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The financial footprint of Digital Twins integration: A case study on Huawei's revenues and profits (2008-2024)

Wpływ finansowy integracji cyfrowych bliźniaków: studium przypadku przychodów i zysków Huawei (2008-2024)

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Abstract:
Research objectives and hypothesis/research questions
In this study, there are two theorized foundations: First-the adopting of Digital Twin technology has a positive impact on the financial performance of the case subject company. Second-the differences in financial performance, measured by operating profit and revenues, before and after the adoption of Digital Twin technology are statistically significant.
Research methods
The use of dummy variable regression analysis and independent T test to validate the impact of Digital Twin on financial performance.

Main results
The empirical results of this study demonstrate that the adoption of Digital Twin (DT) technology has had a substantial and statistically significant impact on Huawei's financial performance. Both operating profit and total revenues increased markedly in the years following DT implementation in 2015, with regression and T-test analyses confirming the robustness of these trends. These results indicate a financial improvement that closely follows the predicted advantages to be achieved through the digital twin approach, such as increased operational efficiency, preventive maintenance, and data-driven decision-making. These findings are in agreement with existing literature emphasizing the economic and strategic importance of DT technologies. For instance, improvements in forecasting and operational cost savings due to DT adoption were cited by Bassey, Opoku-Boateng, Antwi et al. (2024) and Saini, Sharma, Mathur et al. (2022) in the case of the energy and building industries. Likewise, Bányai and Kovács (2023) reported significant improvements in ROI and NPV due to RFID-based digital twins in manufacturing contexts, mirroring the pattern seen with Huawei's rising profits and revenues. Again, Korepin, Mohamed, Zhaksylyk et al. (2024) and Svadkovsky (2024) documented strong revenue growth in high-tech sectors after the DT integration, giving more supporting evidence to the generalization of our results to digital-intensive industries.
Implications for theory and practice
Because of the constraints, future research would concentrate on multi-firm, multi-industry datasets to validate and generalize findings across diverse contexts. Sector-specific drivers, barriers, and enabling conditions for successful DT would also merit attention. A further combining of financial metrics with qualitative assessments could contrive to a more complete view regarding how digital twins affect firm behavior as well as long-term competitiveness.
Keywords: Huawei, Digital Twin, financial performance, operating profit, revenue growth

Abstrakt:
Cel badań i hipotezy/pytania badawcze
W tym badaniu wyróżnia się dwie podstawy teoretyczne: po pierwsze – wdrożenie technologii cyfrowych bliźniaków pozytywnie wpływa na wyniki finansowe firmy, po drugie – różnice w wynikach finansowych, mierzone przez zysk operacyjny i przychody przed wdrożeniem technologii bliźniaków cyfrowych i po jej wdrożeniu są statystycznie istotne.
Metody badawcze
Wykorzystanie analizy regresji zmiennych oraz niezależnego testu T do weryfikacji wpływu cyfrowego bliźniaka na wyniki finansowe.
Główne wyniki
Wyniki empiryczne pokazują, że wdrożenie technologii bliźniaków cyfrowych (Digital Twin, DT) miało znaczący oraz statystycznie istotny wpływ na wyniki finansowe Huawei. Zarówno zysk operacyjny, jak i całkowite przychody znacznie wzrosły po wdrożeniu DT w 2015 roku, a regresja i analizy testów T potwierdzają solidność tych trendów. Wyniki wskazują na poprawę finansową, która ściśle odpowiada przewidywanym korzyściom osiągniętym przez podejście bliźniaków cyfrowych, takim jak zwiększona efektywność operacyjna, konserwacja zapobiegawcza oraz podejmowanie decyzji opartych na danych. Wyniki te są zgodne z istniejącą literaturą przedmiotu podkreślającą ekonomiczne i strategiczne znaczenie technologii DT. Na poprawę prognozowania i oszczędności operacyjne dzięki wdrożeniu DT wskazywali na przykład Bassey, Opoku-Boateng, Antwi et al. (2024) oraz Saini, Sharma, Mathur et al. (2022) w przypadku branży energetycznej i budowlanej. Podobnie Bányai i Kovács (2023) odnotowali znaczącą poprawę ROI i NPV dzięki cyfrowym bliźniakom opartym na RFID w kontekście produkcyjnym, odzwierciedlając wzorzec obserwowany przy rosnących zyskach i przychodach Huawei. Ponownie Korepin, Mohamed, Zhaksylyk et al. (2024) oraz Svadkovsky (2024) udokumentowali silny wzrost przychodów w sektorach wysokich technologii po integracji DT, dostarczając więcej dowodów wspierających uogólnienie naszych wyników na branże wymagające intensywności cyfrowej.
Implikacje dla teorii i praktyki
Ze względu na ograniczenia przyszłe badania powinny koncentrować się na zbiorach danych obejmujących wiele firm i branż, aby weryfikować i uogólniać wyniki w różnych kontekstach. Specyficzne dla sektorów czynniki, bariery oraz warunki sprzyjające sukcesowi bliźniaków cyfrowych również zasługują na uwagę. Dalsze połączenie wskaźników finansowych z ocenami jakościowymi może przynieść pełniejszy obraz tego, jak cyfrowe bliźniaki wpływają na zachowania firm oraz długoterminową konkurencyjność.
Słowa kluczowe: Huawei, cyfrowy bliźniak, wyniki finansowe, zysk operacyjny, wzrost przychodów

Introduction

The Digital Twin (DT) technology has burgeoned into a strategic tool which changes the design, operation, and optimization strategies across industries during this digital transformation. Digital Twin assists in real-time inspection, predictive analytics, and data-driven decision-making by creating a virtual counterpart of physical assets or processes. Beyond operational efficiency, DT has a very promising scope of enhancement in economic performance through cost-cutting, productivity boosts, and fast-tracking innovation.

The urgency of studying this phenomenon is heightened by the current context of accelerated digital transformation, global competition, and economic uncertainties. As industries are pressured to become more resilient and efficient in the aftermath of COVID-19 disruptions, supply-chain instabilities, and rapid advances in artificial intelligence, Digital Twin adoption is no longer a futuristic choice but a present necessity. These factors make the financial implications of DT adoption a pressing and contemporary issue.

With this growing emphasis on economic sustainability and performance benchmarking, financial indicators have emerged to be critical in measuring the success of technological adoption. Among these, operating profits and total revenues are classical yardsticks of institutional efficiency and financial health. When companies engage in investment for disruptive new technologies like DT, understanding their implication in the aforementioned financial metrics becomes very vital in assessing return on investment and aligning future strategies.

This study focuses on the case of Huawei, a global leader in information and communication technologies, which began adopting Digital Twin systems in 2015. This research intended to analyze the financial performance of Huawei during the period 2008-2024 in order to assess the economic benefits of DT and whether they were felt with noticeable effect after implementation. The longitudinal dataset clearly outlines the phases of before and after adoption, enabling assessment of financial outcome variation with statistical precision.

The importance of this research lies in its contribution to the empirical understanding of how digital technologies, particularly Digital Twins, influence core financial performance in large-scale enterprises. This article fills a gap in the literature by providing quantitative evidence on the extent to which financial performance is related to digital transformation.

In this study, there are two theorized foundations: First-the adopting of Digital Twin technology has a positive impact on the financial performance of the case subject company. Second-the differences in financial performance, measured by operating profit and revenues, before and after the adoption of Digital Twin technology are statistically significant.

1. Literature review

Digital twins are revolutionizing the story of financial performance across industries. A digital twin is a dynamic digital replica of physical assets, systems, or processes whose operations could be monitored, simulated, and optimized in real time. Clearly, this affords great economic benefits, which, as noted by Bassey, Opoku-Boateng, Antwi et al. (2024), showed that digital twins in renewable energy projects significantly improved financial returns, enabled accurate forecasts, optimized asset management, and reduced operational costs. Similarly, Saini, Sharma, Mathur et al. (2022) reported impressive reductions in microgrid power consumption as a result of optimized power consumption from the DT-enabled commercial buildings.

For finance, Mascher (2022) stated that "digital twin" means financial "ever: approving market modeling, optimizing value chains, and authorizing sustainable disruption by data or AI". Vaghani and colleagues (2024) introduced the concept of "financial digital twins" in supply chains and noted that this will enhance forecasting, risk mitigation, and real-time financial visibility among others.

Additionally, APP-EMB also cited the use of digital twins in manufacturing and production environments. Bányai and Kovács (2023) measured the economic benefits in job-shop systems where run-time integration of "RFID based DTs" resulted in major improvements in ROI, NPV, and CAGR. In addition, Adhikari, Thakur, Malik et al. (2023) continue showing how DTs would facilitate entire production life cycles-from design to maintenance-would further propel efficiency, product quality, and competitiveness growth. This is also backed by Maheshwari, Kamble, Belhadi et al. (2023) with demonstration on performance improvement in food processing industries through the enhancement of machine availability, worker efficiency, and throughput.

In addition to production, DTs are increasingly used in strategic accounting and financial modeling. Zadorozhnyi, Desyatnyuk, Muravskyi et al. (2023) presented the integration of DTs with FinOps in management accounting to support predictive evaluation and decision-making. Likewise, Abu-Musa and Rayan (2024) showed that the adoption of DTs in Egyptian accounting practices enhances operational efficiency and competitiveness. Extending this to public infrastructure, Lynch, Issa, Anumba et al. (2023) proposed a financial DT framework that automates fund allocation and synchronizes change management across capital projects.

The supply chain domain also benefits from DTs, especially during disruptions. Badakhshan and Ball (2022) found that a supply chain DT framework can optimize inventory and cash management, significantly improving cash flow. Singh, Singh, Daultani et al. (2023) added that DTs enhance sustainability and resilience in manufacturing supply chains, with performance and resilience acting as mediators. Meanwhile, Sandén and Falk (2021) underscored the need for end-to-end data integration in supply chains to fully realize DT benefits, as seen in Northvolt's battery operations.

Operational efficiency remains a recurring theme. Korepin, Mohamed, Zhaksylyk et al. (2024) and Svadkovsky (2024) both identified a strong correlation between DT adoption and revenue growth, particularly in high-tech and extractive industries. These benefits are often achieved through predictive maintenance, reduced downtime, and resource optimization. Abbas, Hameed and Mohammed (2024) further disclosed how the trend prediction and system integration by the DT aid in reducing waste and improved customer experience as well as competitiveness. Beyond operational boundaries, digitized twins are changing the ways people work and improve employee wellness. According to Bruttini, Hagedorn, Cleve et al. (2023), semantic DT prototypes incorporate sensor data and employee feedback for better productivity and decision-making. The model based on DT has valuable insights tailored to performance in retail, as developed by Arshad, Chakhar, Hedaux et al. (2024) to improve retail operations.

Digital twins in the area of strategic planning and governance were also part of the research. According to Hiền and Hanh (2024), DT combined with ESG reporting spurs improved financial performance of firms in industries that are sensitive to CSR. In a similar manner, Williams and Fayoumi (2020) offered an applicable model to gauge how the DT technology improves enterprise agility, one of the most pertinent determinants of long-term firm success. With the changing times, this transition from DTs to Predictive Digital Twins and Digital Triplets will guide the holistic decision support involved in complex financial ecosystems, as echoed by Passas (2025).

Numerous studies have focused on evaluation methods for DTs. Oettl, Schoeler and Schilp (2022) and Eddy, Castanier, Wagner et al. (2023) designed frameworks for evaluation of DT benefits with time-saving, usefulness, and life-cycle analysis metrics, while Stavropoulos, Papacharalampopoulos, Michail et al. (2021) claimed that strong control-oriented DTs greatly improve additive manufacturing performance compared to traditional PID models.

Other researchers considered even wider digital transformation waves, of which DTs are a part. According to Ji, Miao and Wan (2022) and Zhou, Ock, Alnafrah et al. (2023), digital transformation improves financial performance, especially when combined with organizational resources and social capital. Winata and Soekarno (2024) and Kidschun, Gandhi and Hecklau (2024) emphasized how advanced digital technologies, such as simulations, cloud computing, and AI, form the foundational capabilities that enable DTs to function effectively. Additionally, Christanti (2023) illustrated how digital marketing and finance practices can enhance the performance of SMEs, even though they did not refer directly to DTs. Hu (2023), focusing on digital platforms, emphasized the role of digital innovation and data aggregation in shaping firm-level performance, principles that resonate strongly with the goals of DT integration.

In the SME context, multiple studies affirmed the positive financial outcomes of digital transformation. Yang and Ming (2024), Luu, Le, Nam et al. (2023), Ullah, Tahir, Shahzadi et al. (2023), and Cao (2024) emphasized that digital investments enhance profitability, revenue, and efficiency in Malaysian, Vietnamese, Pakistani, and Chinese SMEs, respectively. These benefits are often contingent on digital capabilities and innovation. Fabian, Broekhuizen, Nguyen (2021) added that while digital specialists do not directly affect profits, they enable SMEs to unlock value from digital strategies.

Finally, Demchenko (2023) and Papanagnou (2019) offered a comprehensive overview of DT applications across industries including energy, aerospace, healthcare, and automotive. These studies highlighted how digital twins enable real-time performance measurement, improve decision-making, and foster continuous innovation.

While the existing literature offers compelling evidence of the operational and strategic benefits of Digital Twin technology across diverse sectors, including manufacturing, energy, finance, and supply chains, most studies emphasize theoretical frameworks, sector-specific case analyses, or simulations. Few have quantitatively assessed the direct financial impact of DT adoption using real-world longitudinal data from a global enterprise. This study addresses that gap by offering a robust empirical evaluation of Huawei's financial performance over a 17-year period, clearly distinguishing between pre- and post-DT adoption phases. Unlike prior research that often focuses on process-level outcomes or short-term gains, this work uniquely integrates dummy variable regression and statistical hypothesis testing to measure DT's influence on core financial indicators, operating profit and total revenue, within a large-scale, ICT-intensive firm. As such, this study not only complements existing findings but also advances the literature by linking digital transformation to measurable economic outcomes with methodological rigor and temporal depth.

2. Methodology and tools

This study aims to evaluate the financial impact of digital twin adoption on Huawei Technologies Co., Ltd. by analyzing its financial performance before and after the implementation of digital twin technologies. According to public disclosures and company reports, Huawei began integrating digital twin systems into its operations starting in 2015. The assessment of this transition shall be rigorous and will span a longitudinal time-frame between 2008 and 2024. This timeframe is divided into two distinct periods: pre-adoption (2008-2014) and post-adoption (2015-2024).

On the basis of quantitative data derived from Huawei's audited annual and financial reports, the analysis uses two main indicators of financial performance: total revenue and operating profit. These are generally well-known indicators in corporate financial analysis and provide strong representation of health and efficiency.

In this sense, the study tends to cover both top-line and bottom-line effects that might be attributed to digital twin transformation.

To help measure the significance of the statistical association between digital twin technology adoption and financial performance, this study plans to take a different approach by carrying out dummy variable regression analysis. The basis of this analysis is a dummy variable that would include a binary variable indicating the adoption of digital twin technologies (0 for pre-adoption and 1 for post-adoption). The result of this regression model will be tested for any structural difference in financial outcomes after the specific period of digitizing twin technologies while controls will be kept to accommodate the possible confounding trends related to time.

In addition, there should be coupled with the regression in verifying also by a parametric means. The independent T Test will therefore supplement the earlier regression analysis and parametrically validate the findings. This test is appropriate for independent samples and will be directed towards checking whether there is a statistically significant difference in financial performance indicators' means before and after the digital twin implementation.

All these will be combining so that they triangulate on the findings, so that they are strong on the methodology adopted in validating the real effect of digital twin adoption in the financial performance of Huawei during the entire duration of study, which is 17 years.

3. Assessing the impact of digital twin adoption on Huawei's financial performance: Evidence from 2008 to 2024

Digital Twin technology significantly transects industries; it allows real-time simulation, monitoring, and optimization of physical systems. This study provides a model for measuring the financial effects of DT implementation by comparing pre- and postadoption performance indicators, such as revenue and operating profit, thus providing arguments for the existence of economic value brought by this digital transformation.

3.1. Digital Twin integration in Huawei: Tracing the path of technological transformation

It is imperative to ascertain the timeliness and authenticity of Huawei's digital twin investments prior to an assessment of the financial impact. This section presents evidence from Huawei's annual reports that digital twinning was strategically implemented in 2015. These findings form the empirical basis of the regression design and comparative analysis that follows.

Huawei's journey toward adopting digital twin technologies reflects a gradual and strategic evolution spanning nearly a decade. Initially grounded in foundational ICT and cloud infrastructure, the company progressively integrated advanced technologies such as artificial intelligence, IoT, and edge computing to support real-time data synchronization and virtual modeling. This transformation unfolded across distinct phases, beginning with infrastructural groundwork, moving through conceptual frameworks like "Intelligent Twins", and culminating in the explicit deployment of digital twin platforms in mission-critical sectors such as energy, manufacturing, and smart cities. The following timeline outlines the key milestones and thematic shifts that have shaped Huawei's digital twin strategy from 2015 to 2024 (Huawei, 2015-2024):

Phase 1: Foundation and infrastructure (2015-2016)

During this period, Huawei did not explicitly mention digital twins in its corporate reports. However, the company invested heavily in expanding its ICT infrastructure and cloud computing capabilities. These developments laid the foundational digital backbone necessary for future implementations of simulation-based systems. Initiatives in smart city development and network expansion were early signals of a future-oriented digital strategy.

Phase 2: Implicit integration and ecosystem building (2017-2018)

Between 2017 and 2018, Huawei's strategic emphasis shifted toward platform development, AI integration, and intelligent connectivity. Though the term "Digital Twin" remained absent, related technologies such as IoT, 5G, and cloud-based orchestration were deployed across multiple business lines. These technologies were instrumental in enabling system-level data capture and dynamic modeling, essential components of digital twin architecture.

Phase 3: Partial adoption and domain-specific pilots (2019)

In 2019, Huawei took significant steps toward partial digital twin deployment. The launch of its "1+8+N" ecosystem strategy, coupled with investments in AI--powered automotive platforms and smart manufacturing, marked a pivotal shift. While the concept of digital twins was still not explicitly articulated, the functional mechanisms, such as real-time data processing and device-to-cloud feedback loops, were already being embedded into its products and services.

Phase 4: Conceptual emergence of Intelligent Twins (2020)

The year 2020 introduced the term "Intelligent Twins" into Huawei's discourse. This concept referred to a comprehensive integration of AI, cloud, edge computing, and IoT to create virtual replicas of physical systems. Although still evolving, Intelligent Twins represented a paradigm shift toward unified digital-physical coordination, laying the conceptual and technical basis for formal digital twin frameworks.

Phase 5: Explicit reference to Digital Twins (2021)

By 2021, Huawei had formally incorporated the term "Digital Twin" in its public reports, notably referencing its role in enterprise digital transformation. The company detailed applications in smart automotive, energy management, and industrial automation, indicating a strategic commitment to synchronized digital--physical modeling. This year marked Huawei's transition from conceptual planning to implementation at scale.

Phase 6: Indirect deployment through platforms (2022)

In 2022, digital twins were deployed indirectly through Huawei's smart platforms for automotive control, factory automation, and city-scale energy optimization. Although references to the term were subtle, the use of data-driven control systems and AI orchestration confirmed operational application of digital twin principles, especially within manufacturing and intelligent mobility sectors.

Phase 7: Direct integration into business solutions (2023)

Huawei's 2023 report presented a more direct approach to digital twin adoption. Integration with AI models, particularly the Pangu series, enabled unified digital modeling, simulation, and optimization across sectors such as smart PV systems, campus management, and industrial robotics. Digital twins became central to business intelligence and resource management strategies.

Phase 8: Strategic and explicit Digital Twin ecosystems (2024)

In 2024, Huawei reached full maturity in digital twin deployment. The company explicitly identified Pangu 5.0 as a digital twin-driven platform that bridges the physical and virtual worlds. Major implementations included grid-forming energy storage systems (ESS) and real-time operational monitoring, showcasing the use of digital twins in mission-critical environments. At this stage, digital twins are no longer a feature but a strategic layer embedded across Huawei's core offerings.

3.2. Financial modeling outcomes of Digital Twin adoption

The use of a dummy variable regression model to quantify the impact of 'digital twin adoption' in a dependent variable condition, which would be Huawei's operating profit and total revenues. The statistical results of the regression are presented in this section, providing interpretations of the magnitudes changes associated with the digital shift in importance. The findings inform how digital twin technology serves as leverage for financial optimization.

The impact of Digital Twin on operating profit

Operating profit is one of the most important figures in any company's financial statements, as it measures the company's core activity excluding all the non-operating expenses and non-operating income. It is one of the most important operational efficiency-profitability indicative figures. The introduction of Digital Twin technology, along with virtualized models, all of which mirror physical systems. This will hence optimize operations, reduce downtime, and offer enhanced decision-making-due improvements are expected to affect operating profit positively as it lowers costs and raises productivity, thus making Digital Twin a strategic instrument for financial and operational improvement. The following table and figure illustrate how Digital Twin impact such a metric over the period 2008-2024, making it clear that the adoption began in 2015.

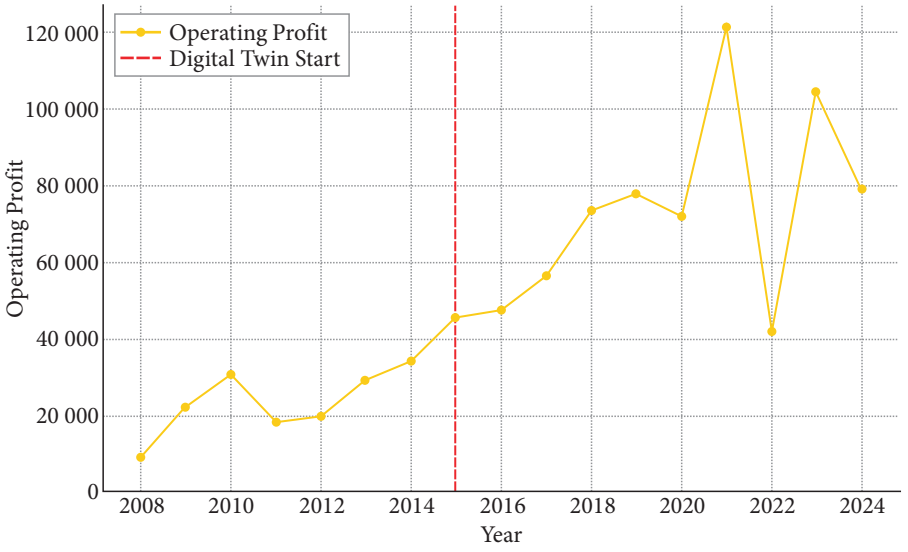

Fig. 1. Operating profit in Huawei 2008-2024

Source: generated by the authors using Python (Matplotlib), based on financial data of Huawei (2008-2024)

Table 1. Operating profit regression results

Statistical test	Result
Dummy variable regression coefficient	48,630
Regression p-value	0.00014
Regression r-squared	0.602

Source: author's calculations using Python based on Huawei's revenue data (2008-2024)

The regression analysis examining the relationship between digital twin adoption and operating profit revealed a statistically significant positive effect. Specifically, the coefficient for the digital twin variable was estimated at 48,630, with a p-value of 0.00014. This indicates that, on average, Huawei's operating profit increased by approximately 48,630 monetary units in the years following the implementation of digital twin technologies. The model's R-squared value of 0.602 suggests that over 60% of the variation in operating profit can be explained by the adoption of digital twins alone, which is substantial given the simplicity of the model.

These statistical findings are strongly supported by the visual trends presented in Figure 1. The graph displays Huawei's operating profit from 2008 to 2024, with a red dashed line clearly marking the year 2015, the point at which digital twin technologies were first introduced. Prior to this date, operating profit remained relatively modest and stable, fluctuating between 9,000 and 34,000. However, starting from 2015, a marked upward shift is observed. Operating profits rose consistently, surpassing 72,000 in multiple years and peaking at over 121,000 in 2021. This visible break in trend not only confirms the regression results but also illustrates the growing financial returns potentially driven by digital optimization strategies.

The combination of a strong regression outcome and a clear visual discontinuity suggests that the adoption of digital twin technology coincided with a significant structural improvement in operational efficiency. This is consistent with the expected benefits of digital twins, such as real-time monitoring, predictive analytics, and enhanced decision-making, which collectively contribute to improved cost control and productivity.

The impact of Digital Twin on revenues

Revenues are a fundamental indicator of a firm's market success and its ability to generate value from core operations. As companies integrate advanced technologies such as Digital Twins (DT), they aim not only to optimize internal processes but also to enhance their revenue-generating capacity through improved efficiency, product innovation, and customer responsiveness. This section examines the impact of DT adoption on Huawei's total revenues by comparing financial performance before and after 2015, the year DT systems were introduced.

Through regression analysis and visual trend exploration, the goal is to determine whether the digital transformation driven by DT technologies has translated into significant top-line growth. The following figure and table represent the main changes in revenues in Huawei over time.

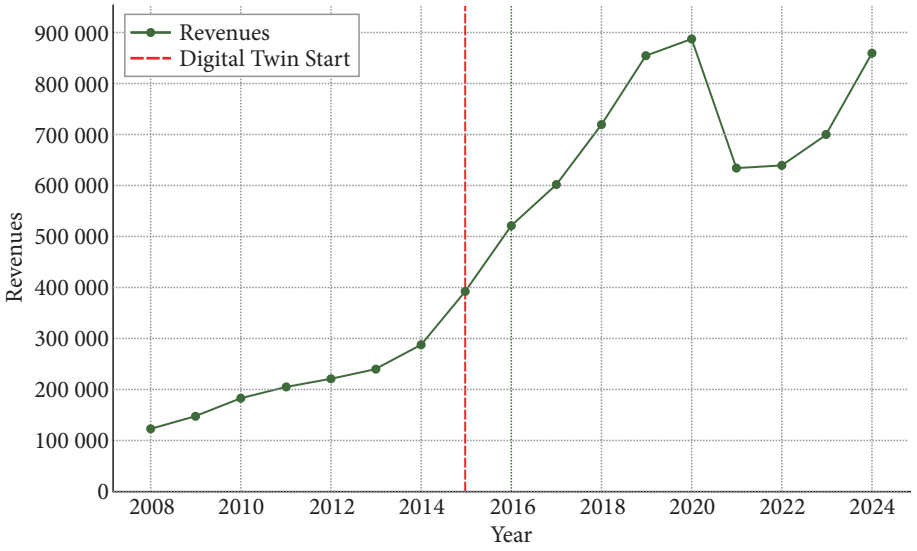

Fig. 2. Revenues progress in Huawei 2008-2024

Source: generated by the authors using Python (Matplotlib), based on financial data of Huawei (2008-2024)

Table 2. Revenues regression results

Statistical test	Result
Dummy variable regression coefficient	483,200
Regression p-value	0.0000014
Regression r-squared	0.796

Source: author's calculations using Python based on Huawei's revenue data (2008-2024)

The regression model assessing the impact of digital twin adoption on total revenues produced even more compelling results. The estimated coefficient for the digital twin dummy variable was 483,200, accompanied by a p-value well below the 0.001 threshold (0.0000014), indicating an extremely strong and statistically significant relationship. The model explained nearly 80% of the variance in total revenues ($R^2 = 0.796$), pointing to a dominant effect of digital twin implementation on revenue growth.

This quantitative evidence is visually reinforced by the trends depicted in Figure 2, which charts Huawei's revenues over the same 2008-2024 period. Again, the year 2015 is indicated by a red dashed line, marking the beginning of the digital twin phase. Before 2015, revenues grew at a moderate and relatively linear rate, increasing from 123,080 in 2008 to just under 400,000 in 2014. After 2015, the company's revenue trajectory changes drastically, with a sharp and sustained acceleration visible year over year. Revenues climbed to more than 860,000 by 2024, indicating substantial business expansion and scaling that appears to have aligned with digital twin integration.

The sharp inflection point in 2015 captured both statistically and visually confirms that the digital twin strategy was more than symbolic, it fundamentally altered the company's ability to generate value. This is likely attributable to various advantages provided by digital twin systems, including enhanced product development cycles, customer-centered innovations, and operational responsiveness, all of which are known to increase top-line financial performance.

3.3. Pre- and post-Digital Twin financial dynamics

While the regression model provides a directional estimate of impact, this section deepens the analysis through a comparative statistical test. By splitting the time frame into pre- and post-digital twin periods, we apply an independent samples t-test to assess whether the observed performance differences are statistically significant. This allows for a clearer understanding of the financial discontinuity surrounding the year 2015.

Operating profit T test results

To assess whether the adoption of Digital Twin (DT) technology has led to a meaningful shift in Huawei's operational profitability, this section applies an independent samples T-test. By comparing the average operating profit before and after the year 2015, when DT integration began, the test evaluates the statistical significance of any observed change, offering further insight into the financial impact of digital transformation. Table 3 presents the comparative results.

Table 3. Operating profit independent T test

Statistical test	Result
T-test mean (before)	23,437
T-test mean (after)	72,070
T-test p-value	0.00014

Source: author's calculations using Python (statsmodels and scipy.stats) based on Huawei's revenue data (2008-2024)

The independent T-test presented in Table 3 evaluates whether there is a statistically significant difference in operating profit before and after the adoption of Digital Twin (DT) technology. The mean operating profit prior to DT implementation (2008-2014) was 23,437, while the mean profit after adoption (2015-2024) increased markedly to 72,070. This substantial rise suggests a strong positive shift in operational efficiency and financial performance following the integration of Digital Twin systems.

The p-value obtained from the T-test is 0.00014, which is significantly below the conventional alpha level of 0.05. This result indicates that the observed difference in means is statistically significant and highly unlikely to have occurred by chance. In other words, the improvement in operating profit can be confidently attributed, at least in part, to the adoption of Digital Twin technology.

This evidence supports the hypothesis that Digital Twin implementation has a meaningful impact on a company's core operational profitability. By enabling real-time monitoring, predictive analytics, and optimization of physical processes, DT systems likely contributed to reducing operational inefficiencies, minimizing downtime, and enhancing resource allocation, all of which are directly reflected in the improved operating profit figures.

Revenues T test results

Revenues act as a principal reflection on the growth, market performance, and all-around financial health of a company. Revenue trends before and after the adoption of Digital Twin (DT) technology will provide a more discerning insight into the economic value that will be created through such digital transformation initiatives into the business. In this section is done to the independent samples T-test to evaluate whether the increases total revenues accrued sales of Huawei became significantly general or not after DT introduced in 2015. It is the complementary of previous regression results, providing a comparative statistical aspect of income dynamics of the firm in terms of the periods which lapse before and after the adoption of a new technology.

Table 4. Revenues independent T test

Statistical test	Result
T-test mean (before)	200,512
T-test mean (after)	683,700
T-test p-value	0.0000014

Source: author's calculations using Python based on Huawei's revenue data (2008-2024)

Table 4 presents the results of an independent T-test conducted to assess the impact of Digital Twin (DT) adoption on Huawei's revenue. The analysis compares two distinct periods: before DT adoption (2008-2014) and after DT adoption (2015-2024). The mean revenue prior to 2015 was 200,512, while the average revenue after the implementation of DT surged to 683,700, indicating more than a threefold increase.

The p-value associated with this difference is 0.0000014, far below the standard threshold of 0.05. This highly significant result confirms that the increase in revenue following the introduction of Digital Twin technology is not due to random variation but represents a real, measurable change.

Such a sharp and statistically significant rise in revenue supports the notion that Digital Twin systems contribute meaningfully to an organization's financial performance. The ability to virtually simulate and optimize processes likely enabled Huawei to respond more quickly to market demands, improve product quality, reduce operational delays, and drive innovation, factors that collectively enhanced revenue generation.

This finding, in tandem with the previous analysis on operating profit, provides robust empirical support for the financial benefits of digital transformation through Digital Twin technology.

Results and discussions

The empirical results of this study demonstrate that the adoption of Digital Twin (DT) technology has had a substantial and statistically significant impact on Huawei's financial performance. Both operating profit and total revenues increased markedly in the years following DT implementation in 2015, with regression and T-test analyses confirming the robustness of these trends. These results indicate a financial improvement that closely follows the predicted advantages to be achieved through the digital twin approach, such as increased operational efficiency, preventive maintenance, and data-driven decision-making.

These findings are in agreement with existing literature emphasizing the economic and strategic importance of DT technologies. For instance, improvements in forecasting and operational cost savings due to DT adoption were cited by Bassey, Opoku-Boateng, Antwi et al. (2024) and Saini, Sharma, Mathur et al. (2022) in the case of the energy and building industries. Likewise, Bányai and Kovács (2023) reported significant improvements in ROI and NPV due to RFID-based digital twins in manufacturing contexts, mirroring the pattern seen with Huawei's rising profits and revenues. Again, Korepin, Mohamed, Zhaksylyk et al. (2024) and Svadkovsky (2024) documented strong revenue growth in high-tech sectors after

the DT integration, giving more supporting evidence to the generalization of our results to digital-intensive industries.

The present study additionally provides a unique contribution to the literature by selecting a study of a global technology enterprise with a 17-year longitudinal dataset. Most of the existing research on the subject of DT deals with manufacturing, logistics, or energy systems; however, the case of Huawei demonstrates that the adoption of digital twin technology can bring about financial value even in the ICT sector. A clear financial discontinuity was observed post-2015, supporting evidence that DT involvement was more than a mere symbolic transformation-it really catalyzed the enhancement of the company's capacity to optimize operations and scale efficiently.

From a managerial standpoint, the results therefore stress the strategy for investing in digital twin technologies. Beyond their technical attractiveness, DT systems can be treated as high-return assets enhancing competitiveness, responsiveness, and ultimately profitability. For companies in rapidly changing or innovation-driven environments, digital twins could represent a way toward sustainable growth and improved financial outcomes.

Conclusions

This study was aimed at assessing the financial effects that would result from Digital Twin technology adoption by taking Huawei Technologies as a longitudinal case. Identification of that the DT adoption in 2015 was a significant statistical turning point in the financial trajectory of Huawei was made by analyzing the company's financial data over a period of 17 years (ranging from 2008 to 2024) and using adequate statistical techniques, dummy variable regression and independent T-tests. The findings show substantial increase in both operating profit and total revenues in the implementation of digital twins. Such findings confirm the hypothesis that the DT adoption would enhance some of the core financial performance.

These findings closely match a growing body of literature that is increasingly emphasizing the economic value of DT technologies in manufacturing, energy, technology logistics, and ICT. Most previous studies typically focused on operational efficiency; this study provides evidence for the assumption that, indeed using actual data from a real business entity, there are direct financial benefits. Not only did the increase in operating profit and revenues lead to statistical significance in Huawei's records, but it could also be said to follow visually tracing the measurable and sustained economic gains driven by DT transformations.

These findings have strategic importance to corporate strategy and technology policy. For the executives and decision-makers, the evidence indicates that such digital twin systems could extend beyond process optimization and serve as strategic

assets with tangible financial returns. This creates a compelling business case for DT adoption as opposed to a simple technology upgrade. On the other hand, to policymakers and development planners, the findings indicate that the proposition of incentives for implementing DT would improve firm-level productivity and competitiveness with respect to digitally intensive or innovation-driven sectors.

The study, however, is not devoid of its limitations. In the first instance, it pitches its tent on a single organization, albeit a global leader; thereby limiting the external validity of the findings. Secondly, the research limits its scope to only two financial metrics without taking into consideration qualitative factors such as customer satisfaction, innovation rate, or organizational culture which would also mediate the effectiveness in utilizing digital twins. Third, while methods were used to account for temporal variation, there are other concurrent digital transformation initiatives implemented such as cloud platforms or AI systems that may also have contributed to improvements in performance.

Because of the constraints, future research would concentrate on multi-firm, multi-industry datasets to validate and generalize findings across diverse contexts. Sector-specific drivers, barriers, and enabling conditions for successful DT would also merit attention. A further combining of financial metrics with qualitative assessments could contrive to a more complete view regarding how digital twins affect firm behavior as well as long-term competitiveness.

In conclusion, this study offers clear, data-driven support for the idea that digital twin technology is a powerful catalyst for financial improvement. Huawei's experience exemplifies how the integration of virtual-physical systems can unlock significant economic value. As digital transformation continues to evolve, understanding and measuring the financial outcomes of technologies like DT will be crucial for firms aiming to remain competitive in a rapidly shifting global economy.

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