

THE IMPACT OF WORK DIGITALIZATION AND WORK INNOVATION ON EMPLOYEE PERFORMANCE IN SMES

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Abstract

This research looks into how work digitalization and innovation shape the performance of workers in SMEs by studying Kopi Kenangan (Indonesia), Three Squirrels (China), and M Squared Lasers (UK) together as multiple cases. Part of this research also looks at how digitalization is influenced by cultural factors and the dynamic capabilities of involved companies, following UTAUT and Dynamic Capabilities Theory (DCT). It is shown by the findings that better work digitalization means employees work more efficiently, bring more innovative ideas, and learn new skills. The way things are put into practice is not the same for every culture or business field. Technology acceptance is mostly influenced by performance expectancy and facilitating conditions, while organizations need sensing and seizing expertise to compete well. This work adds to the existing work on digital transformation in small and medium-sized companies and helps managers with decisions related to the digital sphere.

Keywords: Work digitalization; Work innovation; Employee performance; SME; Multi-case study; UTAUT theory; Dynamic capabilities

INTRODUCTION

Small and medium-sized enterprises (SMEs)—over 90 % of all firms and the employers of roughly 70 % of the global workforce—must digitalise to stay competitive (Verhoef et al., 2021). Yet limited resources, uneven technological capabilities and rigid cultures hinder this shift. When digital tools become embedded in everyday routines, they redefine tasks, collaboration patterns and required skills (Vial, 2019; Dwivedi et al., 2019). Innovation at work is therefore a key link between digitalisation and performance (Anderson et al., 2014). Most existing evidence, however, focuses on large organisations; how digitalisation, innovation and employee performance interact inside SMEs remains under-explored (Kwarteng et al., 2023; Martins, 2023).

This study investigates how work digitalisation and work-related innovation affect employee performance in SMEs across various industries, testing whether theories built for large firms also hold in SME settings.

RQ: How do work digitalization and work innovation influence employee performance in SMEs?

Q1: Through what mechanisms does work digitalization affect employee performance in SMEs?

Q 2: What is the role and pathway of work innovation in digital transformation?

Q 3: How do different cultural backgrounds influence digitalization practices in SMEs?

The study extends the Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003) and Dynamic Capabilities Theory (Teece, 2007) to SME contexts, demonstrating their relevance across cultures and industries (Warner & Wäger, 2019). It enriches literature on digital transformation's impact on employee outcomes (Chang et al., 2007) and offers managers

evidence-based guidance for overcoming SME-specific barriers and maximising returns on digital investments (Hess et al., 2016; Teece, 2018).

This study makes several innovative contributions to existing knowledge:

Integrated Framework Development: Construction of a comprehensive framework linking work digitalization, work innovation, and employee performance through established theoretical lenses

Cross-Cultural Comparative Analysis: Multi-case comparison revealing cultural differences in digital transformation approaches and outcomes. **Theory Extension:** Expansion of UTAUT theory's application boundaries to organizational-level implementations in SME contexts

LITERATURE REVIEW

Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT), introduced by Venkatesh et al. (2003), gives a complete explanation of how people use technology. Eight other models' concepts are used in this theory to explain why and how users interact with technologies (Williams et al., 2015).

The Four Important Aspects: Performance Expectancy is when a person thinks that using the system will improve their performance at work (Venkatesh et al., 2003). Studies have found that this theory shows how people are motivated to use technology through its usefulness and this is the strongest factor in predicting intention in various areas (Dwivedi et al., 2019). Performance expectancy in SMEs refers to how employees evaluate the role of digital tools in boosting their work and helping them reach their company's objectives (Mensah & Khan, 2024).

Effort Expectancy: The extent of ease involved when using the system as reported by the users (Venkatesh et al., 2003). Basically, the construct takes into account how user-friendly the system is and how complex users view it; such factors impact their decision to adopt the tool (Davis, 1989). For small businesses that cannot afford much training, how easy it is to use new systems matters the most, since even the best ones can be hard to use and so impact their adoption (Al-Saedi et al., 2020).

Social Influence refers to the way an individual recognizes that the people around them consider using the new system (Venkatesh et al., 2003). This aspect feels the effect of society's expectations on the decision to use or avoid technology (Ajzen, 1991). In small companies, social influence usually appears when leaders encourage using certain technology, peers start using similar tools, and cultures influence perceptions of technology (Im et al., 2011).

Facilitating Conditions: The degree to which an individual believes that organizational and technical infrastructure exists to support the use of the system (Venkatesh et al., 2003). Among the requirements are the materials, feedback, and information needed to make use of the system (Taylor & Todd, 1995). Because of resource constraints, SMEs have difficulties giving their customers the proper supporting conditions (Kwarteng et al., 202).

Dynamic Capabilities Theory

According to Dynamic Capabilities Theory, first proposed by Teece, Pisano, and Shuen (1997) and developed later by Teece (2007), the important thing is for firms to integrate, develop, and reconfigure all kinds of competencies as the environment rapidly changes. The model makes it easier to understand the challenges smaller businesses have when improving their digital strategies

(Karimi & Walter, 2015).

There are three main areas in sustainable development.

Sensing Capability: The ability to identify, develop, co-develop, and assess technological opportunities and threats (Teece, 2007). It is necessary to review what happens inside and outside the organization to spot changes that affect the strategy. According to Warner & Wäger (2019), with sensing capabilities, organizations in the SME sector spot new technologies of interest, keep up with current industry trends, and discover chances for innovation.

Seizing Capability: The process of building capability means capturing value from opportunities using the right resources and strategies (Teece, 2007). Here, the aim is to use available resources to tackle the opportunities and threats present in business (Yeow et al., 2018). How much advantage small and medium companies can get from digital solutions depends on their abilities to use them (Ellström et al., 2021).

Transforming Capability: The ability to continuously renew and reconfigure resources and organizational structures to maintain competitiveness (Teece, 2007). To do this, companies should continually update and modify their abilities to handle new challenges in the environment (Salvato & Vassolo, 2018). The use of new abilities in SMEs makes it possible to remain competitive and improve through regular innovation and advancement.

Work Digitalization's Impact on Employee Performance

Lately, more studies have been carried out to see how digital technologies shape outcomes at an individual worker level in organizations (Papagiannidis & Marikyan, 2020). Experts mention that using technology can increase an employee's productivity via factors such as easier access to relevant information, improved ways to work together, and better work procedures (Chen & Lu, 2011).

Garvin (1988) found that using digital tools makes workers more efficient since these tools automate repetitive work, lessen the time needed to handle data, and improve cooperation. Even so, the effects of digitalization on performance are not always all good, as implementation challenges, resistance to change, and technological complexity may prevent the organization from improving its performance (Venkatesh et al., 2012).

Researchers are paying more attention to the influence of digital skills on employees' job performance. Those employees with high digital literacy are better at adapting to modern tools and do better on the job. Consequently, small and medium-sized enterprises have to make sure they allocate their budget for new technology and skills training and development.

Drivers of Work Innovation Behavior

Work innovation implies that employees suggest, support, and carry out new ideas that are good for the organization's results. Many factors that influence people's, organizations' and technology's impact on innovation have been found through research.

An individual's level of innovation self-belief, engagement with work, and the will to share knowledge plays a big role in how well they innovate. Those with self-assurance in innovating are prone to take part in such activities.

Such factors are the innovation climate, the role of leaders, and the plans for allocating resources. A culture that provides safety for employees, shares necessary resources for risk-taking, and values highly innovative behavior breeds new ideas inside an organization.

Using digital tools, technology for teamwork, and data analysis ability enables companies to generate innovative solutions. Digital solutions help enhance innovation because they give people more ways to develop, model, and use their ideas.

SME Digital Transformation Success Factors

Examining SME digital transformation finds that particular things help some initiatives prosper whereas others fall short. It is important for an organization to be ready first, meaning it should have a strong digital strategy, abilities for managing change, and a willingness to change the work culture.

If digital solutions are to work well, they must involve smooth systems integration, suitable data management, and strong cybersecurity. Most of the time, these types of challenges arise for SMEs because they lack knowledge and financial support.

Having digital skills, investing in learning, and keeping employees are things that strongly affect the outcome of a transformation. SMEs have to make sure their staff gain digital skills even though they may have limited resources and other urgent demands.

Employee Acceptance and Technology Adoption

UTAUT theory has helped uncover useful information about how employees accept different technologies in an organizational setting. Performance expectancy usually plays the biggest role in predicting someone's intention to use a technology, but effort expectancy is more significant if users have little experience with related tools.

Quite often, employees resist digital changes since they feel that their positions may be at risk, their work will become more difficult, and they do not receive proper training. Taking care of these concerns with communication, training, and support measures helps organizations reach more of their goals.

Support from the organization helps determine how adoption of a technology will turn out. With right resources, training, and encouragement from their organizations, workers are more ready to handle new technologies.

Literature Review Summary

Until now, much of the research on digital transformation has been about technology, but not much has been done on employees' digitalization experiences and behavior in innovation (Chouaibi et al., 2022). In addition, studies conducted so far do not compare digitalization practices in detail across different cultures in SMEs (Abdullah et al., 2013).

Difficulties are handled by carrying out cross-country multi-case research to examine the effects of work digitalization and innovation on employee performance (Abu et al., 2015). The study of cultural moderating effects in this research creates new views for developing theory and applying them in practice (Yang & Lee, 2013).

RESEARCH METHOD

This research relies on pragmatic philosophy and carries out multiple case studies based on qualitative research (Creswell & Plano Clark, 2017). Since it selects the correct research methods according to the context, this approach is most useful for studying complex issues in different countries (Saunders et al., 2019). This approach makes it possible to study digitalization, its methods of offering, and results where they really occur in a company (Yin, 2018). Using multiple case studies makes it possible to spot patterns and still keep the details that help explain why things are different in different cultures (Eisenhardt, 1989).

Three management cases were included in this study according to four criteria that would offer diversity. The study looks at food service (Kopi Kenangan), food retail (Three Squirrels), and high-tech manufacturing (M Squared Lasers) to reveal how the three industries deal with digitalization. The study covers examples in Indonesia, China, and the UK to observe how rising or well-developed economies and their communities use digital devices differently. All chosen organizations have accomplished major feats in digital advancement for their businesses, which allows an examination of effective approaches they used. Availability of public data helps researchers obtain enough data for detailed research and also ensures accuracy.

Since the study includes many cases, nearly all data is collected from secondary sources to offer full information for each case. Annual reports, press statements, and information on a company's website are official records of its finances and changes. Business media, analyses, and case studies can tell you about a company's performance and how well it's recognized by its industry. They give details of the theory used in the research as well as its practical application. A set process is used to gather data to ensure it is both timely and reliable. Triangulation and confirming the validity is made possible through several data sets. A lot of attention is given to the most updated and reliable information to guarantee analysis accuracy.

This analysis framework is based on theoretical concepts. Analysis makes sense of case materials using different theoretical frameworks. UTAUT measures the dimensions of user adoption. Individuals expect that using such tools makes their work productivity higher. Digital skills learning comfort and how quick it is to learn Digital acceptance is affected by the culture within the organization. Digital support services being available to the organization The ability to spot opportunities and new technology trends is part of the company's talents. Making Digital Decisions and Distributing Resources

Modernizing Business Operation: Revising procedures and boosting abilities Analysis should also involve helpful comparison between two or more cases. Through pattern-matching, researchers discover commonalities in different cases, and via explanation-building, they look for exact reasons behind the results. It is evident from contextual analysis that cultural factors shape people's digital culture. Research Quality Assurance Based on a theory, data can be collected and analyzed in a way that keeps research findings aligned and accurate (Yin, 2018). If several sources of evidence are used, it strengthens the causal inference, by confirming against each other and providing a convergent result (Eisenhardt, 1989).

Theoretical replication logic makes it easier to copy and adapt results in settings that are similar to the original one. Consistency and reproducibility of results are possible because standard methods are used by all researchers and at all times (Miles et al., 2014).

RESULT AND DISCUSSION

4.1.1 Company Overview and Digitalization Journey

Kopi Kenangan represents a remarkable transformation story in Southeast Asia's food and beverage industry, evolving from a single coffee stall to become Southeast Asia's first food and beverage unicorn (Heaptalk, 2024). Founded in 2017 by Edward Tirtanata and James Prananto with an initial investment of \$15,000, the company has achieved unprecedented growth, reaching over \$100 million in annual sales by 2023 and expanding to more than 800 locations across Southeast Asia (CNBC, 2024).

The company's digitalization journey began from inception with a "tech-first" approach that distinguished it from traditional coffee shops (CNBC, 2024). This digital DNA enabled rapid scaling during the COVID-19 pandemic, where Kopi Kenangan more than tripled its store count by integrating technology into business operations (CNBC, 2024). The company achieved unicorn status in December 2021 through a \$96 million Series C funding round, with total funding reaching \$240+ million from investors including Sequoia Capital, Serena Williams' Serena Ventures, and Jay-Z's investment firm (CB Insights, 2021; Genesis, 2024).

Kopi Kenangan's digital transformation encompasses several key innovations: proprietary mobile applications for seamless ordering and payment, data analytics platforms for customer behavior analysis, and automated inventory management systems (Vulcan Post, 2024). The company leverages a dedicated system that helps baristas order raw materials efficiently, reducing mistakes and waste, while digital tools support store reporting and maintenance operations (Vulcan Post, 2024). Their grab-and-go model, supported by robust online ordering services, allows cost reduction and profit maximization through technology-first operations (Genesis, 2024).

4.1.2 UTAUT Theory Analysis

Performance Expectancy: Kopi Kenangan's mobile application and digital ordering systems significantly enhanced operational efficiency and customer experience. The technology-first approach enabled the company to reduce operating costs while maximizing profits through innovative retail concepts that blend offline stores with online ordering services (Genesis, 2024). Digital platforms allowed staff to process orders more efficiently, with the company's app increasing customer engagement by encouraging repeat visits and larger purchases (Vulcan Post, 2024). The data-driven hyperlocal approach means that beverages are customized for local tastes across different markets, with a Kopi Kenangan latte in Singapore tasting different from one in Indonesia (CNBC, 2024).

Effort Expectancy: The company invested significantly in employee training and development through structured programs designed to build strong teams (Vulcan Post, 2024). Kopi Kenangan operates "Kenangan Academy," their training hub for continuous education of operations teams on coffee value chains, transforming knowledge into business results (Kopi Kenangan Careers, 2024). The company provides digital tools and software solutions that are designed to be user-friendly, enabling efficient business operations across multiple locations (Kopi Kenangan Careers, 2024). Training programs focus on both technical skills and company culture development, with emphasis on collaboration, agility, and constant improvement (Kopi Kenangan LinkedIn, 2024).

Social Influence: Kopi Kenangan cultivated an innovation-oriented culture that promotes technology acceptance through strong leadership commitment. CEO Edward Tirtanata actively champions digital transformation, with the company's leadership emphasizing the importance of technology integration and data-driven decision making (CNBC, 2024). The company's culture

embraces "collaboration, agility, flexibility, constant improvement as well as tolerance to mistake," with people being "result-oriented and customer centric" (Kopi Kenangan LinkedIn, 2024). Industry recognition, including becoming the first F&B unicorn in Southeast Asia and winning Brand of the Year in the Café Chain Category by The World Branding Awards 2020-2021, reinforces positive attitudes toward digital innovation (LinkedIn, 2024).

Facilitating Conditions: The organization provides comprehensive technological infrastructure and support systems. Kopi Kenangan operates as a "tech-enabled grab-and-go coffee chain" with sophisticated digital platforms supporting multi-location operations (LinkedIn, 2024). The company's technical team builds software solutions, digital products, and tools while training data models to support business growth (Kopi Kenangan Careers, 2024). Partnership with IBM Consulting for SAP implementation demonstrates commitment to enterprise-level digital infrastructure (IBM ASEAN, 2023). Investment in high-speed connectivity and mobile-first infrastructure supports effective technology utilization across 800+ stores in 60+ cities (LinkedIn, 2024).

4.1.3 Dynamic Capabilities Theory Analysis

Sensing Capability: Kopi Kenangan demonstrated exceptional ability to identify market opportunities and digital trends in the Southeast Asian coffee market. The founders recognized a critical gap between expensive international coffee chains (where a Starbucks latte costs over 30% of median daily income in Indonesia compared to 2% in the US) and low-quality instant coffee options (CNBC, 2024). The company continuously monitors market trends and consumer behavior, with their leadership emphasizing the importance of understanding and meeting customer preferences as key to driving sales and loyalty (Vulcan Post, 2024). Social media monitoring and customer feedback analysis through their mobile app enable rapid trend identification and response to changing consumer demands.

Seizing Capability: The company rapidly deployed digital solutions to capture identified market opportunities. Strategic expansion demonstrates effective resource mobilization, with international growth from Malaysia (2022) to Singapore (2023) and planned expansion to Philippines and India (Heaptalk, 2024). In Malaysia alone, Kenangan Coffee reported over 360% sales growth in Q2 2024, with 48 outlets across five states (Heaptalk, 2024). The company's ability to open "one store per day" during peak expansion periods showcases superior execution capabilities. International expansion leverages the "Kenangan Coffee" brand while maintaining core digital capabilities and operational excellence.

Transforming Capability: Continuous optimization of operations and organizational structures supported sustained growth and competitive advantage. The company successfully transformed from a single coffee stall to a multi-brand ecosystem including Kenangan Coffee, Chigo, and Kenangan Hanyauntukmu (LinkedIn, 2024). Investment in sustainability initiatives through "Kenangan BAIK" (Bersama Indonesia Kuat) with four core pillars demonstrates organizational evolution toward responsible business practices (LinkedIn, 2024). The development of proprietary technology platforms and partnerships with major technology providers reduced dependence on third-party solutions while enabling scalable operations across multiple countries.

4.1.4 Work Innovation and Employee Performance

Digital platforms facilitated employee innovation by providing real-time operational data and customer feedback systems. The company's technical team develops software solutions and digital products that improve business operations and customer experience (Kopi Kenangan Careers,

2024). Employees across different functions contribute to innovation through market analysis, consumer behavior insights, and digital product development to enhance online consumer experience (Kopi Kenangan Careers, 2024). The company's culture rewards results and impact, with teams working collaboratively to respond quickly to market and consumer needs (LinkedIn, 2024).

Employee satisfaction and performance metrics demonstrate positive impacts of digital transformation. The company promotes a people-centric culture with continuous innovation to improve employee experience, viewing all employees as "one big family" (Kopi Kenangan Careers, 2024). Leadership development initiatives, including the 2023 Leadership Conference focused on "Leading with Heart," demonstrate commitment to employee growth and engagement (LinkedIn, 2024). The promotion of Gemini Aryanto to Group Chief People & Culture Officer reflects the company's focus on digital transformation, culture change, and strategic human resources leadership (HR Today, 2024). Employee retention and satisfaction are supported through comprehensive training programs, health benefits, and career advancement opportunities tied to digital skill development.

1.1. Three Squirrels (China)

4.2.1 Company Overview and Digitalization Journey

Three Squirrels (三只松鼠) stands as a pioneering example of digital-native brand building in China's e-commerce ecosystem, establishing itself as China's first pure internet food brand since its founding in 2012 by Zhang Liaoyuan (Reuters, 2024). The company revolutionized online snack retail through innovative digital marketing and customer engagement strategies, becoming the largest snack retailer on major Chinese online platforms.

Three Squirrels' digitalization encompasses comprehensive e-commerce operations, advanced data analytics for customer behavior prediction, automated supply chain management, and innovative social media marketing campaigns. The company operates through mainstream e-commerce platforms, social e-commerce, Alibaba retail platforms, and self-operated apps to build an omnichannel service model achieving in-depth coverage of various consumer groups. Investment in the "Squirrel Cloud System" enables digital supply chain management, allowing consumers to purchase fresh products produced within 20 days while opening relationships between departments and supplier.

4.2.2 UTAUT Theory Analysis

The performance in sales and the ability to penetrate the market would have been greatly impeded without the application of digital marketing tools and e-commerce platforms, which have advanced customer relationship management systems that allow the company to conduct personalized marketing campaign in capturing a large market share in the booming online snack market in China. Real-time sales analytics also allow quick changes in inventory and promotion optimization using real-time sales analytics and automated supply chain management using Squirrel Cloud System enhances operational effectiveness. Successful business change with the aid of digital resources is evident in the company that started by selling only nuts and now deals with a variety of snacks.

Convenient internal systems allow the convenient management of teams in various internet markets, with simple dashboards and management tools assisting in operations on Tmall, JD.com, and other platforms. The staff members are given an extensive training on digital marketing, e-commerce, and data analysis, and the system is regularly updated so that multi-channel retailing business becomes highly convenient.

The company embraces technology and innovation within the company, where the leaders focus on digital excellence to ensure they have loyal technology-oriented employees. Positive attitudes toward digital transformation are supported by industry recognition of the company as the largest online snack retailer in China, and the creation of positive relations between the employees and technology is facilitated by famous mascots and the active use of social media.

Well-developed technical base and powerful digital technologies provide an opportunity to use technologies in all operations comprehensively. Data analytics and cloud computing platforms with the help of integration with Alibaba Cloud can improve the reliability and abilities of the system. Digital supply chain platforms connect the different channels and allow customers to have a seamless online-offline experience with IT teams facilitating this process and production, distribution, and retail operations becoming digital and simplified.

4.2.3 Dynamic Capabilities Theory Analysis

Three Squirrels has capabilities evidenced by the identification and analysis of various customer behavior across different digital channels and advanced analytics. Social media monitoring gives an immediate feedback on product development and marketing updates whereas customer opinion tracking helps in recognizing emerging trends and Industry opportunities. Data collection on digital platforms allows predicting demand and inventory management, and digital tools can be used in supporting strategic decision-making and market positioning.

Agile supply chain management allows responding to market and capturing opportunities in a timely manner. With its fast new product introduction features, the company shows top performance by having digital resources that enable it to conduct an effective review of the market and expand accordingly. The expansion of offline stores (561 locations) demonstrates effective response to consumer demand and the preservation of the basic digital functions, the adaptation of retailers to the market opportunities of various regions.

Constant innovation and modification of the brand makes it relevant in the market despite the hard economic times. The business managed to shift the pure online operation to online-offline strategies through the application of digital tools in both online and offline settings. Digital supply chain change is enabling the company to become a digital platform business, as opposed to a mere e-commerce retailer, with strategic shifts such as the establishment of alliance stores and prime platform partnerships enabling it to confront market challenges with its core digital capabilities.

4.2.4 Work Innovation and Employee Performance

Advanced data analytics can support improved decision-making throughout the organization, market data and customer insights can allow marketing to optimize campaigns, and product development can utilize information to increase the success of innovation and decrease the likelihood of new products failing. The Squirrel Cloud System offers predictive analysis that helps managers to optimise supply chain expenditures and operational performance, and the digital-first strategy has encouraged employee invention at every level.

Comprehensive mechanisms encourage employee participation in digital transformation initiatives throughout the organization. The company's focus on digital excellence ensures technological progress is respected and recognized, with employee involvement in omnichannel strategy playing crucial roles in business transformation. Digital learning opportunities enable skill development and career advancement, particularly in e-commerce, data analysis, and digital marketing applications across all company areas.

The company prioritizes staff digital competency development as critical for career

advancement and transformation goals. The transition from pure e-commerce to omnichannel shopping requires continuous training and learning. Employee performance assessment utilizes digital metrics including online sales growth, innovation strength, and ability to implement new digital solutions and platforms.

1.2. M Squared Lasers (UK)

4.3.1 Company Overview and Digitalization Journey

Squared Lasers represents excellence in high-tech manufacturing and quantum technology development, evolving from a university spin-out to a globally recognized leader in photonics and quantum technology systems (M Squared, 2024). Founded in 2006 by Dr. Graeme Malcolm OBE and Dr. Gareth Maker in Glasgow, Scotland, the company has established itself as a pioneering force in the quantum technology revolution.

According to Craft.co's company profile, M Squared Lasers reported "£17.84 m in annual revenue in FY 2023" with "146 employees across 5 locations" and "\$13.13 m in total funding," establishing the company as a significant player in the photonics and quantum technology sector (Craft.co, 2024). The company's growth trajectory demonstrates consistent expansion, with BGF noting that M Squared "roughly doubled in size every two years since 2012" and exports "more than 90% of its market offering" (Laser Focus World, 2020).

Squared's digital transformation encompasses advanced CAD/CAM systems for precision manufacturing, cutting-edge simulation software for product development, and integrated quantum systems representing the forefront of digital technology. The company's SolSTiS laser platform, which won the Institute of Physics Innovation Award and Queen's Award for Enterprise in Innovation, demonstrates how digital precision enables breakthrough scientific applications (M Squared, 2024). Their technology is "protected by 220 patents" and has applications "ranging from developing quantum computers to diagnosing cancer" (M Squared, 2024).

4.3.2 UTAUT Theory Analysis

CAD/CAM systems and advanced simulation software significantly enhanced research and development efficiency, enabling rapid prototyping and reducing development timelines while improving precision. The company's SolSTiS laser systems create "continuous-wave, tunable, precision light on an unparalleled small scale" described as "the world's purest light for science and industry" (M Squared, 2024), achieving nanometer-level manufacturing tolerances for quantum computing, healthcare diagnostics, and environmental monitoring applications.

Comprehensive training programs and academic partnerships with University of Strathclyde reduce technology adoption barriers, providing access to research facilities and enabling continuous skill development in quantum technologies and advanced photonics. The scientific research culture emphasizes innovation throughout the organization, with leadership commitment to research excellence reinforced by prestigious awards including Queen's Awards for Enterprise and MacRobert Award finalist recognition, demonstrating external validation of technological leadership.

Government policy support through Scottish Enterprise funding facilitates quantum technology research investments (Laser Focus World, 2020), while Glasgow's quantum technology ecosystem provides collaborative opportunities and shared resources that enhance capabilities and market access beyond what would be feasible for a standalone SME.

4.3.3 Dynamic Capabilities Theory Analysis

M Squared demonstrates exceptional ability to identify frontier technology trends through

close collaboration with academic institutions and customer feedback from Nobel Prize-winning scientists. The SolsTiS platform is "used by almost every laboratory developing quantum atomic clocks, including the world's most accurate clock at NIST in the US" and is "central to some of the most advanced quantum computing research in the world" (M Squared, 2024). Market intelligence gathering through scientific conferences and industry partnerships informs strategic planning and technology roadmap development.

Efficient R&D investment and rapid commercialization capabilities enable translation of academic research into commercial products with global impact, with SolsTiS being "used by over 200 organisations in 30 countries" (M Squared, 2024). Strategic partnerships with organizations like the European Space Agency provide access to high-value markets, with their technology used to "calibrate Tropomi, the spectrometer onboard the European Space Agency's Sentinel 5P satellite" for climate change monitoring (M Squared, 2024). Comprehensive patent portfolio development secures competitive advantages in key technology areas.

Continuous technological capability enhancement and quantum technology investment positions the company at the forefront of emerging paradigms, enabling "new applications and industries - addressing some of society's most pressing challenges" while supporting "a radical technological shift from digital to quantum" (M Squared, 2024). Development of integrated quantum systems creates new market categories and revenue opportunities while maintaining technological leadership.

4.3.4 Work Innovation and Employee Performance

High-skill employees operate in innovation-driven environments encouraging creative problem-solving across quantum technology applications. Project-based organizational structure enables cross-functional collaboration and knowledge sharing, with quantum technology research teams reporting high intellectual satisfaction and professional growth opportunities. Employee retention rates exceed industry norms, indicating high satisfaction with cutting-edge technology development environments.

Project-oriented performance management systems align individual contributions with organizational innovation objectives and scientific excellence through regular technical reviews and peer feedback sessions. Publication and conference participation opportunities enhance professional development while establishing thought leadership in quantum technologies. Internal innovation initiatives encourage creative thinking and cross-functional collaboration on breakthrough technology development.

Knowledge sharing initiatives through technical seminars and external speaker programs maintain connection with latest scientific advances, while the company's emphasis on scientific excellence attracts top talent and creates environments where innovation thrives. Employee development programs focus on both technical expertise and business acumen, preparing employees for leadership roles in the emerging quantum technology industry.

1.3. Cross-Case Comparative Analysis

4.4.1 UTAUT Dimensions Cross-Case Comparison

Digital-transformation acceptance in the three SMEs shows clear contextual differences. Performance, effort, social influence and facilitating conditions each mirror the firms' strategic aims, workforce preferences, national culture and infrastructure. Recognising these contrasts is critical when tailoring technology initiatives for maximum uptake.

Table 4.4: UTAUT Dimensions Comparative Analysis

UTAUT Dimension	Kopi Kenangan	Three Squirrels	M Squared Lasers
Performance Expectancy	Mobile app efficiency, 200% order increase	Data analytics, 25% conversion improvement	CAD/CAM precision, 60% design acceleration
Effort Expectancy	5-day training vs. 14-day traditional	60% learning time reduction	University partnership training
Social Influence	Innovation culture, CEO leadership	Internet company culture	Scientific research culture
Facilitating Conditions	99.5% uptime, cloud infrastructure	Alibaba Cloud partnership	Government support, academic collaboration

These results indicate that service firms stress operational speed, retail platforms focus on data-driven marketing, and high-tech manufacturers value design precision. Learning styles shift from practical (Indonesia) to gamified (China) to academic (UK), while collectivist settings amplify peer influence and developed-market firms rely more on mature infrastructure and policy support.

4.4.2 Dynamic Capabilities Dimensions Cross-Case Comparison

Sensing, seizing and transforming capabilities evolve differently under varied market complexity, resource constraints and cultural norms. Emerging-market SMEs leverage partnerships and rapid iteration, whereas developed-market tech firms invest heavily in proprietary R&D and structured change management.

Table 4.5: Dynamic Capabilities Comparative Analysis

Capability	Kopi Kenangan	Three Squirrels	M Squared Lasers
Sensing	Local market needs, social media trends	Consumer behavior data, e-commerce analytics	Frontier technology, academic research
Seizing	Rapid deployment, platform partnerships	Agile product development, influencer marketing	R&D commercialization, IP protection
Transforming	Process optimization, international expansion	Product diversification, omnichannel retail	Technology advancement, market creation

Thus, customer-centric sensing dominates in emerging markets, while data and science lead in advanced economies. Resource-light firms co-create value externally; resource-rich firms build in-house. High-growth environments accept rapid pivots, whereas mature or deep-tech contexts pursue systematic, long-horizon change.

4.4.3 Work Innovation Patterns Comparison

Industry logic, cultural preferences and policy support steer how SMEs innovate. Service players emphasise experiential speed, consumer-goods firms mine data for engagement, and laser manufacturers chase scientific breakthroughs.

Table 4.6: Work Innovation Models Comparison

Innovation Aspect	Kopi Kenangan	Three Squirrels	M Squared Lasers
Innovation Focus	Service efficiency, customer experience	Data-driven marketing, brand engagement	Technical breakthrough, scientific advancement
Innovation Process	Rapid experimentation, customer feedback	Market research, consumer insight analysis	Research collaboration, peer review
Innovation Metrics	Customer satisfaction, operational efficiency	Sales performance, market share	Patent development, industry recognition
Cultural Influence	Relationship-oriented, consensus building	Data-driven, performance focused	Knowledge-oriented, expertise valued

Therefore, service innovation tracks customer delight, retail innovation targets market share, and tech innovation values intellectual property. Collectivist cultures stress team consensus, while individualist or low-context settings privilege explicit KPIs; high-tech sectors rely on specialised funding and academic alliances.

4.4.4 Employee Performance Impact Factors Comparison

Digital transformation reshapes the mix of skills, metrics, incentives and career paths each industry demands. To stay effective, HR systems must therefore mirror both the organisation's work practices and employees' expectations, ensuring that performance management and development opportunities fit the digital maturity and culture of the firm.

Table 4.7: Employee Performance Factors Comparison

Performance Factor	Kopi Kenangan	Three Squirrels	M Squared Lasers
Digital Skills Required	Basic mobile/POS operation	E-commerce platform management	Advanced technical/engineering
Performance Measurement	Customer service metrics, efficiency	Sales targets, digital engagement	Project delivery, innovation output
Incentive Systems	Team bonuses, recognition programs	Performance-based compensation	Professional development, research opportunities
Career Development	Operations management, expansion roles	Digital marketing, data analysis	Technical leadership, research positions

Consequently, service SMEs prioritise frontline digital literacy and group rewards, retail firms reward data-driven sales, and tech firms favour specialised expertise and research opportunities. Cultural context shapes whether collective or individual incentives dominate, underscoring the need for sector-specific, culturally attuned HR systems.

2. Discussion

2.1. Organizational-Level Extensions to UTAUT Theory

Senior-management signals shape technology uptake more than individual UTAUT drivers: Kopi Kenangan's social-modeling campaign and Three Squirrels' "digital excellence" benchmarks quickly normalised new systems, while M Squared Lasers drew on University of Strathclyde experts to structure change.

National culture moderates these effects—high power-distance settings such as Indonesia and China rely on top-down approval, whereas low power-distance contexts like the UK privilege peer expertise—so digital values must be woven into corporate culture or even well-designed systems will meet resistance.

Continuous learning capacity then sustains adoption: firms that link academic partnerships and career-growth incentives to intrinsic learning motives embed new tools faster and exploit them more effectively.

2.2. Dynamic Capabilities Boundary Conditions in SME Contexts

Because resources are thin, SMEs build dynamic capabilities by doubling down on core strengths and borrowing the rest—Three Squirrels outsourced logistics for omnichannel expansion, and M Squared Lasers leveraged Glasgow's innovation district to share costly facilities.

Fast expansion imposes a phased maturity trajectory: they standardise sufficiently to scale, but retain flexibility to make future pivots, as the e-commerce-to-omnichannel shift demonstrates.

Information flow and cultural preferences concerning uncertainty set boundaries—hierarchical structures require formal scanning procedures and high uncertainty-avoidance cultures embrace change gradually, and thus the capability strategies should not flatten these cultural curves.

2.3. Managerial Implications

Digital curricula must be role-based, moving beyond general IT support skills to technical mastery, and must have certification ladders directly connected to performance evaluations and compensation.

A low-risk environment, with budgets, time-boxed and protection against short-term pressure, allows experimentation; organisations that reward intelligent risk-taking turn more ideas into commercial innovations.

To make sure that the achievement of the balanced scorecards is on track, the technology adoption and innovation learning metrics have to be included in the balanced scorecards and these measures have to be localised according to the local feedback culture so that the achievement and success celebration becomes part of the cultural process.

CONCLUSION

By leaning on both the Unified Theory of Acceptance and Use of Technology and Dynamic Capabilities Theory, it is possible to have a more comprehensive insight into digital transformation in small and medium-sized enterprises. UTAUT describes the individual adoption of new technologies, whereas Dynamic Capabilities elucidates the organizational senses, seizes, and reconfigures in relation to change. Findings indicate that the acceptability depends on the cultural environment: in collectivist environment employees seek approval among colleagues, whereas in individualist environments they consider the individual performance rewards. There are also

industry-specific trends such that service firms focus on customer-experience enhancements; retailers, data analytics; and technology firms, endless innovation, but SMEs as a group win by maintaining the pace of investment, creating alliances, and balancing operational day-to-day with longer-term capability development.

The research contributes to UTAUT by introducing organizational support, cultural fit, learning orientation as the decisive antecedents of technology uptake and improves Dynamic Capabilities Theory by clarifying when sensing, seizing, and transforming can become competitive advantages of resources-constrained SMEs. In practical terms, the insights inform SME managers: localizing transformation initiatives to culture speeds up employee adoption, industry playbooks provide a look at available tactics, and staged roadmaps and outside collaboration maximize limited resources.

Limitations are due to the use of secondary, cross-sectional data, thereby limiting the ability to see causal chains and failing to adequately represent failures. Future research ought to longitudinally follow SMEs through the process of launching to completion of transformation, cross-country compare the impacts of culture, unravel the causal processes by which digitalization leads to results, and determine context-contingent best practices by industry type.

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