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DOI <https://doi.org/10.32782/CMI/2024-11-9>**Buriak Mykhailo**

PhD Student,

National Technical University "Kharkiv Polytechnic Institute"

ORCID: <https://orcid.org/0000-0001-7882-6142>**Lysenko Sergii**

PhD Student,

National Technical University "Kharkiv Polytechnic Institute"

ORCID: <https://orcid.org/0009-0004-3720-5285>**Shevchenko Roman**

PhD Student,

National Technical University "Kharkiv Polytechnic Institute"

ORCID: <https://orcid.org/0009-0002-2215-7204>

## SIEMES DIGITAL TRANSFORMATION CASE STUDY TOWARDS ORGANIZATIONAL SCALE AND SUCCESS IN ELECTRICAL ENGINEERING INDUSTRY

*This study investigates a range of scaling strategies for electrical engineering firms, with a focus on various crucial aspects such as internal innovation, strategic regional expansion, geographical proximity, and collaborative partnerships. Internal innovation is highlighted as a key driver of growth, as it allows firms to develop new technologies and processes that can differentiate them from competitors. Strategic regional expansion is discussed as a means to tap into new markets and leverage local opportunities, while geographical proximity is examined for its impact on operational efficiency and customer relationships. Collaborative partnerships are also emphasized for their role in enhancing capabilities and driving mutual benefits. The case study of Siemens AG serves as a prominent example, showcasing how digital technologies like the Internet of Things (IoT), artificial intelligence (AI), and cloud computing have significantly transformed their approach to scaling. Siemens AG's experience underscores how these technologies can support internal innovation, streamline regional expansion efforts, overcome geographical barriers, and foster effective collaborations. The article proposes a detailed framework in which digital transformation is central to driving these strategies. It argues that digital technologies are not just enablers but essential components that fuel innovation across various domains. Additionally, digital transformation is posited as a critical factor in facilitating smoother and more effective expansion into new regions, bridging geographical gaps that can otherwise impede growth, and enhancing collaborative efforts both within and outside the organization. By integrating these elements, businesses can achieve sustainable growth and maintain a competitive edge in an ever-evolving and challenging market landscape. The study is considered near the evaluation of efficiency of management an enterprise. Evaluation technology is realized on the basis of comparison of financial indexes, in particular to the analysis of indexes of profitability and analysis of business activity*

**Keywords:** change management, digital transformation, AI in management, IoT in management, organizational scale, innovation management.

**Буряк М.О., Лисенко С.М., Шевченко Р.О.**

Національний технічний університет «Харківський політехнічний інститут»

## ПРИКЛАД ЦИФРОВОЇ ТРАНСФОРМАЦІЇ SIEMENS З МЕТОЮ ОРГАНІЗАЦІЙНОГО МАСШТАБУВАННЯ ТА УСПІХУ В ГАЛУЗІ ЕЛЕКТРОТЕХНІЧНОГО ВИРОБНИЦТВА

*В проведеному науковому дослідженні розглядаються стратегії масштабування провідних міжнародних електротехнічних компаній, підкреслюється важливість запровадження внутрішніх інновацій, стратегічної регіональної експансії, географічної близькості та спільних партнерств. На прикладі компанії Siemens AG проілюстровано трансформаційний потенціал цифрових технологій, зокрема Інтернету речей, штучного інтелекту та хмарних обчислень, у реалізації цих стратегій в електротехнічній галузі як одній з найбільш перспективних з значним потенціалом для розвитку та зростання. На основі проведених аналітичних досліджень, зокрема різномірних опитувань менеджменту, керівників та співробітників електротехнічних компаній, виявлено основоположні фактори та компоненти які сприяють ефективному масштабуванню та цифровій трансформації компанії. У статті пропонується комплексна концепція яка базується на симбіозі Big Data Analytics, інтеграції систем управління взаємовідносинами з клієнтами (CRM) із знанням місцевого ринку та хмарними обчислення і оптимізацією ланцюга постачань, згідно з якою цифрова трансформація не лише стимулює розробку та впровадження інновацій, але й значно полегшує розширення, долає географічні розриви та посилює співпрацю, що, зрештою, сприяє сталому зростанню бізнесу в умовах дедалі динамічнішого та конкурентнішого ландшафту. Автори вважають, що дослідження довгострокової стійкості та стабільності цифрових систем, ефективності blockchain в промислових додатках, використання даних клієнтів і конфіденційності, а також впливу цифрових двійників на життєвий цикл продукту дадуть додаткову цінну інформацію для розуміння побудови ефективних стратегій організаційного масштабування. Отримані результати окреслюють вектор подальших наукових досліджень пов'язаних з вивченням*

кількісного впливу цифрової трансформації на бізнес та стратегію міжнародних корпорацій, оцінку адаптації працівників до цифрових змін, ефективність алгоритмів штучного інтелекту та внесок цифровізації в досягнення цілей сталого розвитку.

**Ключові слова:** цифрова трансформація, організаційне масштабування, управління змінами, штучний інтелект в менеджменті, інтернет речей в менеджменті, управління інноваціями.

**Statement of the problem.** The electrical engineering industry stands at a pivotal juncture, propelled by rapid advancements in automation, renewable energy integration, and miniaturization. These developments present substantial opportunities, with the global market anticipated to reach USD 1.3 trillion by 2030 [1]. However, for established firms, navigating this dynamic landscape and achieving sustainable growth within a competitive market remains a significant challenge, characterized by a compound annual growth rate (CAGR) of 6.4%. A 2021 study by Ricardo Godinho Birlo et al. in the *Journal of Business and Industrial Marketing* found that firms exhibiting a higher degree of strategic flexibility experienced a 20% increase in profitability compared to their less adaptable counterparts [2]. This agility enables companies to identify and capitalize on emerging market opportunities, respond to evolving customer needs, and incorporate disruptive technologies such as artificial intelligence (AI) and the Internet of Things (IoT) into their offerings. However, successful scaling requires a multifaceted approach that extends beyond mere adaptation. Siemens AG exemplifies the transformative potential of digital innovation in an era marked by rapid technological advancements. This article explores Siemens' journey, detailing how the integration of IoT and AI into their operations of electrical engineering industry.

**Analysis of recent research and publications.** The study of digital transformation and organisational scale draws on the work of authors such as Al-Haddad, Galib, and Herzallah [3], who examine consumer intentions to engage in proximity marketing. Other important findings include reports by Bain & Company [4] and Gartner [5], which analyse in detail trends and technology developments, including the impact of big data and artificial intelligence on business processes. Given the context of our research, we particularly rely on analytical reports such as those provided by McKinsey [6; 7] and PwC [8]. These sources provide in-depth analyses of the impact of digital technologies on various aspects of organisational scale and strategy. In addition, in the context of our analysis of Siemens, we have extensively used open data and press releases, including information from official Siemens sources [9] about their investments and digital transformation initiatives. This data helps to better understand real-life examples of digital solutions and their impact on organisational development.

**Formation of the objectives of the article (task statement).** The goal of this research is to propose a comprehensive four-pronged framework designed to empower electrical engineering businesses through internal innovation, strategic regional expansion, geographical proximity, and collaborative partnerships. This study aims to analyze the case study of Siemens' journey, focusing on how the integration of IoT and AI into their operations, especially through the Siemens Xcelerator platform, is central to their digital strategy. By examining the interplay of organizational scale and digital transformation components, the research seeks to uncover how Siemens sustains its industry leadership and adeptly navigates the complexities of a dynamic business environment.

**Summary of the main research material.** This agility helps companies seize market opportunities, adapt to customer needs, and integrate technologies like AI and IoT. Scaling requires a multifaceted approach, with a framework proposing four key strategies:

1. **Internal Innovation:** Investing over 4% of revenue in R&D accelerates revenue growth, as shown by Nippon Electric Corporation [10] and Chang et al. [11]. R&D drives innovation in smart grids and energy-efficient components.

2. **Strategic Regional Expansion:** Entering new markets can increase revenue by 27%, according to McKinsey [12]. As the global electrical engineering market grows to USD 354.79 billion by 2030, regional expansion helps diversify revenue and stabilize finances during downturns [13]. Partnerships in new regions offer valuable insights and talent [14].

3. **Geographical Proximity:** Closer physical presence to customers boosts sales by 1.5% with a 10% reduction in distance, as per Al-Haddad et al. [3]. Benefits include faster service, lower transportation costs, and stronger customer relationships [15; 16].

The framework for scaling—internal innovation, strategic regional expansion, geographical proximity, and collaborative partnerships—benefits greatly from digital transformation based on the following reasons:

1. **Internal Innovation:** Digital tools like AI and machine learning boost R&D productivity, doubling output as noted by McKinsey [12]. This fosters innovations like smart grids and energy-efficient solutions [10].

2. **Strategic Regional Expansion:** Cloud computing supports regional growth by enabling firms to enter new markets with scalable infrastructure, as IDC [17] reports \$375 billion in cloud spending by 2026.

3. **Geographical Proximity:** IoT technology enhances connectivity, with Gartner [18] projecting the IoT market to hit \$4.4 trillion by 2026. IoT improves real-time monitoring and customer interaction, increasing sales by 1.5% with a 10% reduction in distance to customers [19].

4. **Collaborative Partnerships:** Collaboration platforms are crucial for innovation, with 83% of executives emphasizing their importance [20]. These tools facilitate partnerships and joint R&D, accelerating innovation and knowledge sharing [14; 21; 22].

Via the analysis of the Siemens' open data about its initiatives around the digital transformation we can outline the following top trends:

1. **IoT and AI-Driven Energy Management:** Siemens uses IoT platforms for real-time energy optimization and predictive analytics, enhancing plant performance and reducing emissions.

2. **Siemens Xcelerator Platform:** This open digital platform facilitates modular, cloud-connected interactions, driving digital transformation and ensuring interoperability across Siemens' hardware and software.

3. **Enhancing Industrial Automation:** Siemens integrates IIoT solutions and IoT-as-a-service with Industrial Operations X to improve performance and productivity by breaking data silos.

4. Digital Twins and Machine Learning: Siemens uses digital twins and machine learning to analyze and optimize industrial processes throughout their lifecycle.

5. Comprehensive Energy Management Solutions: SIMATIC Energy Management Software provides insights into energy consumption and helps companies optimize usage while meeting environmental standards.

Considering the other side of the Siemens' core strategies in organizational scale we believe the following cases are of important consideration hence we outlined and categorized them by the components of the suggested framework:

#### 1. Encompassing Internal Innovation

##### a. Investment in R&D for New Projects:

i. Siemens invested US\$18.8 million in a new manufacturing plant (ITESA 4) focused on developing energy measurement and distribution products in Ciudad Juarez, Mexico [23].

ii. The company also announced a US\$14 million investment in Mexico between 2020 and 2021, with a focus on innovation and development, particularly in areas like motors, electrical systems, automation, digitization, and cloud-based manufacturing systems [24].

iii. Siemens Energy is building the largest Liquefied Natural Gas (LNG)-to-power complex in Latin America, showcasing innovation in efficient power generation [25].

These investments in R&D and new facilities directly address the model's emphasis on internal innovation. By developing new products and processes, Siemens is positioned to meet the evolving demands of the electrical engineering market and secure a competitive edge. The focus on areas like automation and digitization aligns with the industry's shift towards smart technologies. Siemens' commitment to internal innovation is expected to lead to several positive outcomes:

- Increased exports: The ITESA 4 plant is estimated to boost exports by 16% [26].

- Enhanced product offerings: The focus on R&D will lead to new products catering to the growing demand in the housing sector and other key markets [26; 27]

- Improved efficiency: Investments in automation and digitization are likely to optimize operations and enhance production efficiency [27].

- Market Leadership: By pioneering advancements like the LNG-to-power complex, Siemens strengthens its position as a leader in innovative solutions for the electrical engineering sector [28].

2. Strategic regional expansion – Siemens' success story extends beyond internal innovation to strategic regional expansion, another key component of our model. Here's how their actions in Latin America demonstrate this:

a. Focus on a High-Growth Market: Siemens recognized Latin America's potential as a dynamic and fast-growing region [29].

b. Targeting Key Sectors: The company identified strategic sectors with high growth potential, including mining, energy, and infrastructure, aligning their offerings with the region's specific needs [30]. Indicating that the electrical engineering services market in Latin America is expected to reach a staggering USD 142.7 billion by 2027, reflecting the significant demand in the region [2].

c. A statement by Siemens' CEO for South America, excluding Brazil, highlights their intention to maintain their investment pace in the "dynamically-growing region" of Latin America [31].

3. Geographical Proximity – Siemens exemplifies the successful application of geographical proximity as a key component for scaling a business through nearshoring. Here's how their presence in Mexico leverages this strategic advantage:

a. Proximity to Target Market: Siemens has established manufacturing facilities in Mexico, strategically located near their primary North American market [31]. This geographical advantage reduces transportation costs and simplifies logistics compared to offshoring to distant locations in Asia.

b. Capitalizing on Nearshoring Trend: The case study highlights the significant shift towards nearshoring from Asia to North America due to recent global disruptions [31]. Siemens' presence in Mexico positions them to capitalize on this trend and cater to the growing demand for near-sourced manufacturing.

c. Investment Boom: The article mentions Mexico receiving US\$30 billion in investment in strategic sectors in 2022 alone, highlighting the country's attractiveness for nearshoring [31].

d. Projected Growth: Financial analysts predict US\$60 billion to US\$150 billion could flow into Mexico over the next decade due to nearshoring trends [31].

e. Trade Agreements: Mexico's network of 14 Free Trade Agreements (FTAs) with 50 countries further enhances its position as a strategic nearshoring hub [31].

#### 4. Collaborative Partnerships

a. Partnership with Volkswagen for Electrify America [32]:

i. Joint Investment: The text highlights a joint investment by Volkswagen and Siemens in Electrify America. This collaboration signifies a strategic partnership between two industry leaders.

ii. Combining Expertise: Volkswagen brings its car manufacturing expertise, while Siemens offers its technological knowledge and resources in charging infrastructure.

iii. Shared Goals: Both companies aim to "grow a collaborative ecosystem that propels EV adoption" demonstrating a shared vision for the future of electric mobility.

iv. Future Collaboration: The agreement mentions "future collaboration between Siemens and Electrify America" underlining a commitment to ongoing partnership.

b. Partnership with HEINEKEN for Net Zero Production Roadmap [33]:

i. Long-Term Collaboration: Siemens and HEINEKEN collaborate on a long-term program to decarbonize HEINEKEN's production facilities.

ii. Complementary Skills: HEINEKEN provides industry knowledge and expertise in brewing, while Siemens offers technological solutions for energy optimization.

iii. Shared Vision: Both companies are committed to sustainability with HEINEKEN aiming for net zero and Siemens offering decarbonization expertise.

iv. Scalable and Replicable Solutions: The program focuses on creating solutions applicable across all HEINEKEN's production sites.

Siemens' commitment to digital transformation extends beyond energy systems to various sectors, emphasizing the need for an innovative, data-driven approach in facing global challenges like climate change. The company advocates for a holistic approach, where digital transfor-

mation encompasses not just technology but also organizational and cultural shifts [34]. Siemens AG's digital transformation strategy leverages cutting-edge technologies and innovative business models to ensure sustainable and efficient energy management. Their approach not only addresses immediate operational needs but also sets a pathway for future advancements in digital technology and industrial automation. This ongoing transformation is crucial for maintaining Siemens' leadership in the industrial and energy sectors which includes the following main components to get organizational success by digital transformation (Fig. 1):

1. Adaptive Technology

a. Internet of Things (IoT) – Siemens harnesses IoT to facilitate advanced remote monitoring and maintenance of industrial equipment. This integration supports predictive maintenance strategies, which use real-time data to predict and prevent equipment failures, thereby reducing downtime and maintenance costs [35; 36].

2. Cloud Computing – Siemens utilizes cloud computing to enhance the scalability and flexibility of its services. Cloud platforms enable Siemens to dynamically scale resources according to demand, supporting a broad range of digital services from data storage to processing and analytics [35; 37]

a. Edge Computing – by deploying edge computing, Siemens processes data at the network's edge-close to where it is generated. This approach minimizes latency, improves response times, and reduces bandwidth costs, essential for real-time applications in industrial settings [35].

3. Data-Driven Decision Making

a. Big Data Analytics – Siemens employs big data technologies to sift through and analyze extensive datasets collected from various sources, such as sensors embedded in manufacturing equipment. This enables them to identify inefficiencies and optimize operations to enhance productivity [35; 38].

4. Artificial Intelligence (AI) – AI is a pivotal tool for Siemens in optimizing complex systems like supply chains or managing energy in smart grids. AI algorithms help

in making predictive decisions that conserve energy and streamline operations [36; 38].

5. Digital Twins – Siemens uses digital twins to create and manage digital replicas of physical assets. These virtual models simulate the real-world conditions of their counterparts, enabling Siemens to test scenarios and improve asset performance without the risks associated with physical trials [36; 34].

6. Customer-Centric Processes

a. Customer Relationship Management (CRM) Systems – Siemens leverages CRM systems to gather insights into customer behaviors and preferences, which allows them to tailor their marketing and product development strategies to meet specific customer needs effectively [34].

b. Augmented Reality (AR) & Virtual Reality (VR) – AR and VR technologies are used by Siemens for enhanced customer service and interactive product demonstrations. These technologies allow customers to virtually experience products, facilitating better understanding and engagement before purchase [34].

c. Mobile Applications – Siemens develops mobile applications that provide customers easy access to information and services, enhancing user experience and engagement. These apps support various functionalities, from remote monitoring to customer support and service management [34].

7. Innovative Business Models

a. Platform-as-a-Service (PaaS) – Siemens offers PaaS solutions that enable customers to develop and deploy applications utilizing Siemens' industrial IoT services. This model promotes innovation by providing the foundational infrastructure and tools necessary for app development [36; 37].

b. As-a-Service Models – Siemens is shifting from selling products to providing them as services, such as 'Equipment-as-a-Service.' This model allows customers to pay for equipment usage rather than ownership, facilitated by digital tracking and subscription technologies [34; 36].

c. Blockchain – Siemens is exploring the use of blockchain for enhancing the transparency and security of its



Figure 1: Components of organizational success framework that incorporates components of organizational scale and digital transformation

Source: designed by authors



Table 1

**Organizational Success as the intersection on sub-component level**

<b>Organizational Scale Sub Component Name</b>	<b>Digital Transformation Sub Component Name</b>	<b>Organizational Success</b>
R&D Investment (Internal Innovation)	Cloud Computing	Cloud computing provides scalable and cost-effective resources for R&D activities. Companies can access high-powered computing resources on-demand, enabling them to run complex simulations, analyze vast datasets, and accelerate innovation cycles. A study by IDC found that companies utilizing cloud computing for R&D experienced a 30% reduction in innovation costs [39].
Cross-functional Teams (Internal Innovation)	AI	AI tools can automate routine tasks, freeing up team members to focus on creative problem-solving and collaboration. AI can also assist with tasks like data analysis and trend identification, empowering teams to make data-driven decisions and accelerate innovation. A study by Gartner found that companies leveraging AI for innovation projects reported a 20% increase in team productivity [18].
Technology Adoption (Internal Innovation)	Internet of Things (IoT)	IoT sensors collect real-time data from physical assets, enabling companies to monitor performance, identify potential issues, and optimize product development. This data can be used to improve existing products, develop new features, and create entirely new product categories. A study by McKinsey found that manufacturers leveraging IoT for product development achieved a 15% reduction in time-to-market [6].
Market Entry Strategies (Strategic Regional Expansion)	Big Data Analytics	Big data analytics combined with market research tools provide valuable insights into customer demographics, competitor activity, and market trends in new regions. This empowers companies to develop data-driven market entry strategies and optimize resource allocation across regions. A study by Forbes Insights found that 70% of executives leverage data analytics to inform their global expansion strategies [40].
Localization Strategies (Strategic Regional Expansion)	Customer Relationship Management (CRM)	CRM systems enable companies to manage customer relationships and personalize marketing campaigns for local audiences. Companies can leverage customer data to tailor product offerings, messaging, and support services to meet the specific needs and preferences of local markets. A study by Salesforce found that companies personalizing marketing campaigns based on customer data see a 45% lift in sales [41].
Regulatory Compliance (Strategic Regional Expansion)	Blockchain	Blockchain technology provides secure and transparent record-keeping, facilitating compliance with complex regulations across different jurisdictions. Blockchain can be used to track product lifecycles, manage supply chains, and ensure adherence to data privacy regulations. A study by Accenture found that 84% of executives believe blockchain can streamline regulatory compliance processes (Accenture, 2021) [42].
Local Market Understanding (Geographical Proximity)	Big Data Analytics	By leveraging Big Data Analytics, companies can enhance their Local Market Understanding, allowing them to tailor their offerings and strategies to meet specific market demands effectively. This alignment not only improves market penetration and customer satisfaction but also drives sustainable growth. According to a study by McAfee and Brynjolfsson (2012) in their article "Big Data: The Management Revolution," organizations that utilize data-driven decision-making are 5% more productive and 6% more profitable than their competitors. Furthermore, Gartner (2010) reports that businesses using advanced analytics in their local market strategies can increase their operational efficiency by 20%, thereby directly contributing to organizational scalability and success. Thus, integrating Local Market Understanding with Big Data Analytics is a validated approach to achieving superior performance and competitive advantage in the business landscape [43; 44].
Cultural Alignment (Geographical Proximity)	AR/VR	Augmented reality (AR) and virtual reality (VR) technologies can bridge cultural gaps by providing immersive training experiences and fostering collaboration between geographically dispersed teams. AR/VR can be used to simulate real-world scenarios, promote cultural understanding, and create a more inclusive work environment.
Supply Chain Optimization (Geographical Proximity)	Cloud Computing	Cloud computing provides a centralized platform for managing supply chain data across different locations. Companies can access real-time data on inventory levels, production schedules, and transportation logistics, enabling them to optimize their supply chains for regional needs. A study by PwC found that companies leveraging cloud computing in their supply chains experienced a 15% reduction in lead times (PwC, 2023) [8].
Joint Ventures (Collaborative Partnerships)	Platform as a Service (PaaS)	PaaS platforms provide the infrastructure and development tools for companies to co-create innovative solutions with partners. This facilitates joint venture development and streamlines collaboration on new products and services. A study by Gartner found that 70% of new business models will be platform-based by 2025 [45].
Strategic Alliances (Collaborative Partnerships)	As-a-Service Model (XaaS)	The As-a-Service (XaaS) model allows companies to access specialized skills, resources, and technology from partners on a subscription basis. This facilitates strategic alliances by enabling companies to collaborate on new ventures without significant upfront investments. XaaS offerings can include Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS), providing companies with the flexibility to access the specific resources needed for successful collaboration. A study by Bain & Company found that companies leveraging XaaS models for strategic alliances experienced a 20% increase in project completion rates [4].

Source: designed by authors

supply chain management. Blockchain technology can help streamline operations, ensure product traceability, and secure data across the supply chain [36; 37].

These components illustrate how Siemens integrates cutting-edge technologies into its business operations to drive innovation, efficiency, and customer satisfaction, aligning with its broader digital transformation strategy. Analysis of scale/digital transformation components & sub-components in Table 3.

To support the research, the authors decided to carry out a comprehensive survey targeting senior and middle management, executives, as well as employees of lower grades. This inclusive approach ensures diverse perspectives and comprehensive insights. To provide a numeric context and justify the research, the survey included the following questions:

- How many employees work in your company?
- Choose the top 3 important components that contribute to organizational scaling.

- Choose the top 3 important components that contribute to digital transformation.
- Define 3 intersections of both factors that may impact organizational success.

A total of 240 respondents (Fig.2) completed the survey, providing a diverse range of insights into the factors contributing to organizational scaling and digital transformation.

Choose the top 3 important components that contribute to digital transformation.

- The majority of respondents, 54.2% voted for AI (Artificial Intelligence) which proves it to be a key technology for enhancing operational efficiency, automating processes, and providing advanced analytics.

- 50% of respondents voted for Big Data Analytics as it provides deep insights into customer behavior, market trends, and operational performance.

- Same number of responses, 37.5% are shared between CRM and Mobile Applications but the correlation

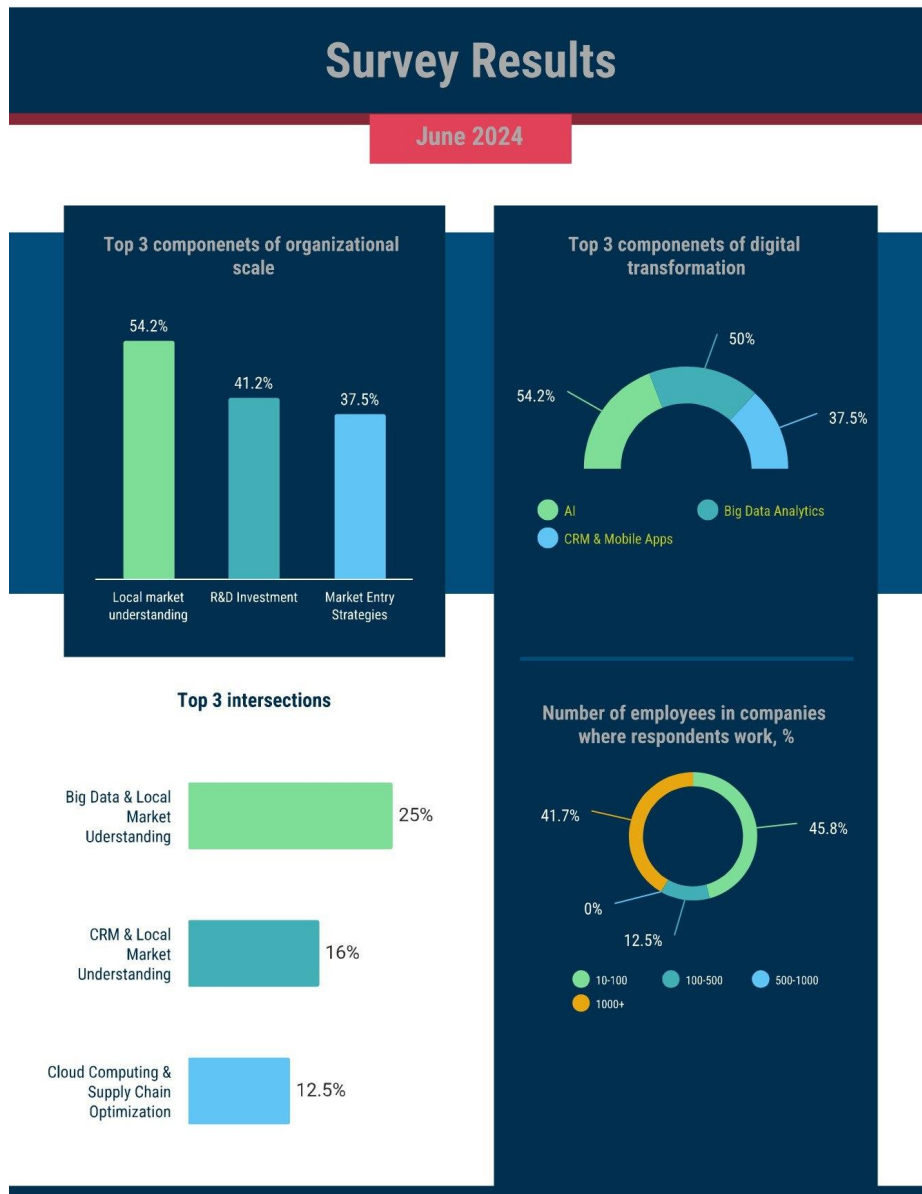


Figure 2. Survey results

Source: composed based on retrieved answers

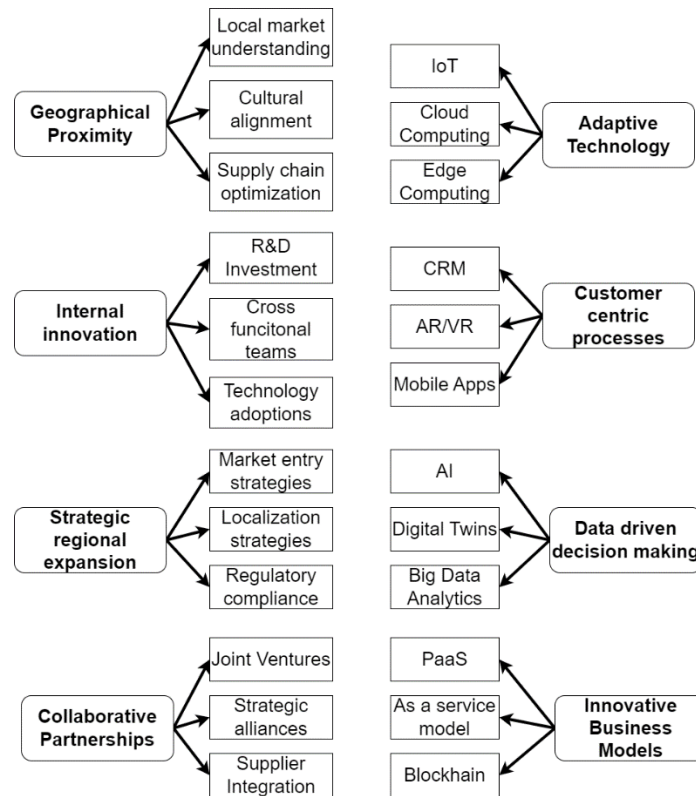


Figure 3. Components and subcomponents of suggested framework

Source: designed by authors

is clear as both assists with improving customer engagement, streamlining sales processes, and enhancing overall user experience.

Top 3 Intersections of Digital Transformation and Organizational Scale Factors:

- **Big Data Analytics & Local Market Understanding:** Combining big data analytics with local market understanding enables companies to make more informed and data-driven decisions. By analyzing large datasets, organizations can gain insights into local consumer behavior, preferences, and trends. This integration allows for more precise market segmentation and targeting, optimizing marketing strategies to meet the specific needs of different regions. For example, a study by McKinsey & Company found that organizations using big data analytics to understand local markets can improve their marketing return on investment (ROI) by up to 20% [47].

- **CRM & Local Market Understanding:** Integrating Customer Relationship Management (CRM) systems with local market knowledge enhances the effectiveness of customer interactions. CRM systems provide a centralized platform to manage customer data, track interactions, and analyze customer preferences. When combined with insights from local market understanding, companies can deliver personalized and contextually relevant communications, leading to improved customer satisfaction and loyalty. According to research by Forrester, companies that integrate CRM with local market insights see a 15-20% increase in customer retention rates (Forrester, 2023) [48].

- **Cloud Computing and Supply Chain Optimization:** Utilizing cloud computing for supply chain optimization offers multiple benefits, including enhanced efficiency, reduced costs, and greater scalability. Cloud-based solu-

tions enable real-time tracking of inventory, streamlined logistics, and improved collaboration across the supply chain network. A study by the World Economic Forum suggests that companies implementing cloud-based supply chain solutions can reduce operational costs by 23% and increase supply chain efficiency by 16%, according to the World Economic Forum (2019) [49].

**Conclusions.** The research concluded that the success of an organization in electrical engineering (see Figure 3) lies in the harmonious combination of change management and digital transformation.

Siemens AG exemplifies the integration of digital transformation and organizational scaling. Their strategy combines big data analytics with local market understanding to tailor solutions to regional demands, enhancing marketing efficiency and sales performance. Siemens utilizes CRM systems in conjunction with local market insights to deliver personalized customer interactions, significantly boosting customer retention and satisfaction. Additionally, Siemens leverages cloud computing to optimize supply chain processes, improving operational efficiency and reducing costs. These strategic intersections enable Siemens to maintain a competitive edge while driving sustainable growth and innovation in a rapidly evolving market. Future research opportunities related to Siemens' case study could explore the quantitative impact of digital transformation on their business, employee adaptation to digital changes, the efficiency of AI algorithms, and the contribution of digitalization to sustainability goals. Additionally, investigations into the long-term resilience of digital systems, the effectiveness of blockchain in industrial applications, customer data utilization and privacy, and the impact of digital twins on product lifecycle would provide valuable insights in electrical engineering.

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