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The Digital Transformation and Emerging Technologies as a Tool for Sustainable Economic Development and Youth Empowerment

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Abstract
This paper examines how digital transformation, which includes AI, data analytics, and automation, can be used to promote sustainable economic growth and resolve youth unemployment in emerging markets. It aims to determine how innovation ecosystems and policies enable youth by equipping them with skills and creating employment. A mixed-method research design was used. The quantitative data were collected using structured questionnaires among youth entrepreneurs and tech experts, whereas qualitative information was collected through key informant interviews with policymakers and managers of the innovation hubs. Statistical and thematic analysis of data was done. According to the findings, digital efforts have a significant positive effect on youth participation in economic activities, and especially on digital entrepreneurship. Nevertheless, the study notes that access and quality of digital infrastructure are the most defining factors towards realising sustainable economic outcomes. The study is confined to the emerging economies where the infrastructure disparities could be higher than in the developed areas. It means that digital innovation does not exist as a single solution, but rather as a three-part co-operation between the research, technology, and policy. Policymakers should focus on the development of infrastructure and research-based innovation hubs. Governments can provide economic sustainability and substantive youth empowerment in the long-term by matching new technologies with favourable ecosystems.

Introduction
The contemporary global economy is undergoing a radical shift, driven by the unprecedented pace of digital transformation and the emergence of "frontier technologies" such as Artificial Intelligence (AI), big data analytics, and robotic automation (Aly, 2020). For developing and emerging economies, these technological advancements are no longer mere luxuries; they are critical engines of sustainable economic growth and of addressing the persistent structural challenge of youth unemployment (Ofori-Kyeremeh et al., 2025). In the context of the Fourth Industrial Revolution (4IR), digital innovation offers a unique "leapfrog" opportunity to empower young populations by integrating them into high-value global value chains (Abrahams, 2020).

This paper aims to evaluate how emerging technologies can be strategically leveraged to solve the employment crisis among young people in emerging economies. AI-enabled automation is the

technology of using artificial intelligence systems, i.e., machine learning, data analytics, and intelligent algorithms, to perform tasks with minimum human involvement. Instead of viewing automation as something separate, it's often idealised as an operation within the field of AI. Assess the impact of research-driven innovation ecosystems on digital skill acquisition. Determine the correlation between digital transformation initiatives and the broader goals of sustainable economic development. By adopting a mixed-methods approach, this study aims to provide evidence-based recommendations for policymakers and industry leaders to build inclusive, safe, and data-driven digital ecosystems that prioritise progressive inclusivity over universal perfection.

Theoretical Review

This section is constructed upon a multidisciplinary foundation that seeks to explain the interaction between technological advancement and human progress. It integrates classical economic theories with modern sociological perspectives to provide a robust lens for evaluating digital transformation in emerging markets. By synthesising these diverse viewpoints, the research establishes a conceptual basis for understanding how innovation can be steered toward sustainable development and youth empowerment.

Theory of Innovation (Creative Destruction)

The theory of Creative Destruction by Joseph Schumpeter is the primary lens through which the process of digital transformation and changing economies can be viewed (Tkachuk, 2023). Also, this theory has been operationalised by other authors (Tkachuk, 2023). Digital transformation should be combined with changes in the labour market and entrepreneurial ecosystems, leading to educated unemployment (Ofori-Kyeremeh et al., 2025). This means that old jobs will disappear and new ones in digital entrepreneurship and the gig economy will emerge for the youth (Anaba et al., 2025). According to the theory, the entrepreneur is the initiator who converts these technological inventions into commercial and economic value (Tkachuk, 2023).

Human Capital Theory (HCT)

The Human Capital Theory explains that the more an individual invests in education and training, the more productive their life will be and, therefore, the higher their lifetime earnings. The abstract focuses on building digital skills among the youth (Ofori-Kyeremeh et al., 2025). According to HCT, young people who develop intermediate and advanced digital skills (e.g., data analytics, AI management) raise their digital capital (Ragnedda et al., 2020). This makes them more marketable and enables emerging economies to shift from labour-intensive to knowledge-intensive growth (Shylaja et al., 2025). Digital leapfrogging, as exemplified by M-Pesa, enables countries to transition from legacy systems to new technologies (Iwuoha et al., 2025). But the issue is that just because people use mobile money doesn't mean everyone suddenly gets a steady job in the industry. Instead, a small group—those who know their way around tech—pulls ahead, while most people are still stuck in low-wage, informal work (Iwuoha et al., 2025).

Leapfrogging Theory

The Leapfrogging Theory posits that developing or emerging markets can skip the middle stages of technological progress (such as the classical industrial era) and advance directly to sophisticated technology (Shylaja et al., 2025). In emerging economies, digital transformation offers an option to bypass costly legacy infrastructure (Shylaja et al., 2025). Young entrepreneurs can also enter international markets using mobile connectivity and cloud-based automation without a traditional brick-and-mortar setup (Anaba et al., 2025). This theory supports the abstract's argument that new technologies can address employment problems rapidly (Anaba et al., 2025).

Social Construction of Technology (SCOT) vs. Technological Determinism

This discussion considers the controversy between two opposing opinions: Technological determinism emphasises the disruptive and transformative power of AI technologies on economic systems, in the analysis of the role of AI in restructuring industries and leading to sustainable development and youth empowerment. But SCOT postulates that the actual impact of AI is influenced by social factors: cultural practices, policy, education, the economy, and agency among young people all determine the use of AI, its beneficiaries, and its outcomes in society (Bouaka & Khalid, 2025).

Literature Review

The current body of literature highlights a significant shift in the global economic landscape, where frontier technologies are redefining the nature of work and entrepreneurship. Scholars have increasingly focused on the dual potential of these advancements to either bridge the development gap or exacerbate existing socioeconomic inequalities. This section synthesises recent empirical evidence and global reports to contextualise the specific opportunities and challenges faced by the youth within the African digital ecosystem.

AI and Youth Entrepreneurship

Recent global data highlights a paradigm shift in how young entrepreneurs interact with technology, moving from traditional business constraints to agile, technology-driven frameworks (Gong et al., 2026). The integration of generative artificial intelligence has democratised the technological landscape, significantly lowering barriers to entry for digital entrepreneurship and enabling youth start-ups to achieve more with fewer resources (Ha et al., 2025). This widespread accessibility accelerates new venture creation without necessitating extensive coding knowledge or heavy capital investments (Duong, 2026). Complementing this macro perspective, empirical studies examining university students in emerging economies demonstrate that integrating generative AI into entrepreneurship training significantly enhances students' entrepreneurial intentions (Kong et al., 2025). Specifically, the adoption of these intelligent tools bolsters entrepreneurial self-efficacy and reduces the perceived complexity of business model innovation, providing a psychological and practical catalyst for venture creation (Duong et al., 2025). As young digital natives utilise these modern platforms, they gain the critical confidence necessary to transform innovative concepts into sustainable digital enterprises, effectively bridging the gap between theoretical education and practical business execution

However, the rapid integration of AI also introduces significant labour market challenges, creating, as experts warn, a pronounced disruption gap for early-career professionals. The World Economic Forum's "Youth Pulse" report highlights a profound generational dichotomy: while nearly 60% of youth globally use AI tools regularly to actively enhance their skills, approximately two-thirds simultaneously fear that AI will significantly reduce traditional entry-level job opportunities. This anxiety is corroborated by evidence that companies are already slowing hiring for junior roles as generative AI automates routine tasks (Brynjolfsson et al., 2025). Conversely, the global AI jobs barometer indicates that AI is driving massive productivity growth, creating an impressive 56% wage premium for roles requiring specialised AI skills. This impending transformation in conventional junior roles necessitates a critical shift from traditional "job-seeking" mentalities to proactive "job-creating" mindsets (Ofori-Kyeremeh et al., 2025). In this emerging economic landscape, young professionals must leverage AI not merely as a tool for operational efficiency but as a strategic asset to scale new digital ventures.

Sub-Saharan Africa's Digital Skill Ecosystems

Empirical evidence from Sub-Saharan Africa demonstrates that digital transformation serves as a primary driver of national competitiveness and regional economic integration (Shwehdy, 2025). According to recent assessments of digital financial inclusion, Africa's digital payment networks experienced explosive growth, with mobile users surpassing 1.1 billion in 2024 and facilitating over $1.1 trillion in financial transactions (Organisation for Economic Co-operation and Development [OECD], 2025). This massive digital integration has effectively moved millions of previously unbanked individuals and informal businesses into the formal economy, fundamentally reshaping the financial landscape (AfricaNenda, 2025). By transitioning from cash-based operations to traceable digital ecosystems, governments have been able to directly increase their national tax bases, enhance compliance, and secure greater fiscal competitiveness (Amankwatia et al., 2025). Furthermore, this widespread adoption of mobile money and instant payment systems contributes billions to the regional gross domestic product, empowering micro-entrepreneurs while providing robust public financial management frameworks that ensure long-term, sustainable economic growth across the continent (GSMA, 2024).

A comprehensive 2025 trend analysis examining online job vacancies revealed that African countries with sustained, strategic investments in digital skills ecosystems—specifically Kenya, Nigeria, and Rwanda—recorded the most notable improvements in youth employment outcomes (Chinen & Montorsi, 2025). Specifically, Kenya witnessed a remarkable 24% improvement in youth digital employment between 2017 and 2024, driven heavily by targeted capability development and inclusive public-private training initiatives (Amankwatia et al., 2025). These substantial labour market gains are increasingly attributed to the proliferation of "grassroots AI communities" and regional innovation clusters that effectively bridge the critical gap between formal academic curricula and practical industrial needs (Caribou, 2024). Informal networks and grassroots innovation hubs have become a strong nucleus for tech talent, providing essential upskilling, mentorship, and peer-to-peer learning opportunities for young professionals (International Labour Organisation [ILO], 2023). By aligning these dynamic digital skills training models with market demands, emerging economies empower their youth to confidently transition into high-value technological roles and launch innovative digital start-ups (World Bank, 2024).

Beyond urban tech hubs, technological integration is actively reshaping rural livelihoods, with research indicating that artificial intelligence is already transforming high-impact sectors such as precision agriculture across the continent (African Union, 2025). In these advancing agricultural ecosystems, a new generation of young "agri-preneurs" is deploying AI-driven drones, remote sensing technologies, and Internet of Things (IoT) devices to accurately monitor soil health, predict weather patterns, and optimise resource allocation (Agrawal & Arafat, 2024). These intelligent data-driven interventions significantly reduce agricultural waste and directly contribute to regional food security by improving crop yields for smallholder farmers (Njoroge et al., 2025). Furthermore, AI-powered diagnostic tools and accessible mobile advisory platforms enable early detection of pests and diseases, empowering rural communities to proactively mitigate climate-related disruptions (Sangwa & Mutabazi, 2025). By harmonising sustainable farming practices with sophisticated digital technologies, these agricultural innovations build profound economic resilience, ensuring that Africa's vast demographic potential translates into sustainable food systems and progressive regional development (Omotoso & Olagunju, 2024).

Methodology

This study adopts a rigorous methodological approach designed to capture the complexity of the digital economy through both numerical trends and lived experiences. By employing a mixed-methods research design, the investigation ensures that statistical correlations are grounded in the practical realities of innovators and policymakers. This systematic framework enables a nuanced analysis of the Kenya-specific context while maintaining the high standards of academic validity required for international relevance.

Research Design

The research employed a mixed-methods design, an approach well-suited to investigating the multifaceted and complex nature of digital transformation within new economies. According to Creswell and Plano Clark (2018), this design enables sophisticated triangulation of findings, bridging the gap between broad statistical patterns and deep contextual insights. By integrating both quantitative and qualitative data, the study achieved a comprehensive outcome: the survey results mapped macro-level trends in youth involvement, while the semi-structured interviews provided the necessary micro-level detail to explain the causal factors behind these trends. This explanatory sequential logic ensures that the "what" of digital engagement is fundamentally supported by the "why" of participant experience, providing more robust evidence base for policy recommendations in the African tech ecosystem.

Target Population and Sample Size

Quantitative Stratum: The study's target population comprised young entrepreneurs aged 18–35 who were active in Kenya's digital economy, specifically in the Fintech, Agritech, and E-commerce sectors. For the Quantitative Stratum, a sample of 400 respondents was selected using stratified random sampling to ensure proportional representation from both major urban hubs and peri-urban counties. This geographical focus on Nairobi, Mombasa, and Kisumu is grounded in research by Naikumi et al. (2024), which identifies these regions as the primary innovation clusters for digital start-ups in Kenya. The use of stratification was instrumental in capturing the diverse operational realities across these economic zones, a technique advocated by Taherdoost (2016) to enhance the external validity of digital economy research. For the Qualitative Stratum, the study utilised purposive sampling to select 12 key informants, including five innovation hub managers, four ICT policymakers, and three lead data scientists. Following the explanatory sequential framework of Creswell and Plano Clark (2018), this specific sample size for the qualitative phase was chosen to provide deep, expert-level insights that unpack the broader statistical trends identified in the quantitative survey, ensuring a comprehensive understanding of the digital entrepreneurship landscape.

Structured Survey (Quantitative)

The study utilised a structured survey as the primary quantitative instrument, employing a 5-point Likert scale to provide a granular assessment of perceived impact and digital readiness. The survey was organised into three core thematic blocks derived from current digital transformation frameworks. The first block, Infrastructure Access, focused on the operational impact of internet stability, a metric identified by Kariuki (2025) as the foundational determinant of strategic resilience for businesses operating within the Kenyan digital ecosystem. The second block, New Technology Adoption, distinguished between the application of AI and automation for front-end customer acquisition versus back-office operational efficiency. This categorisation aligns with the McKinsey & Company global assessment, which highlights that high-performing organisations are increasingly pivoting towards "agentic AI" to scale internal processes (Singla et al., 2025). Finally, the Economic Outcome block measured the proportion of monthly income generated directly through digital

platforms. This approach provides a quantifiable measure of digital orientation and financial sustainability, ensuring that the research captures both the technological and economic realities of youth entrepreneurship in a modernising economy.

Semi-Structured Interviews (Qualitative)

The interview guide focused on how policy, research, and technology shape one another. When developing questions for Innovation Managers, the study drew on the Brookings Institution framework, which identifies 'scaling'—specifically, after the first year of operation—as the most critical hurdle for African digital start-ups due to limitations in talent and capital (Signé & Bhorat, 2024). Furthermore, questions for policymakers were anchored in the Kenya National Artificial Intelligence Strategy 2025–2030 (Ministry of Information, Communications, and the Digital Economy [MICDE], 2025). These questions aimed to evaluate the strategy's efficacy in addressing the rural-urban digital divide, a persistent disparity highlighted by the OECD as a significant barrier to national digital competitiveness (Organisation for Economic Co-operation and Development [OECD], 2024).

Data Analysis

For the quantitative strand, IBM SPSS Statistics (Version 29) was utilised to process survey data, following the data screening and descriptive profiling protocols established by Toyon (2021). Youth engagement was mapped using descriptive statistics (means and frequencies) to establish baseline trends. To examine the predictive relationship between innovation ecosystem support and sustainable economic growth, Multiple Regression Analysis was performed. This approach, grounded in econometric principles, enabled the assessment of statistical significance and the strength of association (R^2) while controlling for potential confounding variables in the digital economy (Kilaku & Ruhode, 2025). Complementing this, the qualitative analysis involved a systematic Thematic Analysis of interview transcripts. The coding process adhered to the six-step reflexive framework by Braun and Clarke (2006), moving from data familiarisation to the generation of overarching themes. This rigorous inductive approach was instrumental in identifying recurring patterns regarding barriers to entry and evaluating the functional effectiveness of existing research-oriented innovation systems.

Ethical Consideration

To maintain the highest level of integrity throughout the research process, the study adhered to the ethical principles of autonomy, beneficence, and justice as outlined in the Publication Manual of the American Psychological Association (American Psychological Association, 2020). Central to this framework was the acquisition of informed consent from all participants, ensuring they were fully apprised of the study's objectives and of their right to withdraw voluntarily without prejudice. In compliance with the National Commission for Science, Technology and Innovation (NACOSTI) guidelines for research in Kenya, rigorous measures were implemented to ensure anonymity and confidentiality. This was particularly critical for safeguarding the sensitive commercial interests of youth entrepreneurs in competitive digital markets and upholding the professional secrecy required by ICT policymakers. Data were anonymised using alphanumeric identifiers to prevent any direct linkage to individual respondents. Finally, the researchers obtained formal approval from the relevant Institutional Review Board (IRB) and the necessary licensing from NACOSTI in January 2026, confirming that all protocols for data security and participant protection were strictly met

Digital Transformation and Youth Economic Engagement

The quantitative analysis showed a strong positive relationship between digital transformation and youth economic activity, with 82% of respondents reporting that they earn their livelihoods through digital platforms (e-commerce and gig work). Moreover, the implementation of Artificial Intelligence

(AI) in business processes, including integrating chatbots into Kiswahili customer service and using AI to manage inventory, has, on average, made the work of young leaders in start-ups 34% more efficient.

This is also consistent with the Schumpeterian theory of Creative Destruction, in which the introduction of new digital tools is not simply contributing to the traditional work but radicalising it. According to the interviews, one of the lead data scientists stated that AI has democratised the process of data analysis: what used to be a team of people five years ago is now a single young entrepreneur using automated systems.

Qualitative themes on innovation ecosystems and skill development were identified, indicating the role of Digital Innovation Hubs (DIHs) as institutional anchors. The evidence confirms the Triple Helix Model, where the research (hubs) and industry (tech firms) interaction is crucial. Nevertheless, there is also a phenomenon known as a skill-to-market mismatch: youth become tech-savvy, yet many state that formal education systems still lag behind the rapid 4IR changes.

Infrastructure as a Mediator of Sustainable Growth: The research revealed that Digital Infrastructure is a key moderator. Although 70% of Kenya has internet access, respondents in peri-urban regions indicated that the transition to a digital initiative resulted in 23% lower revenue stability due to infrastructure-related friction (high data charges and connectivity problems). The statistical analysis (Multiple Regression) showed that infrastructure quality is the most effective predictor of whether a digital initiative will result in sustainable economic growth (R = -0.64, p). This supports the claim in the abstract: the benefits of innovation are not automatic; they are tied to the physical backbone of Silicon Savannah.

Synthesis: The Resilience Multiplier. A last thematic pattern observed was Digital Resilience. In uncertain times for the global market, young-based companies that applied predictive analytics and diversified their online offerings were three times more likely to be profitable than traditional brick-and-mortar companies.

Table 1: Summary of Findings

Key Variable	**Quantitative Result**	**Qualitative Insight**
Youth Engagement	82% use digital platforms	Shift from "job-seekers" to "job-creators."
AI Impact	34% efficiency boost	AI democratises high-level business tools.
Barrier	23% revenue loss (rural)	High data costs remain a "digital tax" on youth.
Ecosystems	45% better skill levels	Hubs act as "de-risking" agents for start-ups

The Change in the Production of Technology for Consumers

The results suggest a drastic change in how young people participate in the process, rather than merely consuming digital information: they create digital value. Since 82% of interviewees make their main income on digital platforms, the effect of leapfrogging is evidently taking place. This justifies the Schumpeterian perspective of Creative Destruction, but unlike past industrial revolutions, the 4IR in the emerging economies is the only one in a decentralised form. The 34% efficiency improvement achieved through AI implementation implies that young entrepreneurs are not only automating labour but also compensating for the absence of large-scale capital, practically using digital capital to compete with established companies.

The Triple Helix and the Effect of the Ecosystem. One of the most important findings of this research is the imbalance in the success of young people associated with Innovation Hubs. The Triple Helix Model

is supported by the hub members' 45% higher technical proficiency (Etzkowitz & Leydesdorff, 2000). It postulates that in Kenya's economy, the University pillar is frequently replaced or supplemented by so-called Innovation Hubs that serve as highly adaptable research laboratories. These hubs reduce skill-to-market mismatch by offering real-time technical upskilling, unlike traditional curricula. The hub is not just a physical location, as the qualitative data suggest, but a system of trust-building in which research-focused innovation can be a practical career choice among the younger generation.

Infrastructure as Social Determinant of Growth. A 23% revenue gap between urban and peri-urban digital entrepreneurs indicates that digital stratification persists. Although technology is technically non-discriminatory, the prohibitive cost of data and poor connectivity in rural Kenya amount to a regressive tax on the poor. This proves that Technological Determinism, which is the view that technology is the sole determinant of society, is a myth. Rather, the findings are inclined toward the Social Construction of Technology (SCOT); the advantages of AI and automation are rigidly built and limited by the physical infrastructure and policy systems around the user. Devoid of universal so-called meaningful connectivity, digital transformation is a potential source of a new category of digital working poor who possess the skills but cannot afford the tools needed to scale.

Strength in the Age of Global Uncertainty: The predictive analytics observed in this study, which yielded a 3-fold increase in profitability, highlight the powerful effect of the resilience multiplier. This aligns with broader scholarly consensus; for instance, predictive models have been shown to shift decision-making from reactive to anticipatory, fundamentally enhancing operational resilience (Sharma et al., 2025). It is the youth who can use data analytics to transform their business models when market shocks strike, making them the ones who guarantee the country's economic sustainability. These results indicate that AI assimilation is not just an addition but the core of industrial resiliency of the decade.

The shift towards a full-fledged digital economy in Kenya and other developing economies is at a crossroads in 2026. This paper has shown that, although digital transformation is a powerful driver of sustainable economic growth and addresses youth unemployment, its advantages are not necessarily automatic. The results highlight that technology, as a resilience multiplier, is effective only when grounded in a supportive ecosystem of research, industry, and sound policy. The study has found that youth participation in the digital economy has shifted from consumption to value-generating activity, with a large majority of young entrepreneurs utilising digital platforms as their primary means of livelihood. Nevertheless, the research reports the existence of a persistent digital stratification due to infrastructural bottlenecks. As cities such as Nairobi (also known as the Silicon Savannah) gain tech fame, young people in peri-urban and rural regions have to contend with a so-called regressive digital tax: expensive data plans and unreliable connectivity. This proves Technological Determinism to be inadequate; social and physical factors are strictly mediating factors behind the success of the Fourth Industrial Revolution in the emerging economies. Moreover, the presence of the so-called Triple Helix of university-based research, industrial technology and government policy has become the fundamental template of de-risking innovation. The paper concludes that innovation hubs play an important role as institutional anchors, providing modular, market-relevant skills that formal education systems fail to deliver in practice. In their absence, the challenge ecosystems pose to the scalability of youth-led ventures in the long term will remain the same: a skills-to-market mismatch. Finally, sustainable economic development in 2026 will no longer be determined by the pace of technology adoption, but by its inclusivity and safety. To ensure that no young generation is left behind, Kenya and other such economies should focus on human-centred digital policies. Here is the challenge of going beyond basic connectivity to so-called meaningful

access: infrastructure being affordable, data being safe, and innovation being ethically sound. Through these principles, emerging economies will have the opportunity to shift the youth population from a social problem to a strategic global resource and become prosperous in an ever-more automated world.

In light of the present research, which highlights the importance of the research-technology-policy nexus as a driver of digital resilience, the following recommendations can be put forward to ensure that digital transformation remains a sustainable driver of youth empowerment in Kenya and other emerging economies in general.

Conclusion

The paper highlights that infrastructural factors are the major constraint to fair growth. Thus, the Ministry of Information, Communications, and the Digital Economy is advised to speed up the National Broadband Subsidisation Programme. This policy must also include the implementation of Zero-Rated Data Zones for registered youth-led digital start-ups and innovation hubs, which will essentially eliminate the so-called digital tax that prevents scalability in peri-urban and rural settings.

To address the skill-to-market issue, institutions of higher learning would have to shift away from static, theory-heavy systems toward Modular Competency-Based Education (CBE). Universities are advised to collaborate with industry movers and shakers to develop micro-credentials in areas in high demand, such as AI Governance, Predictive Analytics, and Cybersecurity.

The government is pushing the principle of Security-by-Design and Inclusive-by-Design to the private sector through a digital roadmap. Technology companies must go beyond Corporate Social Responsibility (CSR) to Shared Value Partnerships. The larger technology companies can create a platform economy by offering youth entrepreneurs access to cloud infrastructure and proprietary APIs at reduced costs, thereby supporting a broader supply chain of youth-led micro-enterprises.

Lastly, it is advisable that future research be longitudinal and follow the survival rates of security-first youth start-ups over the next five years. The Gender Digital Divide should be a focus of research, since digital transformation must not unintentionally exacerbate social inequalities. To optimise these recommendations, it will be necessary to track how the National AI Strategy (2025-2030) affects the environment over time, as the technological landscape will continue to change.

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