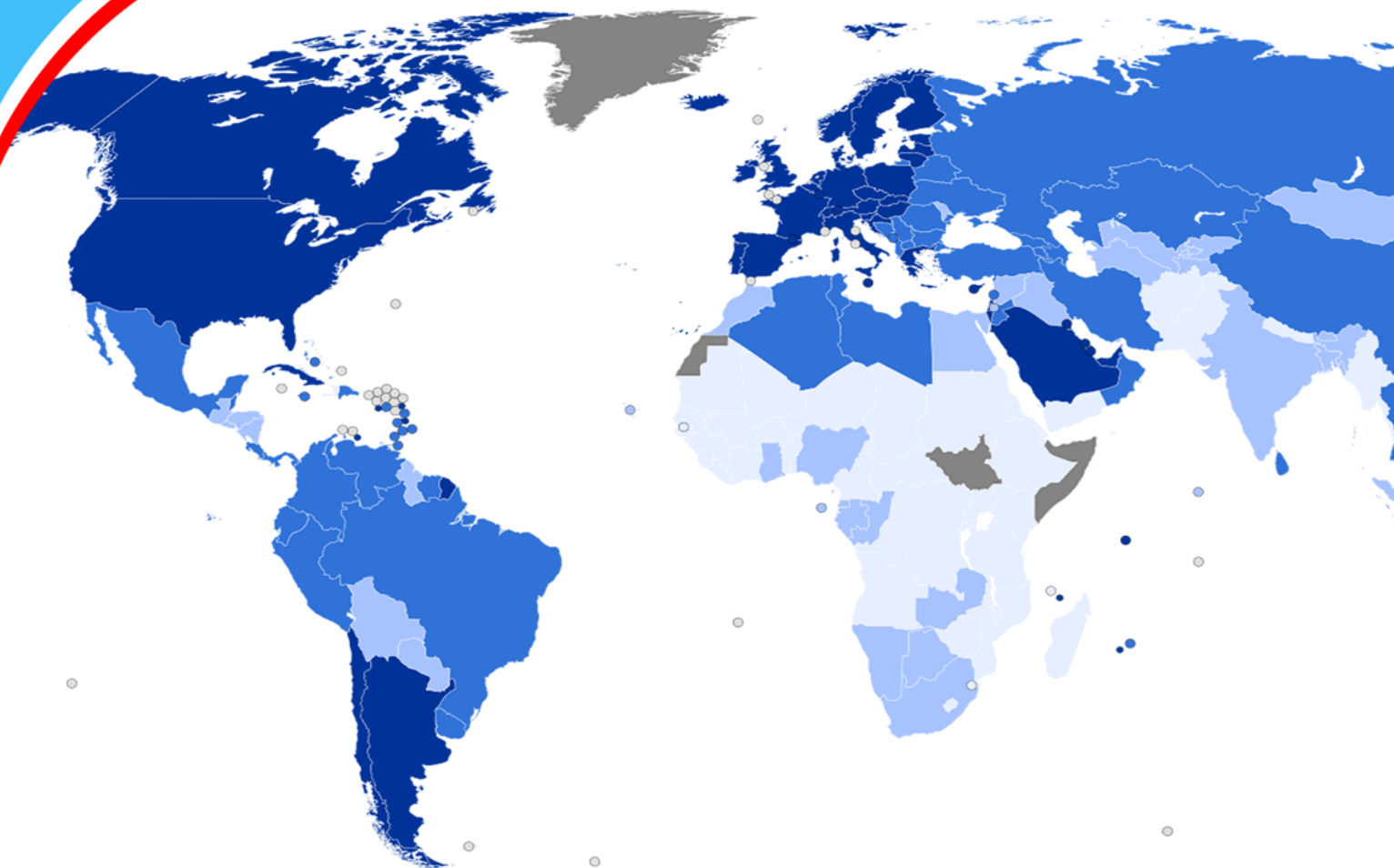


# Journal of Developing Economies (JDE)



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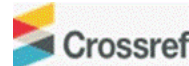


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## Telecom Connectivity as Economic Infrastructure: Assessing the Impact of Mobile Broadband Expansion on SME Productivity and Market Participation in Africa

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Article history

Submitted 06.01.2026 Revised Version Received 12.02.2026 Accepted 31.03.2026

### ABSTRACT

**Purpose:** In this article, the authors examine the aspect of telecom connectivity as a constituent of the economic infrastructure of a country. They also examine the role of the growth of mobile broadband connectivity in the improvement of the productivity of small and medium-sized enterprises (SMEs) in Africa. The authors have attempted to move beyond the ‘access-based’ discourses to examine the role of telecom infrastructure as a system of production, which improves the efficiency of transactions, the flow of information, the outreach of markets, and the improvement of the efficiency of enterprises.

**Materials and Methods:** An integrative literature review approach has been used as the research design. The authors have used literature review as the research approach, where the literature reviewed includes the findings of studies, reports, and publications on digital infrastructure, broadband, SMEs, productivity, and inclusive growth in Africa.

**Findings:** The literature review reveals the following findings: mobile broadband development increases the productivity of SMEs through improved communication speed, digital payment systems, reduced information asymmetry, innovation, and improved access to both input and output markets. In addition, the literature reveals that digital communication has a positive influence on the innovation and labor productivity of micro, small, and medium-sized

enterprises in Africa, whereas the development of ICT infrastructure promotes inclusive growth as well as the economic participation of the broader economy.

**Implications to Theory, Practice, and Policy:** The study draws on the theory of infrastructure-led development, the diffusion of innovation theory, and transaction cost economics. Theoretically, the study supports the argument of infrastructure-led development theory, which holds that telecom infrastructure should be viewed as a productive economic asset rather than a mere service used for communication. In practice, the findings of the literature review suggest that the highest benefits of mobile broadband development accrue to SMEs when the development of broadband infrastructure is complemented with digital skills, digital payment systems, as well as the development of the broader business environment. In conclusion, the study recommends that the development of mobile broadband infrastructure should be viewed as a strategic economic infrastructure, whereas the development of telecom infrastructure should be aligned with the development of SMEs, digital skills, as well as the broader market.

**Keywords:** Mobile Broadband, Smes, Productivity, Market Participation, Africa

**JEL Codes:** L96, O14, O33, R11, D24

## 1.0 Introduction

The development of telecommunication infrastructure in Africa has gone beyond communication to the point where it is now considered to be part of the economic infrastructure supporting coordination within the economy, between businesses and consumers, expansion, and the modernization of institutions. Although the standard view of development, which focuses on access through growing mobile subscriptions, geographic reach, and internet penetration, is still important, it is no longer sufficient to capture the scale and nature of the change underway. GSMA argues that mobile technologies and services contribute \$220 billion to the economy in Africa in 2024, which is equivalent to 7.7% of GDP. This is expected to grow as the digitalisation of enterprises and the adoption of advanced mobile technologies increase. The Digital Economy for Africa initiative by the World Bank views digital infrastructure as the foundation to empower individuals, businesses, and governments.

This change is particularly noteworthy for SMEs. In African countries, SMEs contribute significantly to employment and economic activities, but they also operate in an environment characterized by high transactional costs, low visibility, a fragmented business environment, and limited support infrastructure. Mobile broadband has great potential to overcome some of these underlying structural challenges, such as communication, digital payments, selling through platforms, customer relationship management, information search, and connecting to broader supply and demand chains. In micro and small-sized enterprises in South African manufacturing, some forms of digital communication technologies were found to have a positive impact on innovation, and innovation conditioned on these technologies was found to improve labor productivity. Thus, broadband access is no longer merely a communication tool for firms; it is increasingly a driver of enterprise performance.

At the continental level, the infrastructure case has strengthened, albeit in a more nuanced form. ITU data indicate that, as of 2024, 86% of Africa's population was covered by mobile broadband, implying that 14% of the population has no opportunity to access broadband connectivity via a mobile platform. This figure rises to 25% when considering only the rural population. However, 70% of Africa's population was covered by 4G, 16% was still served by 3G, and 5G was present in 11% of the population. Thus, Africa's connectivity story is no longer characterized merely by a single transition, from 2G to 3G, and then to 4G. Instead, we observe a more complex story, where 4G continues to expand to mass markets, 3G continues to persist in areas where 4G has not yet penetrated, and 5G has selectively appeared in a few commercially viable areas.

This next phase is seen to emerge with greater clarity in 2025 and into 2026, with operators in major hubs such as Nairobi, Lagos, and Johannesburg stepping up investments in mobile networks with greater capacity. For instance, Safaricom reported expansion in the coverage of its 5G networks to 35 counties in Kenya and significant investment in its 5G footprint. Vodacom, on the other hand, reported significant investment in Southern Gauteng to drive the rollout of its 4G and 5G networks. In Nigeria, the deployment of 5G networks remains largely centered in major hubs such as Lagos, even as operators expand their networks. More importantly, GSMA recognizes the significance of mid-band spectrum to the future value of 5G networks, noting the importance of this technology to dense urban markets. This is to say, while the expansion of 4G and 3G networks remains the mainstay of digital inclusion, the rollout of 5G networks represents a different level of

infrastructure development. It is targeted at enhancing the capacity and efficiency of the digital infrastructure.

This is a key distinction for the argument of the present paper. If the old story of telecommunications in Africa has been about access, the new story is becoming more about the quality, capacity, and economic role of such access. Not only is mobile broadband no longer significant simply because it allows people to connect to networks, it is significant because it allows for lower coordination costs, expanded commercial reach, digital payments, information flows, and the enhanced ability of firms, particularly SMEs, to participate in markets more effectively. Within this context, the present paper argues that mobile broadband should not simply be viewed as telecommunications infrastructure, but rather should be viewed in terms of its role in improving SME productivity and participation in markets. Thus, the present paper reviews the literature to explore the means through which the development of mobile broadband impacts SME productivity and participation in Africa.

### **1.1 Problem Statement**

The problem is no longer connectivity; the problem is a usage gap, even where mobile broadband is present. In Africa, mobile broadband coverage has increased significantly, but small and medium-sized enterprises (SMEs) remain only weakly integrated into productive digital markets. In other words, the problem is no longer a matter of "infrastructure building," but ensuring that connectivity is being meaningfully utilized to improve enterprise performance, supply chain participation, and ultimately expand market access. This, therefore, presents a problem: on one hand, we have a relatively high level of penetration, and on the other, a low level of deep digital integration in SMEs, particularly in customer management, digital payments, inventory coordination, supplier relationships, and platform commerce.

This problem is of great importance because SMEs play a key role in job creation, income generation, trade, and development in African countries. If mobile broadband can be regarded as a new layer of economic infrastructure, then the poor uptake of this technology by SMEs is not merely a telecommunications problem. Rather, it is a development problem. Although the literature reveals positive relationships between digitalization, innovation, and SMEs, the relationship between broadband expansion and SME performance is not straightforward. Rather, it is conditional upon other factors such as affordability of access, quality of service, digital skills of SMEs, availability of devices, compatibility of payment systems, device availability, managerial capabilities of SMEs, and other support factors. The situation is more serious in rural areas because of coverage gaps, poor quality of service, and support gaps. Thus, there is a significant gap in the literature.

Although there is considerable literature on ICT, digitalization, and SME performance in general, there is limited literature on the synthesis of the specific links between mobile broadband development as economic infrastructure and SME performance in Africa. Thus, there is a need for this study because of the gap in the literature. The motivation for this study is to address the gap in the literature by assessing the problem from a variety of aspects by combining theory, empirical evidence, and policy in order to explain the contribution of mobile broadband development to SME performance in Africa.

## 2.0 LITERATURE REVIEW

### 2.1 Theoretical Review

This research is based on three different theoretical concepts: Infrastructure-Led Development Theory, Transaction Cost Economics Theory, and Diffusion of Innovation Theory. These three theories are used in a complementary way in this research to explain how mobile broadband expansion contributes to SME productivity and participation in the African market.

The first theory is Infrastructure-Led Development Theory. This theory is based on the ideas of various development economists, including Calderón and Servén. These economists argue that infrastructure plays a crucial role in economic growth, productivity, and distribution by reducing coordination bottlenecks in different markets. This theory is crucial in this research because it gives a general framework in which mobile broadband is being used in Africa. In this research, mobile broadband is not being used as a communication tool; rather, mobile broadband is being used as a tool for enterprise coordination and commercial participation in the African market. This theory is crucial in this research because it gives a general framework in which mobile broadband is being used in Africa. Infrastructure plays a crucial role in economic growth and in reducing inequality in Africa by developing infrastructure in the continent.

The second perspective used in this study is Transaction Cost Economics (TCE), which was propounded by Ronald Coase and Oliver Williamson. This economic theory argues that economic organizations and markets are shaped by the costs of searching for information, transacting, and enforcing. In most African markets, there is fragmented demand, poor coordination, and lack of market information. Mobile broadband can help to solve these problems. TCE is relevant in this study because it explains why mobile broadband in African markets matters. Mobile broadband matters because it can help to reduce transaction costs, which would otherwise make the efficiency of African enterprises low.

The third perspective used in this study is Diffusion of Innovation Theory (DOI), which was propounded by Everett Rogers. This economic theory argues that innovations diffuse through social and economic systems over time depending on certain factors, which include perceived usefulness, compatibility, complexity, observability, and trialability. In this study, mobile broadband tools like digital payments, online communication, e-commerce, and cloud-based business apps are considered innovations. The innovation benefits depend on whether or not these innovations can be adopted and integrated into the business practices of African SMEs. The DOI theory is relevant in this study because it explains the implications of mobile broadband in African markets. It explains whether or not mobile broadband can be translated into economic benefits. The existence of infrastructure like mobile broadband does not automatically mean that there will be economic benefits. The innovation must be perceived by African SMEs to be relevant, convenient, and compatible with their business needs.

The strength of these theories lies not in the individual theories but in the way they are used together. The infrastructure-Led Development Theory establishes the context in which the theories operate by establishing the role of mobile broadband as part of the broader infrastructure within which businesses operate. Transaction Cost Economics then explains the rationale behind the role of broadband in the economy by establishing the way in which the infrastructure reduces search

costs, coordination costs, and exchange costs. However, the effectiveness of the infrastructure is subject to the way in which the infrastructure is used. The Diffusion of Innovation Theory establishes the way in which SMEs must perceive the innovation before the innovation is used effectively. For example, mobile broadband reduces search costs, which is the role of the infrastructure established by Transaction Cost Economics; however, the way in which the infrastructure is used is subject to the way in which the SME perceives the innovation as useful, compatible, and convenient, as established by the Diffusion of Innovation Theory. Therefore, Transaction Cost Economics explains the way in which the infrastructure is used to reduce search costs, the Diffusion of Innovation Theory explains the way in which the innovation is used, and the infrastructure-Led Development Theory establishes the environment within which the infrastructure is used.

In conclusion, the way in which the theories are synthesized establishes the argument that the expansion of mobile broadband influences SME productivity and market participation not on the basis of the existence of the infrastructure but on the basis of the way in which the infrastructure influences the way in which transaction costs are reduced. Mobile broadband is therefore infrastructure, innovation, and transaction cost reduction.

## **2.2 Conceptual Framework**

The conceptual framework of this study is based on the premise that mobile broadband expansion has a significant impact on SME productivity and market participation through a set of enabling conditions, transmission mechanisms, and time-dependent adoption processes. It is assumed that mobile broadband expansion is not directly related to economic outcomes; rather, there is a set of intervening variables and transmission mechanisms that play a crucial role in determining the impact of mobile broadband expansion on SME productivity and participation.

### **Independent Variable**

- Mobile broadband expansion

### **Intervening / Mediating Variables**

- Data and device affordability
- Digital skills
- Quality of regulation
- Access to digital payment systems
- Electricity reliability
- Broadband service quality
- Interoperability with e-government systems, business registries, tax systems, and cross-border payment systems
- Managerial readiness and enterprise digital capability

### **Transmission Mechanisms**

- Improved communication speeds
- Reduced information asymmetry
- Lower search and transaction costs

- Access to new and existing customers
- Digital payments and digital recordkeeping
- Platform participation and e-commerce engagement
- Better coordination with suppliers, buyers, and service providers
- Increased innovation and process improvement
- Greater formal integration into public and market systems

### **Dependent Variables**

- SME Productivity
- SME Market Participation

### **Expected Outcomes**

- Increased Sales Efficiency
- Improved Labour Productivity
- Increased Innovation
- Expanded Access to Local, National, and Regional Markets
- Increased Digital Market Inclusion
- Improved SME Integration into Formal Commercial and Regulatory Systems

### **Temporal Dimension**

This framework also assumes that the effect of mobile broadband expansion on SMEs will experience temporal lag effects. SMEs will not automatically become more productive the moment they gain access to mobile broadband. It is assumed that improvements in SME productivity and participation will occur over time as SMEs learn to adapt to the new technology.

### **Figure 1: Conceptual Framework**

Mobile Broadband Expansion → Adoption and Integration Conditions → Reduced Friction / Improved Information / Digital Tools Use / Institutional Interoperability → SME Productivity and Market Participation

This relationship is moderated by the factors of cost, digital literacy, regulation, electricity supply reliability, digital tools and institutional interoperability, and rural-urban access conditions, and is mediated by the time required for effective enterprise adoption.

### **2.3 Research Gaps**

The literature on digital technology, ICT infrastructure, productivity, and inclusive growth in Africa reveals a positive relationship. However, there are significant gaps in the literature that need to be addressed in this research. First, most of the literature explores digital technology or ICT in general terms without differentiating mobile broadband technology from other digital technologies. Thus, it is not clear whether the positive impact of digital technology on SME productivity and market participation in Africa can be attributed to mobile broadband technology. Secondly, there is a divide in the literature between those that use the macro perspective in examining the impact of digital technology on SMEs in Africa and those that use the micro perspective. There is limited synthesis of these two views in the literature on digital technology in

Africa. Finally, most of the literature reveals a positive impact of digital technology on SME productivity in Africa. However, there is limited exploration of the conditions that influence the positive impact of digital technology on SME productivity in Africa.

Fourth, insufficient emphasis is placed on issues of interoperability and integration with e-government initiatives. This is because some SMEs cannot fully participate in digital markets because of fragmentation in the broader ecosystem. This means that, whereas mobile broadband access is a necessary condition, it is not a sufficient condition for SMEs to participate in digital markets because they cannot be integrated with digital tax systems, business registration systems, customs systems, and cross-border transactions such as PAPSS.

Fifth, insufficient emphasis is placed on issues of time lags in enterprise adoption. This is because, whereas some studies suggest that SMEs will be more productive after accessing broadband, they fail to recognize that SMEs cannot be more productive immediately after accessing a device or a data bundle. There is a learning curve to be considered, where SMEs have to adjust to being more productive. This means that a more appropriate relationship to be considered is not a linear relationship, where broadband access leads to SME productivity, but a time-dependent relationship.

This paper seeks to address these gaps in knowledge by considering a synthesis of the literature on broadband access, SME productivity, and market participation from a perspective of development economics, with a specific emphasis on how mobile broadband works as economic infrastructure for SMEs in Africa.

### **3.0 MATERIAL AND METHODS**

The research design of the study was descriptive and explanatory, utilizing a desk review approach. This was based on the integrative review of literature and policy. The geographical scope of the review was Africa, with a focus on Sub-Saharan Africa and country-specific studies of interest to the review of SMEs and the adoption of digital technology and its impact on productivity. The population of the review was scholarly publications, policy documents, and publications of institutions on the theme of mobile broadband, telecommunications, SMEs, digitalization, and productivity, as well as inclusive growth. For the review, the researcher used a purposive sampling approach to select the most relevant literature on the theme of the review from peer-reviewed journals, the World Bank, GSMA, and ITU publications. This research design was most appropriate for the review since the intent of the review was to assess the developmental impact of mobile broadband as economic infrastructure and not to report any fabricated primary data.

### **4.0 FINDINGS**

The review generated four main findings. First, expansion in mobile broadband technology improves SMEs' productivity by lowering coordination costs and facilitating communication. Research into digitalization in African enterprises shows that digital communication technologies facilitate product and process innovation, and innovation has a significant effect on labor productivity. In relation to South Africa, digitalization in the form of social media and mobile internet for businesses was positively correlated with innovation, and innovation conditional on these technologies positively impacted labor productivity in micro and small enterprises. This

implies that broadband technology is more than just a tool for connectivity; it is a tool for enhancing productive capacity.

Second, expansion in mobile broadband technology improves SMEs' market participation by broadening access to customers, suppliers, and payment systems. With broadband technology, SMEs can communicate with customers, market their products, and pay for services electronically, thus enhancing market access, particularly for small enterprises. Research into entrepreneurship and digital technology in developing countries provides support for the argument that broadband technology plays an important role as an enabling technology for entrepreneurship and market access.

Third, the advantages of mobile broadband services are enhanced when they are part of a wider digital ecosystem. For the continent as a whole, it has been demonstrated that the presence of ICT infrastructure can contribute to inclusive growth in Africa. However, the impact of such infrastructure can be enhanced if supportive policies, finance, and digital capabilities are in place. The DE4A framework developed by the World Bank also identifies digital infrastructure as one of the pillars of the ecosystem but acknowledges the presence of other pillars. This suggests that the presence of digital infrastructure is necessary but insufficient for the achievement of development outcomes.

Fourth, the advantages of mobile broadband services are subject to limitations. For example, coverage is limited, especially for rural Africa. Also, the cost of access to mobile broadband services affects the actual level of engagement. According to the ITU, 25% of the African population living in the countryside lacked mobile broadband coverage as of 2024. According to the GSMA, the expansion of the economic contributions of the mobile industry will need to be supported by coordinated investments, as well as the presence of digital skills and partnerships. This suggests that the expansion of the mobile infrastructure may be insufficient to achieve deeper and wider contributions to economic development.

The above observations support the argument that mobile broadband services can be treated as economic infrastructure since they have the potential to influence enterprise efficiency, information, innovation, and markets. However, the above observations also suggest that the relationship between broadband and economic development is conditional.

## **5.0 CONCLUSION AND RECOMMENDATIONS**

### **5.1 Conclusion**

This study aims to evaluate the role of mobile broadband development in enhancing SME productivity and market engagement in Africa from the perspective of telecom connectivity as a case of economic infrastructure. From the above literature review, mobile broadband development has the potential to enhance the productivity of SMEs through the efficiency of communication, digital innovation, reduced transaction costs, as well as the ability of SMEs to access more markets. In addition, mobile broadband development has the potential to enhance the inclusivity of the broader African economy through the engagement of SMEs in digital payment systems as well as the broader market.

Despite these potential benefits, the benefits of mobile broadband development are limited or constrained in certain ways. In particular, the benefits of mobile broadband development are constrained or limited by the presence of affordability barriers, digital capability, interoperability, service quality, as well as the ability of mobile broadband development to cover the rural areas. In conclusion, mobile broadband development has the potential to enhance the productivity of SMEs as well as the inclusivity of the broader African economy. However, the benefits of mobile broadband development should be viewed from the perspective of the broader African economy as a whole, rather than as a standalone technological service.

## **5.2 Recommendations**

First, African governments should recognize mobile broadband development as strategic economic infrastructure, as well as align telecom development strategy with SME development strategy, moving from a narrow focus on telecom connectivity towards a focus on SME productivity and engagement.

In addition, African governments should consider the development of policies aimed at enhancing the affordability of mobile broadband development, as well as improving the service quality of mobile broadband development.

Furthermore, African governments should consider the development of policies aimed at enhancing the coverage of mobile broadband development, as well as the development of rural broadband infrastructure, as the uneven coverage of mobile broadband development undermines the inclusivity of the broader African economy.

Finally, researchers should consider the extension of the above study through the conduct of country-level panel studies, as well as survey studies.

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