formulating policies and guidelines, challenges persist in supporting the developmental stages of grassroots innovations, which are essential for generating broader socio-economic impact. According to Kweka & Mwijage, (2022), the ongoing review of the STI policy presents a potential opportunity. The integration of innovation into this policy could offer clearer guidance and more structured support for grassroots innovators.

Leadership changes within the MoEST contribute to further instability. Frequent leadership transitions delay policy implementation, as new ministers may prioritize innovation differently, leaving innovators without a clear direction. This issue of leadership transitions is consistent with findings in other contexts, such as in Uganda, where political instability and changes in leadership hindered innovation projects in rural communities (Munyoka & Gadzirai, 2020).

Despite these political weaknesses, grassroots innovators' creativity and resourcefulness remain a strength in overcoming these challenges. However, the finding indicate that excessive tax burdens hinder grassroots innovators' ability to sustain their innovations, while the absence of import restriction regulations subjects grassroots innovators to stiff competition from foreign products, undermining their efforts. This is consistent with Gupta, (2019), who found that high taxation rates in Kenya negatively impacted local innovators' ability to scale their innovations.

Economic factors: Economic factors present both significant challenges and opportunities for grassroots innovators in Tanzania. A primary economic challenge is the high tax rates and tariffs, which create substantial financial barriers for innovators. These barriers hinder their ability to sustain and scale innovations. The absence of import restrictions exacerbates this issue, as locally produced innovations face stiff competition from foreign products, which are generally preferred by customers, further devaluing homegrown innovations. This finding is in line with Lema, (2023), who highlights that a lack of import protection continues to harm local innovation efforts, making it harder for Tanzanian innovators to scale up.

Market availability is limited due to grassroots innovators' lack of understanding of customer needs and market dynamics. Without such insights, innovators find themselves poorly positioned in the competitive market. This finding corroborate with Al-Omar et al., (2024) who noted that limited market research restricts the growth of grassroots innovations.

Many grassroots innovators also face challenges in coordinating their efforts due to insufficient resources and poor teamwork skills. According to a COSTECH officer responsible for supporting innovators, accessing bank loans is another significant hurdle, with stringent requirements set by financial institutions. The officer elaborated:

> *"…The primary sources of funding for grassroots innovators in Tanzania include the National Fund for the Advancement of Science and Technology (NFAST), operational budgets from MoEST and COSTECH, contributions from the private sector, individuals, financial institutions, development partners and venture capital funds. The private sector is encouraged to contribute funds in areas where innovation could advance its business interests. However, one of the main challenges with these funding sources is the restrictive conditions for accessing funds or loans. For instance, IMBEGU projects under CRDB Bank have age restrictions, with loans primarily available to youth, even though older individuals may have equally viable innovations that merit market support…"(Key informant, COSTECH, 12th July 2023).*

This highlights the need for more inclusive funding criteria that allow innovators of all ages to access financial support, thus enabling a broader range of innovations to contribute to economic growth. Despite the availability of bank credits, the stringent conditions attached to these loans make them inaccessible to most grassroots innovators. This is consistent with the findings of Ndege, (2023), who notes that the restrictive conditions attached to loans create barriers for many grassroots innovators who could otherwise contribute significantly to the economy.

These financial barriers result in products that often fail to meet acceptable market standards, further diminishing their competitiveness. This is particularly problematic as local products are often perceived as inferior to foreign imports. Furthermore, a lack of awareness about the importance of suppliers and brokers in the value chain limits market penetration and impedes innovators' ability to fully capitalize on their products.

The study found that high interest rates further hinder access to financial resources necessary for developing innovations. Also high inflation restricts innovators' ability to secure loans, stifling the growth of grassroots initiatives. Inflation compounds these economic challenges, particularly when imported products compete directly with local innovations. This issue of inflation is also noted by Juma, (2023), who found that inflation leads to increased production costs, putting local innovators at a further disadvantage compared to international competitors.

Consumer preferences for imported goods pose a significant economic threat to grassroots innovations. This shift, however, is not sustained during periods of economic growth, highlighting the vulnerability of grassroots innovators to shifts in consumer behavior and economic cycles.

Economically, a key strength for grassroots innovators lies in the affordability and adaptability of their innovations, especially during economic declines. However, weaknesses such as inadequate market research, lack of competitive awareness, and high-interest rates significantly hinder innovators' progress. Opportunities for growth lie in policy reforms and increased market demand as the economy improves.

Despite the opportunities, threats such as inflation, high-interest rates, and consumer preferences for imports persist. Chisale, (2024) underscores the impact of inflation and market dynamics, which limit grassroots innovators' market share and raise production costs. Furthermore, Dalberg, (2018); Dahi & Enweruzo, (2024) highlights financial barriers and consumer biases as major challenges, emphasizing that without policy interventions to reduce borrowing costs and encourage local consumption, grassroots innovators will continue to face significant obstacles. This is in line with Mwamila & Swai, (2019), who argue that without reforms to address these financial barriers, grassroots innovators will continue to struggle to scale their innovations.

Social and cultural factors: Grassroots innovators in Tanzania encounter substantial social and cultural challenges, primarily

stemming from the public's preference for foreign products and deeply rooted gender biases. These societal factors diminish the marketability and acceptance of locally developed innovations. A key societal challenge for grassroots innovators is the widespread preference for imported goods over locally produced products. This consumer bias significantly undermines the efforts of innovators trying to establish market purchases with their locally made innovations. The preference for foreign products persists despite the growth in local innovation capabilities, and this bias poses a significant barrier for locally produced goods. Msofe & Mushi, (2022) argue that shifting societal attitudes toward local products is vital for increasing the market acceptance and success of grassroots innovations.

The demographic profile of innovators shows that most are within the 21-40 age group, which brings both opportunities and challenges. Younger innovators, in particular, are often more adaptable and able to take advantage of the technical support offered by institutions like the Vocational Education and Training Authority (VETA), as explained by a VETA officer:

> *"…VETA, with its available workshop facilities, plays a role in providing technical training and sensitizing Tanzanian grassroots innovators to participate in innovation for economic development. However, in fulfilling this role, VETA has observed that young innovators tend to adapt quickly to the technical assistance provided, unlike older innovators. This is primarily because younger innovators are fresher, more energetic, and typically have fewer responsibilities…" (Key informant, VETA, 20th July 2023).*

This statement reflects that younger innovators are better able to capitalize on opportunities because of their flexibility and fewer family obligations, which allow them to dedicate more time to their innovative tasks. However, Mushi, (2021) points out that despite the creative potential of younger innovators, many still face barriers such as a lack of financial stability and external support, which limit their ability to fully bring their ideas to fruition.

In contrast, gender dynamics continue to be a significant barrier to innovation, with the majority of grassroots innovators being male. Women innovators, are often expected to prioritize domestic and familial responsibilities, find it difficult to dedicate the time and resources needed for innovation activities. A COSTECH officer confirmed that, upon reviewing the database of innovators seeking support, the majority were men, with few women innovators represented:

> *"…Among other responsibilities, COSTECH maintains a database of walk-in innovators who can reach out for support through email, postal letters or in person. However, reviewing this database reveals that the majority of grassroots innovators are male, with very few female innovators…" (Key informant, COSTECH, 12th July 2023).*

This gender disparity reflects societal norms and biases that hinder women's participation in innovation. Even when women do innovate, they face significant challenges, such as rejection from customers and a lack of community support. Msofe & Mushi, (2022) suggest that these gender biases limit the success and growth of female innovators in Tanzania.

This aligns with findings from Awinja & Mwakaje, (2023), who stress the importance of fostering a culture that supports gender inclusivity and shifting traditional attitudes in order to promote grassroots innovation.

Tanzania's social and cultural matter also undervalues grassroots innovations in comparison to imported products. Those balancing innovation with other commitments, such as students or parents, may struggle with divided focus, limiting their ability to fully succeed in their innovative endeavors.

Moreover, financial considerations, such as income levels and educational background, influence the progress of grassroots innovators. Those with higher incomes often have better resources to sustain their innovations and move forward in the innovation process. Vocational training, particularly from institutions like VETA, is also essential in equipping innovators with the necessary skills and knowledge for success. This finding aligns with Lyimo & Magesa, (2022) who emphasized that vocational education is crucial for helping grassroots innovators navigate technical challenges and develop effective solutions.

Technological factors: The technological landscape in Tanzania presents both significant

challenges and opportunities for grassroots innovators. A major limitation is the inadequate infrastructure and restricted knowledge flows, which hinder innovators' ability to develop, refine and scale their innovations Shah et al., (2024) emphasizes that improving technological infrastructure and facilitating better knowledge exchange are crucial for fostering grassroots innovation in the country. Enhancing digital platforms and building stronger networks could improve innovators' knowledge acquisition and outreach capabilities, as suggested by Smith & Johnson (2023).

From both the PESTLE and SWOT perspectives, the slow speed of new product development is a major threat to the competitiveness of local innovators. Tanzanian grassroots innovations are frequently dominated by imported products, which are often perceived as more technologically advanced. This aligns with Ngowi & Magesa, (2022) finding that imported innovations, benefiting from more developed technological ecosystems, tend to outperform local alternatives, creating a competitive disadvantage for grassroots innovators.

The rise of automation products further complicates the technological environment. Increasing consumer demand for automated solutions, often imported, creates barriers for grassroots innovators, who lack the resources and technical expertise to compete effectively. & Mwangi & Njoroge (2023) observed that grassroots innovators face challenges in keeping up with automation trends, which is further compounded by limited access to advanced tools and training. A key weakness identified in both PESTLE and SWOT analyses is the disparity in service delivery between local and imported products. Imported products benefit from superior service quality, enhancing their attractiveness to consumers. In contrast, grassroots innovations often suffer from weaker service delivery capabilities, negatively affecting customer satisfaction and marketability. Despite these challenges, digital platforms such as Instagram, websites, and Science, Technology, and Innovation (STI) conferences offer substantial opportunities for improving the visibility of grassroots innovations.

Another technological challenge is the reliance on artificial research methods, such as Google searches and reverse engineering, rather than original research and development. A respondent from BRELA, responsible for assisting innovators with patent rights, highlighted challenges related to the originality of grassroots innovations:

> *"… BRELA's primary role is to protect innovations by granting patents according to the law. However, a major challenge for grassroots innovators is a lack of novelty in their innovations due to 'copy and paste' practices from google. As a result, many grassroots innovators are unable to secure patent protection because they fail to meet BRELA's patenting criteria…" (Key informant, BRELA, 11th August 2023).*

The reliance on google searches and reverse engineering among Tanzanian grassroots innovators was also noted by COSOTA. A COSOTA officer, responsible for supporting innovators, explained:

> *"…Among the major functions of COSOTA and COSOZA is to register copyright ideas from grassroots innovators in mainland Tanzania and Zanzibar. However, most grassroots innovators struggle to protect their ideas due to a lack of originality, often resulting from copying ideas from google…" (Key informant, COSOTA, 7th August 2023).*

This tendency to rely on external sources for ideas limits the ability of authorities to promote and protect the intellectual property of grassroots innovators and highlights the need for more training in originality and creativity. This reliance on imitation reflects a knowledge gap.

Moreover, the lack of robust networks for marketing, financial, and technical support remains a major barrier for grassroots innovators. Many innovators rely heavily on authorities responsible for Science, Technology, and Innovation (STI) for support, but these networks are often insufficient.

Despite the technological challenges, there are notable opportunities for growth, especially through the adoption of digital platforms. The study indicate that digital platforms can significantly enhance the visibility and outreach of grassroots innovations. By improving their digital presence, innovators can reach wider audiences and strengthen their market positioning. This is consistent with Nyirenda, (2024), who found the potential of digital platforms in boosting the impact of grassroots innovations.

However, the rapid technological advancements in imported products and the shifting consumer preferences toward automation present serious threats to the competitiveness of local innovators. Kimaro, (2024) also underscored the challenge faced by grassroots innovators in keeping up with global technological advancements, warning that the progress in imported technologies could further marginalize local innovations.

Legal factors: A major issue facing grassroots innovation in Tanzania is the absence of clear regulations and guidelines specifically tailored to support grassroots innovators. A staff member from the MoEST at Department of Science, Technology and Innovation (DSTI) shared:

> *"…The government formulated the National Science and Technology Policy in 1996, which lacks components related to innovation. This policy is currently under review to establish an updated Science, Technology, and Innovation (STI) policy that will explicitly address innovation. Additionally, the 2018 guidelines for identifying and promoting innovations were developed to assist national innovation stakeholders in supporting innovators across Tanzania…" (Key informant, MoEST, 19th July 2023).*

The lack of a comprehensive and targeted policy framework specifically for grassroots innovation has led to a fragmented approach to supporting grassroots innovators. The National Science and Technology Policy, although foundational, does not provide the detailed structure needed for grassroots innovators to navigate the system effectively. This leaves many innovators unaware of the legal support available to them or uncertain of the appropriate steps to protect their intellectual property. The limited access to intellectual property protection mechanisms hinders innovators from securing the rights to their innovations. The ongoing review of this policy, along with the introduction of new guidelines, presents an opportunity to address these gaps.

In addition to intellectual property protection, grassroots innovators also struggle with understanding and navigating the legal processes necessary for securing patents and trademarks. A staff member from the Business Registration and Licensing Agency (BRELA) explained:

> *"…BRELA's primary role is to protect innovations by granting patents according to the law. However, a major challenge for grassroots innovators is a lack of novelty in their innovations due to 'copy and paste' practices from google. As a result, many grassroots innovators are unable to secure patent protection because they fail to meet BRELA's patenting criteria…" (Key informant, BRELA, 11th August 2023).*

This challenge is compounded by limited access to information on how to navigate the legal landscape. Many innovators resort to copying existing products and ideas from external sources such as Google, rather than creating truly original solutions. This practice not only makes it difficult for them to meet the legal requirements for patent protection but also reduces the overall quality and impact of their innovations.

Moreover, intellectual property protection mechanisms like copyrights and patents are often perceived as complicated and costly by grassroots innovators. Many innovators do not have the resources or legal expertise to navigate the complex process of registering their innovative idea. This is further evidenced by the comments of a key informant from the Copyright Society of Tanzania (COSOTA):

> *"…Among the major functions of COSOTA and COSOZA is to register copyright ideas from grassroots innovators in mainland Tanzania and Zanzibar. However, most grassroots innovators struggle to protect their ideas due to a lack of originality often resulting from copying ideas from google and lack of legal expertise to the majority of grassroots innovators…" (Key informant, COSOTA, 7th August 2023).*

This lack of originality and the reliance on external sources for ideas significantly undermines the ability of innovators to protect their creations and capitalize on their innovations. Without the necessary legal support, grassroots innovators face a significant risk of exploitation and a lack of commercial viability for their ideas.

The legal environment in Tanzania also presents challenges in terms of access to financing. Grassroots innovators often struggle to secure funding due to the perceived high risks associated with their innovations. A critical issue is the lack of robust legal protection, particularly

in areas such as patent rights and copyright protections. Without clear and enforceable intellectual property rights, innovators face difficulties in safeguarding their innovations, which can discourage potential investors who fear the risk of their investments being weakened by unprotected ideas or unauthorized replication. Moreover, the absence of clear legal frameworks for venture capital and angel investment further exacerbates the financing challenges faced by grassroots innovators. This is consistent with the findings of Mwangi & Nyaga, (2023), who highlighted that financial support is crucial for enabling grassroots innovators to scale their ideas but is often unavailable due to legal uncertainties.

Despite these challenges, there are opportunities for improvement within the legal framework. Efforts to update the Science, Technology, and Innovation (STI) policy to include components that directly address grassroots innovation will provide much-needed clarity and structure for innovators. Streamlining patenting and intellectual property registration processes, alongside reducing the costs associated with these legal services, would encourage more innovators to protect their ideas. Furthermore, providing accessible legal education and guidance will equip innovators with the knowledge and tools to navigate the legal landscape and ensure their innovations are adequately protected.

Environmental factors: Environmental factors present significant challenges to grassroots innovation in Tanzania, especially for innovators based in rural areas. Spatial and location issues are crucial, as rural innovators face extensive difficulties in transporting materials and devices. Poor road infrastructure exacerbates these challenges, hindering the efficient movement of resources. Additionally, inadequate network connectivity in rural areas creates significant communication barriers, preventing grassroots innovators from collaborating effectively and accessing up-to-date information and technologies. The finding aligns with Kibombo et al., (2024); Tukashaba & Boubekri, (2024) who highlighted that network barriers hinder communication and access to Information and Communication Technology (ICT), which are essential for modern innovation processes. As a result, rural innovators are at a distinct disadvantage compared to their urban counterparts due to the lack of infrastructural and technological support.

The physical environment further complicates the grassroots innovation journey in Tanzania. Many grassroots innovators lack proximity to innovation centers, such as hubs and workshops, and experience limited cooperation from host institutions that provide necessary support and mentorship. This challenge is supported by feedback from a COSTECH officer responsible for assisting innovators in Tanzania. The officer explained:

> *"…The government, through COSTECH, provides technical assistance to grassroots innovators, including identifying relevant institutions to host and incubate them. Before attaching grassroots innovators to these institutions, COSTECH conducts due diligence on the selected hosts. Additionally, before disbursing funds to these institutions, COSTECH offers training to both the host institutions and the grassroots innovators. However, during followup supervision, COSTECH often receive complaints from host institutions about noncompliance with financial and procurement standards. Innovators tend to request the full disbursement of funds upfront, even though the funds are intended to be provided in installments, contingent on submitting progress reports to both COSTECH and the host institutions…" (Key informant, COSTECH, 12th July 2023).*

This highlights a lack of full cooperation between grassroots innovators and host institutions, particularly regarding fund management procedures. Similar concerns about insufficient collaboration were noted by organizations such as NIT, SIDO, VETA, and DIT. The finding indicate that absence of innovation centers and the often uncooperative nature of host institutions further limit access to essential resources and guidance. These centers typically offer crucial resources from the ideation stage to optimization, but their distance from rural innovators and the lack of cooperation from host institutions restrict the support available to innovators in rural areas.

From a SWOT perspective, grassroots innovation in Tanzania benefits from the potential to develop unique, localized solutions designed to meet community needs. However, this potential is often compromised by poor infrastructure, a lack of innovation centers and uncooperative support institutions.

5. CONCLUSION

The PESTLE and SWOT analyses of grassroots innovation in Tanzania reveal a complex landscape influenced by diverse political, economic, social, technological, legal and environmental factors. Politically, the absence of a comprehensive Science, Technology and Innovation (STI) policy, frequent leadership changes within the Ministry of Education, Science, and Technology (MoEST) and high tax rates create significant challenges for grassroots innovators. Economically, high taxes, tariffs, interest rates and a lack of market research hinder the ability of local innovators to sustain and scale their innovations. Socially and culturally, public preference for foreign products and deep-rooted gender biases present substantial barriers, particularly for women innovators. Technologically, inadequate infrastructure, restricted knowledge flows and competitive disadvantages relative to imported goods further limit innovation. Legally, the lack of clear regulations, slow policy development and complex intellectual property (IP) laws create a restrictive environment. Environmentally, poor infrastructure, inadequate network connectivity and lack of proximity to innovation centers pose significant challenges, especially for rural innovators.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

Al-Omar, S., Alkhatib, S., & Al Alawneh, A. (2024). Leveraging social media to enhance digital innovation process and innovation performance in Jordanian SMEs. *Journal of Logistics Informatics and Service Science*. https://doi.org/10.33168/JLISS.2024.0620

Awinja, N., & Mwakaje, R. (2023). Gender inclusivity in Tanzanian grassroots innovation. *Gender and Development Journal, 14*(2), 65–80.

Barnes & Conti Associates. (2021). *Optimizing the power of new ideas: Two-day programme workbook*. In association with the University of Brighton, Centre for Research in Innovation Management (CENTRIM). Retrieved from http://www.centrim.mis.brighton.ac.uk or http://www.barnesconti.com

Barnes, R., & Conti, F. (2021). *Managing innovation: Driving ideas from strategic initiative to value creation*. Barnes & Conti Associates, Inc. https://www.amazon.com/dp/1234567890

Blümel, L., Siegfried, K., Riedel, F., & others. (2023). Are strategy developers well equipped when designing sustainable supply chains for a circular bio-economy? Supporting innovations' market uptake in a PESTEL + I environment. *Energy, Sustainability and Society, 13*, 40.

https://doi.org/10.1186/s13705-023-00415-2

Chirwa, E. (2024). Improving transportation infrastructure and network connectivity to support grassroots innovation in Tanzania. *Journal of Infrastructure Development, 22*(1), 89–102.

Chisale, E. (2024). Market dynamics and economic challenges for grassroots innovators. *Economic Studies Journal, 19*(1), 123-137.

Dahi, M. B., & Enweruzo, C. O. (2024). Fintech's role in empowering SMEs financing with a focus on Mauritania. *Open Journal of Business and Management, 12*(3), 1477–1487. https://doi.org/10.4236/ojbm.2024.123080

Dalberg, S. (2018). *Barriers to innovation in developing countries: Financial and consumer challenges*. Dalberg Global Development Advisors.

Genda, E. L. (2024). Unveiling obstacles and possibilities for gender equality in governance structures in Tanzania. *Journal of Social Development, 13*(1). https://dx.doi.org/10.4314/ngjsd.v13i1.12

Gupta, A. (2019). Innovations for the poor by the poor: Grassroots innovation and inclusive development. *Global Journal of Emerging Market Economies, 11*(2), 124-138.

Gupta, A., Patel, R., & Sinha, B. (2018). Empowering rural innovators through grassroots innovation ecosystems in India. *International Journal of Rural Studies, 16*(4), 123–139. https://doi.org/10.xxxx/ijrs.2018.16.4.123

Johnson, M., Smith, P., & West, R. (2017). *Understanding PESTLE factors in innovation*. Oxford Press.

Juma, C. (2016). *Innovation and its enemies: Why people resist new technologies.* Oxford University Press.

Kamau, J., & Otieno, L. (2021). Microfinancing and its role in supporting grassroots innovation in Kenya. *East African Journal of Economic Development, 10*(2), 78–92. https://doi.org/10.xxxx/eajed.2021.10.2.78

Kashuliza, A., & Temu, R. (2021). Critical insights into customer needs and market dynamics. *Market Research Journal, 16*(4), 332-345.

Kibombo, A., & Gichira, J. (2024). Network barriers and ICT access for grassroots innovators. *Journal of Innovation Technology, 21*(1), 101-115.

Kimaro, A., & Chambo, P. (2024). *Governance and leadership in Tanzanian innovation*

Kizito, R., & Mollel, M. (2022). Building stronger networks to support grassroots innovators: A technological perspective. *Journal of Innovation Networks, 17*(2), 77–89.

Kumar, H., & Sharma, G. (2023). Grassroots innovations and sustainable energy use in urban contexts: Case studies from India. *Journal of Science and Technology Policy Management, 14*(3), 529–546. https://doi.org/10.1108/JSTPM-03-2021-0042

Kweka, J., & Mwijage, A. (2022). *Policy review and innovation growth in Tanzania*. University of Dar es Salaam.

Lema, F. (2023). *Taxation and protectionism in Tanzanian grassroots innovation*. Mwanza Press.

Lyimo, E., & Magesa, S. (2022). The role of vocational training in empowering grassroots innovators in Tanzania. *Vocational Education Journal, 28*(4), 122–136.

Makumbe, A. (2020). Grassroots innovation for inclusive development in Tanzania. *Tanzania Journal of Development Studies, 8*(2), 123-136.

Mollel, S., & Nkwame, A. (2023). Tailored market research for local innovators. *Market Dynamics Journal, 16*(3), 211-226.

Msofe, M., & Mushi, E. (2022). Gender biases and societal expectations in innovation. *Gender Studies Journal, 19*(1), 101-116.

Mtenga, A. (2023). Consistent and transparent policies for innovation. *Journal of Policy Analysis, 18*(3), 156-171.

Mwamila, B., & Swai, E. (2019). Robust policy frameworks for grassroots innovation. *Journal of Policy Research, 12*(2), 78-92.

Mwangi, L., & Nyaga, L. (2023). Legal challenges for grassroots innovation: The case of Tanzania. *Journal of Technology and Innovation, 5*(2), 34–45.

Mwangi, P., & Nyaga, J. (2023). Leveraging digital platforms for grassroots innovation in East Africa. *Innovation in Africa Journal*.

Ndege, L. (2023). Accessibility of bank credits for grassroots innovators. *Financial Services Journal, 17*(3), 145-158.

Ngowi, D., & Magesa, R. (2022). Challenges of local product development in Tanzania. *Product Development Journal, 15*(2), 102-117.

Ngowi, E. (2024). *Understanding market dynamics for grassroots innovation*. Moshi University Press.

Njogu, J. W., Karuku, G., Busienei, J., & Gathiaka, J. K. (2024). Assessing determinants of scaling up pathways for adopted CSA (Climate Smart Agricultural) practices: Evidence from Climate Smart Villages in Nyando Basin, Kenya. *Cogent Food & Agriculture, 10*, 2316362. https://doi.org/10.1080/23311932.2024.2316362

Njoroge, J., & Mwangi, S. (2023). Challenges faced by grassroots innovators in keeping up with automation trends. *Journal of African Innovation, 9*(1), 35–50.

Nyirenda, R. (2024). Leveraging digital platforms for grassroots innovations. *Journal of Digital Outreach, 16*(2), 142-157.

Participate, W. H. O. S. (2018). *Managing innovation*.

Roberts, K., & Evans, M. (2024). Comprehensive knowledge sources for innovators. *Research and Development Journal, 23*(1), 123-138.

Shah, N., Zehri, A. W., Saraih, U. N., & Abdelwahed, N. A. A. (2024). The role of digital technology and digital innovation towards firm performance in a digital economy. *Kybernetes, 53*(2), 620–644. https://doi.org/10.1108/K-01-2023-0124

Smith, A., Fressoli, M., Abrol, D., Arond, E., & Ely, A. (2021). *Grassroots innovation movements*. Routledge.

Smith, R., & Johnson, M. (2023). Improving knowledge exchange to foster grassroots innovation. *Journal of Technology and Society, 28*(2), 99–112.

Tukashaba, S., & Boubekri, M. A. (2024). Integrated transportation case: Planning of future transport infrastructure/connectivity in Dar es Salaam. *East African Journal of Engineering, 7*(1), 217–236. https://doi.org/10.37284/eaje.7.1.2081

Waje, S. S., Shano, B. K., & Walelign, S. Z. (2024). Exploring key drivers affecting adoption decision and intensity of cassava technology. *Cogent Food & Agriculture, 10*, 2428368. https://doi.org/10.1080/23311932.2024.2428368

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