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The Impact of Digital Tools on Transforming Music Education in Nigeria

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ABSTRACT

The rapid advancement of digital technology has significantly transformed educational practices worldwide, including music teaching and learning. This study examines how digital tools are transforming music education in Nigeria. It explores how technological resources are reshaping music teaching, learning, composition, performance, and appreciation. The study uses a qualitative survey design and highlights the opportunities and challenges of integrating digital tools into Nigerian music education. The work indicates that digital tools can enhance students' creativity, musical skills, collaboration, access to learning resources, and engagement in classroom activities. They also provide music educators with innovative methods for instruction, assessment, recording, composition, and performance. However, inadequate technological infrastructure, unreliable electricity supply, limited internet access, high device costs, insufficient digital skills among teachers, and unequal access to technology remain significant barriers. The study concludes that effectively integrating digital tools can modernize music education in Nigeria and improve its relevance to contemporary educational and creative-industry demands. It recommends increased investment in digital infrastructure, teacher training, affordable technology, and supportive educational policies to ensure sustainable digital transformation of music education in Nigeria.

KEYWORDS: Digital Education • Music Education • Technology-Enhanced Learning • NCCE Curriculum

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Introduction

Information and communication technologies (ICTs) have revolutionized how people work and are now transforming educational systems, driving dynamic changes in society (Modeme & Onwuegbuna, 2023). Information and Communication Technology (ICT) refers to a myriad of technologies used in the process of collecting, storing, editing, retrieving and transferring information (Modeme & Onwuegbuna, 2023). It includes any equipment; interconnect system, or subsystem used for the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information (Ogbonnaya, 2017). For Bhati, Bhati, and Kulvia, ICT means "the use of

all conceivable digital media in managing and processing information." ICT influences all aspects of life. This influence is felt more and more in schools because ICTs give teachers and students more opportunities to adapt, teach, and learn to meet individual needs.

The National Commission for Colleges of Education (NCCE), the body that is responsible for Colleges of Education in Nigeria, according to the National Policy on Education (2014), has the sole right to review the National Certificate in Education (NCE) programme, which is the minimum qualification for entry into the teaching profession in Nigeria (Ugwu et al.). According to the NPE, curriculum review generally arises from dissatisfaction with the existing education system, which has become irrelevant to national needs, aspirations, and goals (Ugwu et al., 2025). Moreover, the NCCE music teacher curriculum has been critiqued in literature extensively on the technicality of the document, the divorce of the content from the student's experience, teaching methodology, and so forth (Adeogun, 2006, as cited in Ugwu et al., 2025). These spotlights might have given rise to the 2020 edition of the NCCE curriculum, but the digital nature of our society is critical.

Society is a dynamic phenomenon; education, and teacher education in particular, cannot be otherwise. Ideally, society should shape the school curriculum because it sponsors schools; hence, schools serve society (Ugwu et al., 2025). We now live in a digitalized society, and digital technologies have driven growth in the music world even before the internet became advanced enough for users to share and download music online. People could download virtually any song they wanted through file-sharing. Streaming services like Spotify have revolutionized how people consume music. Innovative music technologies are also integral to the creation of a lot of modern music software-based virtual instruments and MIDI technology allow people to use millions of sounds in the production of their music, which musicians can program and manipulate in complex ways. This offers great creative potential for technology-savvy composers and producers. Technology has changed how people create music. Composers can produce their scores from their home studios. Musicians can play for fans around the world through live-streamed performances. Songwriters can record albums and release them through digital distribution on streaming platforms without ever landing or signing a record deal. Advancements in digital technologies have led to monumental shifts in most aspects of music. Compact discs ostensibly improved the quality of studio recordings for consumers and minimized manufacturing and distribution costs (Onwuegbuna, 2022; Pereverzeva et al., 2021, as cited in Ugwu et al., 2025). Given these influences of digital technologies on music in society, curriculum planners and implementers must make a serious effort so that we do not train students who will be absurd and incompetent at navigating music in our digitalized economy. The content of our curriculum should not differ much from the real world. Thus, this study examines the impact of digital tools on music education in Nigeria, with the aim of identifying the opportunities they offer for teaching, learning, composition and performance, the challenges that limit their adoption, and the measures needed for their sustainable integration. This paper adopts a qualitative approach to research because it is concerned with the interrogation of subjective assessment of attitudes, opinions and behaviour as pertains to the investigation of the impacts of digital tools in the transformation of Music Education in Nigeria.

Concepts of Music

Music is a language of its own with expressive and communicative elements. Music has been studied as art, science, therapy, and power. Music is sound organized in a meaningful way, and may include a melody, harmony, rhythm, and form. Music can be performed by one voice or instrument, or by many, and it can even be performed as silence. The ancient Greeks believed music was cosmically related to science and culture. They saw harmony in all matters, from the spiral growth patterns seen in nature to geometry and good government. This magical connection between sound and form was thought to be integral in maintaining harmony at all levels of society. The ancient Greeks embraced music as much more than an expressive art (Enea, 2022).

According to OpenStax (2016), the power of music is not merely abstract but also physical. The air vibrations of sound are real and measurable, capable of shattering glass. Music and other sounds cause all kinds of sympathetic vibratory resonances within objects at a distance. Schäfer et al. (2013) argue that

music is a human activity because it plays functional and aesthetic roles in the life of the individual and the society at large. According to Epperson (2022), Music is the actualization of the possibility of any sound whatever to present to some human being a meaning which he experiences with his body - that is to say, with his mind, his feelings, his senses, his will, and his metabolism. Music, as a primary human activity, is a means by which humans generate their own spiritual, social, and cultural niche. Music connects people with others who share similar interests. It helps keep a record of, give proof of, verify and authenticate the history of social and cultural changes in society. It is the opinion of Eze, Ezenwafor and Obidil (2017) that, since music is an aspect of cultural expression, it should be fully embedded in the educational front.

Music is present in every society and culture; wherever one turns, music plays important roles because of its profound relationship with the daily life of the individual and society at large. Celestine (2015), in their own explanation of why and how music and dance are so important to people's understanding of themselves and their identities, state that although many societies around the world do not have a single concept translatable with the English word music, activities akin to what we call music and dance are practiced among people everywhere and have been throughout history. The reason this is so, according to him, is that Music, dance, festivals and other public expressive cultural practices are a primary way that people articulate the collective identities that are fundamental to forming and sustaining social groups, which are, in turn, basic to survival (Celestine, 2015).

Music is profoundly interwoven into the fabric of Nigerian society, serving not merely as entertainment but as a cornerstone of cultural expression, historical transmission, and social cohesion. Across its more than 250 ethnic groups, indigenous music plays a pivotal role in daily life, communal rites, ceremonies, and the informal education of younger generations, transmitting values, narratives, and social norms (Celestine, 2015). Historically, transmitting musical knowledge was an intrinsic part of community life, ensuring the continuity of unique cultural identities (Izu, 2024). However, in an increasingly globalized world, traditional Nigerian music and the cultural identities it embodies face significant challenges, including the pervasive influence of Western popular culture and the marginalization of indigenous arts within formal education systems. This situation raises critical questions about whether current educational practices effectively safeguard Nigeria's rich musical heritage (Michael, 2024). Music, according to Epperson (2022), varies in definition across cultures, yet it is present in all human societies and is a cultural universal. Odeme (2024) also argued that while scholars agree that music is defined by a few specific elements, there is no consensus on their precise definitions. However, it is noted that music is the art of arranging sounds to create a combination of form, harmony, melody, rhythm, or other expressive content. Music can be described as a creative construction of sound for social and aesthetic purposes (Okechukwu, 2025). Music plays a significant role in socialization. Teenagers and students listen to various genres of music, including rap, heavy metal, Christian rock, country music, jazz, electronic music, and dance music. Music involving rap, hip hop, hard rock and Christian rock has become the most popular type of music among teenagers.

Digital Transformation in Music Education

Digital transformation in music education is not merely the application of digital technologies in teaching but also a comprehensive process that changes how education is organized and managed. Digital technology plays an important role in optimizing teaching and learning methods, helping to improve the effectiveness and accessibility of music education. Online learning platforms, music learning software, and interactive learning tools not only help students learn flexibly but also create a new learning space where digital tools expand access to and creativity in music (Okechukwu, 2025). These tools can include music apps, audio recording and editing software, vocal analysis tools, online learning platforms such as Coursera and edX, and gamified learning systems such as ArchiTone (Yu et al., 2025). Gamified technologies, such as ArchiTone, are particularly useful in creating an interactive learning space where students can practice, improve their vocal skills, and receive feedback through visualizations and music practice exercises. These tools also help students engage in more active learning, improving accessibility and effectiveness. Traditional learning methods can limit creativity and flexibility, but when combined with technology, they open opportunities for students to develop their musical skills in a more

comprehensive, modern way. Thus, digital transformation in music education can help create a learning environment not limited by space or time. Students can participate in online vocal classes, practice, and receive feedback from instructors or classmates without having to be physically present in the classroom. This also helps instructors monitor student learning more effectively through learning management systems (LMSs), which track learning outcomes, practice progress, and student interactions (McKin et al., 2021). However, to implement digital transformation effectively, both instructors and students must invest synchronously, while educational institutions develop the necessary technological infrastructure.

Theoretical Framework

This study employs Lev Vygotsky's Sociocultural Theory (1978). The theory emphasizes that learning occurs through tools. Digital technologies serve as learning tools that enhance collaboration, communication, and knowledge construction. This theory suits this study because music education relies on interactive software, online collaboration, digital instruments, and multimedia resources that support active, cooperative learning. Sociocultural Theory argues that learning is fundamentally a social process and that cognitive development occurs through interaction with other people and the surrounding cultural environment. According to Vygotsky (1978), as cited in Bauer (2014), learners acquire knowledge, skills, attitudes, and values through collaboration with knowledgeable individuals such as teachers, parents, peers, and other members of society. Unlike theories that view learning as an individual process, Sociocultural Theory, according to Hall (2020), emphasizes that culture, language, and social interaction are central to intellectual development. The Theory, according to Dweck (2016), has become one of the most influential frameworks in education and is widely applied in teaching, curriculum development, educational technology and music education.

Technology in Music Education

Over the past decade, digital technology has increasingly shaped music education, with constructivism, connectivism, and social learning theories offering insight into its integration. According to constructivist theory, pioneered by theorists like Vygotsky (1978) and Piaget (1945), learning occurs through active engagement and interaction with one's environment. Recent research in digital music education, such as Hallam (2015), aligns with this perspective, highlighting how technology lets students engage with music more deeply through virtual instruments, music production software, and interactive tutorials. These tools provide students with hands-on, experiential learning opportunities that are crucial for developing technical skills and creative expression in music. For instance, studies by Cain and Meredith (2018) emphasize that digital tools encourage "learning by doing," allowing students to explore sound manipulation and composition through experiential practice, thereby reinforcing critical understanding and performance skills in music.

Another critical theory relevant to technology in music education is connectivism, proposed by George Siemens (2005), which emphasizes learning as a networked process enabled by digital connections. In music education, connectivist principles appear in online music communities and collaborative platforms, where students can interact with peers and experts beyond their immediate academic setting. Gaunt and Westerlund (2017) highlight that music students benefit from these digital communities, which foster a more inclusive and diverse learning experience. Connectivism supports students in sharing compositions, receiving feedback, and expanding their knowledge base through collaborative digital platforms (Osofisan, 2021). Additionally, technology facilitates access to a global music library, providing students with exposure to various music genres and cultures, ultimately enriching their understanding and appreciation of music.

Social learning theory, developed by Albert Bandura (1977), also supports the use of digital tools in music education, as technology enables observational learning and modeling, particularly through video tutorials and performance simulations. Recent studies underscore that online video resources enable students to observe and emulate the techniques of professional musicians, an essential component of skill acquisition in music (Bauer, 2020). Hence, by integrating these video resources, university programs

enable students to learn complex concepts at their own pace, fostering self-regulation and independent learning. Furthermore, digital simulations of music performances give students opportunities to practice and refine their skills in a controlled environment, boosting their confidence and readiness for real-world applications.

Theories of constructivism, connectivism, and social learning demonstrate that technology is not merely an instructional tool but a transformative element that enriches music education by enhancing access, collaboration, and hands-on practice. As digital innovations continue to evolve, they offer university-level music programs valuable opportunities to develop adaptable, well-rounded musicians equipped for a digitally driven world. Technology-enhanced learning (TEL) in music education aligns with connectivist principles by expanding access to global networks of musicians, educators, and resources. Siemens' connectivist theory argues that learning happens across a network of information sources, a structure that digital tools enable by providing access to vast libraries of music and theory resources, as well as global communities. Students in TEL-enhanced music programs can access a diverse array of materials, broadening their cultural and stylistic exposure and enriching their understanding of music's global dimensions. A networked learning approach promotes cultural awareness and adaptability, as students interact with musical traditions and innovations beyond their immediate environment. This access to varied perspectives and styles helps prepare students for a versatile and collaborative career in the modern music industry.

Challenges of Implementing Technology in Music Education

Despite the numerous benefits of technology-enhanced learning (TEL) in music education, implementing digital innovations in university-level music programs presents several significant challenges. These challenges can hinder effective technology integration, affecting both educators and students as they navigate the complexities of a digitally driven learning environment. One of the foremost challenges envisaged in the Nigerian educational system is the disparity in access to technology among students. While digital tools offer transformative learning opportunities, not all students in Nigerian schools have equal access to the necessary hardware and software. This digital divide can create inequities in learning experiences, particularly for students from low-income backgrounds or those attending institutions with limited resources in Nigeria. Celestine (2015) emphasizes that access to technology is often uneven, leading to significant gaps in digital literacy and technological proficiency. In Nigerian music education, this disparity can limit students' ability to fully engage with digital tools, hindering their creative potential and technical skill development. Moreover, without equitable access to technology, the collaborative and interactive aspects of TEL may not be fully realized, further exacerbating educational inequalities.

Another critical challenge, according to Celestine (2015), is the need for ongoing professional development for educators. While many music educators may have strong musical skills and pedagogical knowledge, they may lack the training to integrate technology effectively into their teaching. Studies indicate that many educators feel unprepared to incorporate digital tools into their curriculum, leading to reluctance or inconsistent classroom use of technology (Bauer, 2020). Without proper training, educators may struggle to select appropriate digital tools, design effective lessons, and assess student learning in a technology-enhanced context. This gap in professional development not only impacts teachers' confidence but also limits the potential benefits of TEL for students. To address this challenge, music programs must prioritize ongoing training and support for educators, fostering an environment where they feel equipped to leverage technology effectively.

Beyond access and training, integrating technology into music education often requires a shift in pedagogical approaches. Traditional music education typically emphasizes direct instruction, structured practice, and performance-based assessment. However, TEL encourages a more student-centered approach in which learners actively create, collaborate, and explore musical concepts. This shift can be challenging for educators who are accustomed to conventional teaching methods. Resistance to change may stem from unfamiliarity with digital tools or a belief that traditional methods are more effective. According to research by Dede et al. (1999), educators require time and support to adapt their teaching

philosophies and practices to align with the opportunities technology presents. Overcoming this resistance is essential for creating an environment conducive to innovation and experimentation in music education.

Another significant challenge is the technical issues that can arise during the implementation of digital tools. Music technology is often complex and requires reliable hardware and software to function effectively. Issues such as software crashes, compatibility problems, and insufficient internet connectivity can disrupt the learning process, leading to frustration among both educators and students. However, technical difficulties can detract from the educational experience, causing instructors to spend valuable class time troubleshooting instead of focusing on teaching and learning. Additionally, reliance on technology raises concerns about potential disruptions in the event of equipment failure or power outages, emphasizing the need for contingency planning in technology-enhanced music programs.

Furthermore, evaluating student learning in a technology-enhanced context presents unique challenges. Traditional assessment methods may not effectively capture the nuanced skills and competencies that students develop through digital tools. For instance, evaluating creativity, collaboration, and technical proficiency can be difficult when using standard grading rubrics designed for conventional music performance. Thus, educators need to develop new assessment strategies that align with the objectives of TEL, incorporating formative assessments, peer evaluations, and digital portfolios to provide a comprehensive view of student progress. This shift in assessment practices requires additional time, resources, and training, compounding the challenges faced by educators.

There are concerns regarding the over-reliance on technology in music education. While digital tools can enhance learning, they should not replace the foundational skills developed through traditional music instruction. The excessive focus on technology may lead to a decline in essential musicianship skills, such as ear training, sight-reading, and improvisation. A study by Leung (2004) found that students who relied predominantly on digital tools often struggled in traditional performance settings, where their technical skills were put to the test. This highlights the importance of striking a balance between technology integration and the preservation of core musical competencies. Music educators must ensure that technology complements traditional methods rather than substitutes for them, fostering a well-rounded musical education.

The need for improvement

Developing online vocal learning software and platforms can help students practice more effectively while enabling teachers to monitor progress and refine teaching methods for each student. Training teachers to use these technologies is also important to ensure an effective transition between traditional and digital teaching methods. Teachers need the technological skills to integrate technology effectively into their teaching. Without investment in training and support, technology cannot fully develop its potential to improve the quality of vocal teaching. Therefore, developing online vocal learning tools and training teachers to use this technology are essential to help music schools meet students' growing learning needs in the current digital transformation context.

Solution to improve the effectiveness of Music Teaching in the Context of Digital Transformation

The following are plausible solutions towards improving the effectiveness of music teaching in the context of digital transformation:

1. Developing online vocal learning tools

To optimize the application of digital transformation in vocal education, it is important to develop online vocal learning tools that meet students' needs. These tools must not only provide theoretical lessons but also support practical training to help students improve their singing skills effectively. Modern vocal learning software can integrate interactive features that let students practice singing and receive immediate feedback. This not only helps students recognize and correct errors in singing technique but also fosters an active learning environment, enabling them to develop skills along a personalized path. Voice recognition and audio analysis technologies, such as pitch and timbre testing software, can help

students improve their singing technique more accurately. These tools can analyze and provide detailed feedback on pitch, rhythm, and breath control, helping students practice and refine their vocal skills in an online environment. These technologies not only help students learn effectively but also stimulate creativity and develop musical thinking, both of which are difficult to achieve with traditional teaching methods.

2. Training teachers on the use of technology in teaching

To maximize technology's effectiveness in vocal teaching, teacher training is key. Teachers need to be properly trained in the use of technology in teaching, including online learning platforms, music-learning software, and other teaching aids. Teacher training not only helps them master technology but also helps them integrate technology into their teaching methods in a flexible and effective way. Training courses on online teaching methods, e-learning platforms, and interactive learning tools will help teachers improve their teaching skills, increase student engagement, and provide accurate and timely feedback. Furthermore, teachers will be able to better assess student progress through online learning platforms, helping them adjust their teaching methods to suit each student's needs and level. Training teachers in technology will improve teaching quality and create a positive, effective learning environment for students (McKlin et al., 2021).

3. Support students in using technology

In addition to developing learning tools, supporting students in using technology is an important factor in ensuring the success of digital transformation in vocal education. Students need to be provided with detailed instructions on how to use online learning platforms, music software and other learning tools. Organizing tutorials and technical support sessions will help students become familiar with technology and make the most of learning tools. Furthermore, creating learning support resources, such as tutorial videos, online forums and help sessions, will help students overcome difficulties in using new technologies, especially for students with little experience with technology. Supporting students not only helps them access technology more easily but also encourages them to participate actively and proactively in the learning process. Students can practice their vocals on their own, improve their skills, and receive feedback from instructors and peers more flexibly and effectively. This will create a dynamic, evolving learning environment and help students achieve better outcomes.

4. Building an internationally connected learning environment

Collaborating with international music schools will provide students with access to advanced teaching methods and rich learning resources. Online learning platforms can act as a bridge between students and teachers from different countries, creating a rich, diverse and global learning environment. Students cannot only learn different teaching methods but also participate in discussions, seminars, and online classes with international teachers and students, expanding their knowledge and understanding of music from different cultures. Connecting with international music schools will give students access to richer learning resources, such as digital libraries, learning materials, and teaching videos, helping them improve their learning ability and develop their vocal skills comprehensively. In addition, international cooperation will create opportunities for students to participate in international music competitions, student exchange programs, and career opportunities, helping them expand their networks and enhance their career development after graduation (Westerlund & Gaunt, 2017).

Application of Sociocultural Theory to the Impact of Digital Tools on Music Education

Sociocultural Theory, developed by Lev Vygotsky (1978), provides a framework for explaining how digital tools affect music education in schools. The Theory posits that learning is a social process that is mediated by cultural tools, language, and interaction with more knowledgeable individuals. One central concept of Sociocultural Theory is the Zone of Proximal Development (ZPD), which refers to the difference between what learners can accomplish independently and what they can achieve with appropriate guidance. In music education, digital tools help teachers provide instruction within each learner's level of ability, while teachers use digital demonstrations, recorded tutorials, and online assessments to guide

students progressively toward mastery of musical concepts and performance. As students gain confidence and competence, teacher support is gradually reduced, allowing them to work independently (Kauffman & Kauffman, 2023).

Another important aspect of the theory is scaffolding, which involves temporary support provided by teachers or experienced peers until learners become capable of completing tasks on their own. Digital technology strengthens scaffolding by providing instructional videos, virtual demonstrations, practice exercises, simulation programmes, automated feedback, and step-by-step tutorials. For example, beginners learning keyboard performance can use digital piano applications that show finger positioning, provide rhythm guidance, and immediately correct mistakes. This support helps learners overcome difficulties while gradually building independence and confidence.

The theory is also important because it highlights the role of the More Knowledgeable Other (MKO), who may be a teacher, peer, mentor, or expert with greater knowledge and experience. Digital tools expand access to MKOs beyond the traditional classroom. Through online lessons, virtual masterclasses, educational videos, webinars, and collaborative music platforms, students can learn from experienced music educators and professional musicians across different locations. This broadens learning opportunities and exposes students to diverse teaching styles and musical traditions.

The theory also supports collaborative learning, which is essential in music education. Digital tools enable students to collaborate on compositions, ensemble rehearsals, recording projects, and performances, even when they are physically separated. Cloud-based applications allow multiple learners to contribute to a single musical project, encouraging teamwork, communication, problem-solving, and shared responsibility. Such collaboration reflects Vygotsky's view that knowledge is socially constructed through interaction.

Conclusion

The integration of digital tools into music education has significantly transformed the teaching and learning of music in schools. Digital technologies such as music notation software, digital audio workstations (DAWs), virtual instruments, online learning platforms, multimedia resources, and educational applications have made music instruction more engaging, interactive, and accessible. These tools have enhanced students' creativity, practical skills, critical thinking, collaboration, and overall musical understanding by providing opportunities for composition, performance, recording, editing, and self-paced learning.

Furthermore, digital tools have expanded access to quality music education by overcoming geographical and resource limitations, enabling students and teachers to connect with diverse musical cultures and instructional materials. They have also improved instructional efficiency by supporting personalized learning, immediate feedback, and innovative assessment methods. Consequently, schools that effectively integrate digital technologies into their music programmes are better positioned to prepare learners for the technological demands of contemporary music practice and the creative industries. However, successfully implementing digital tools in music education depends on several factors, including the availability of technological infrastructure, adequate funding, reliable electricity and internet connectivity, teacher competence, and continuous professional development. Challenges such as unequal access to digital resources, inadequate technical support, limited ICT skills among teachers, and the high cost of acquiring and maintaining digital equipment continue to hinder the full realization of the benefits of digital music education, particularly in many developing countries. Overall, digital tools have an overwhelmingly positive impact on music education in schools. When supported by appropriate policies, investment, teacher training, and equitable access to technology, digital tools enrich music teaching and learning, improve students' musical achievement and creativity, foster lifelong learning, and contribute to developing a technologically competent generation of musicians, educators, and informed citizens.

Recommendations

The following recommendations arose from the study.

1. Lecturers should be retrained to upgrade their knowledge as well as their philosophy so that their instruction will be attuned to the digital era's teaching peculiarities.

2. Revision of the music curriculum for digital competencies, provision of music learning technological laboratories, musical-pedagogy training for music teachers and partnerships for affordable music software licenses.

3. Although the issue of infrastructure is implicit in the present policy, it should be reviewed in such a way that the policy addresses concrete terms, since this is important in ICT integration.

4. Given that teachers are important in ICT integration in education, the national policy on IT should address the issue of teachers' professional development. This should incorporate issues relating to teacher training institutions and ICT, pre-service teacher education, in–service teacher education, and standards for teacher competence and certification in ICT.

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