Proceedings of the 3rd International Conference on Business and Policy Studies
DOI: 10.54254/2754-1169/106/20241670

The Impact of Digital Transformation on Enterprises

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Abstract: Digitization, a key aspect of Industry 4.0, presents a dual-faced scenario for traditional business models: it poses significant challenges but also offers opportunities for complete transformation. This dichotomy is particularly evident as numerous businesses acknowledge the imperative to digitize yet grapple with the question of where to initiate this process. Addressing this gap, the current study introduces a comprehensive methodology aimed at facilitating the onset of digital transformation in businesses. This methodology not only confronts the various challenges and complexities associated with digitization but also emphasizes a cycle of continuous development. Central to this approach is the integration of triggers for both creative and technological thinking within organizational structures. This aspect is crucial as it fosters an environment conducive to innovation and technological advancement, key drivers in the digital era. The practical applicability and effectiveness of this model have been demonstrated through its successful implementation in the German service industry. This validation not only underscores the model's relevance but also its potential as a blueprint for digital transformation in various business sectors, aligning with the evolving demands of Industry 4.0.

Keywords: Digital Transformation, Apple Inc., Operational Efficiency, Financial Performance, Technology Companies.

1. Introduction

Digitization is a recent phenomenon that has become quite popular in the service industry. radically altered consumer behavior and expectations, which indirectly compelled businesses to reinvent themselves to attract and retain consumers. Industrie 4.0, which may be the greatest movement in the world, is significantly influenced by digitization and poses a serious challenge to the viability of many organizations and existing business models. Customers today implicitly expect businesses to foresee and meet their future requirements before they become conscious of them, in addition to responding to their declared needs. In this digital era, it has been shown that this proactive client orientation is the most reliable driver for both increasing customer value and creating a competitive advantage. Therefore, emerging producers should pay greater attention to customer wants and system value generating areas. Therefore, future companies should pay greater attention to customer wants and system value generating areas [1].

DOI: 10.54254/2754-1169/106/20241670

2. Literature Review

For a very long time, scholars from many disciplines have been very interested in change in organizations and technology-induced corporate transformation [2]. Our knowledge of change mechanisms is supported by a wide range of theories, including Detailed Stability and Constant Development [3]. The changes brought about by the concurrent and fluid impacts of digitization on consumers, companies, and industries, however, represent a new sort of transition that presents new problems, according to the current discussion on digital transformation. Developments in a field or the company itself can both be referred to as "digital transformations." Only organizational changes will be discussed for the duration of this essay. According to the term "digital transformation" includes the processes of digitizing with an emphasis on efficiency and technological advances with an emphasis on augmenting current physical goods with digital capabilities. In recent decades, the escalating use of digital technologies has acted as a major catalyst for shifts in organizations [4]. This has allowed organizations to take advantage of novel use cases, integrate digital technologies into business processes, and perhaps even enable significant business enhancements. The expression "transforming" refers to an essential change inside the organization that significantly affects its strategy, structures, and power dynamics [5]. Therefore, it necessitates realignment and the beginning of a change process for both internal company structures and business models, which is unquestionably a difficult organizational process of learning [6]. Because digital evolution is an alteration handle that is actively planned and carried out [7], it is crucial to comprehend its mechanisms and create an agreement on them within the organization.

A framework for maturity includes maturity stages that show the development route toward maturity as well as dimensions and criteria that identify the areas of activity. According to maturity models are a tool that primarily allow for the evaluation of the current situation and show the prospective, predicted, or usual development route to the desired goal phase [8]. Two approaches to the usage of maturity models. Maturity models' narrative abilities expose the design-required characteristics, and their normative powers allow businesses to specify the strategies or competencies required to achieve the target maturity level. The growing interest in maturity models is being shown in studies on IS [9]. Since development routes in digitizing are not linear and it is unclear whether a business that is at its greatest stage of maturity actually outperforms its rivals, the area of digital evolution is too broad to allow for the application of a model of maturity in its restrictive capabilities. It could be difficult to make the transition to platform-based, digital business models since there are a number of difficulties that are sometimes unfamiliar to the organizations. Through a qualitative single case study, this study seeks to comprehend the procedure of digital transformation in a setting of a traditional industry. The organization assisting the digital shift is likely to confront obstacles and the digital strategy that may be used to develop and profit from digital transformation is given particular attention.

The empirical data from this study suggests that the existing literature on digital strategy may place an undue emphasis on the informativeness of digital initiatives while ignoring the value of digitizing traditional business processes to lay the groundwork for future digital innovation. Additionally, whereas the most significant and challenging difficulties in the scientific case considered the stifling societal environment of the company, the existing literature places a strong emphasis on internal change challenges. The emergence of digital technology has altered how consumers get information, assess value claims, and make purchasing decisions. Customers in the age of technology are often knowledgeable, self-assured, connected, and hooked to convenience [10]. Our interviews revealed that many established firms do not adhere to a rigid customer-first policy, even though technological innovators and start-ups do. Our participants further revealed that getting in touch with consumers has been much harder due to digitization, which has a significant impact on access to clients.

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Management of customer experiences is crucial in the age of digitization for any company looking to build and maintain connections with customers. Contrary to sales process automation, customer experience management is focused on individual experiences rather than efficiency and straight-through preparation. The term "customer experience" describes how consumers feel about their encounters, both direct and indirect, with businesses. Customers interact with businesses on several levels (i.e., mental, emotional, sensory, physical, or spiritual) since this encounter is unique and dynamic. A better knowledge of how digital innovations, which may seamlessly integrate into consumers' lives, impact their experience at every possible touch point would be advantageous for organizations that participate in digital transformation. A consistent end-to-end client experience is made possible by each contact point and communication [11].

By gathering consumer data during client interactions across digital contact points, or whenever clients utilize smart devices and services, digital technologies can give businesses new possibilities to get insights into their customers. Organizations may get views into the attitudes, moods, drives, ambitions, and goals of their consumers thanks to the amount and diversity of information about customers. These insights provide the basis for precisely forecasting consumer behavior, creating individualized products and services, and improving customer happiness and loyalty. The major issue in obtaining consumer insights, according to our interview participants, is not gathering the data but rather combining it from numerous sources. Customers' interactions with businesses through digital and conventional channels are so intertwined in the digital economy that many businesses choose not to divide up their clientele based on how they use different channels. As indicated by our respondents, customers utilize digital platforms for all their interactions with businesses, including sales and customer support. This phenomenon compels businesses to use multiple channels of leadership in order to communicate with consumers more strategically and to cater to their unique needs. Many well-established businesses find it difficult to control the growing number of outlets and contact points. Our interviews specifically brought to light the difficulty of maintaining an identical client experience across every platform and touch point while avoiding cannibalizing effects and leveraging synergy benefits across digital and conventional channels. Low entry barriers cause existing competitive advantages to diminish when new rivals enter markets, which accelerates the deregulation of businesses that do not contribute value from a consumer standpoint. Some interviewees acknowledged investing in digital value claims in order to keep customers instead of exploring new revenue streams. Most of the people we spoke with said that in the age of digital commerce, the most difficult rivals are digital leaders rather than those who are in the same business. From this vantage point, enterprises must pick up speed in order to match the scientific competence and capacity for constant innovation of digital leaders and start-ups. Liabilities are converted into assets, and participation in electronic economies. While thing-centric offerings are closely related to tangible goods, complementary services make use of tangible goods as value carriers, and services provided by the ecosystem aid in integrating tangible goods into larger goods and services systems. According to Porter and Heppelmann [12], the basis of competitiveness in the digital economy evolves from single items to smart items and services, items and services, systems, and systems of systems. Although this change draws rivals from other sectors, it gives established businesses access to fresh revenue sources. Organizations may discover the behavioral patterns of their clients, increase the availability of manufacturing facilities, enable evidence-based business choices, and decrease the latency of innovation by utilizing data via advanced analytics. Considering this, techniques like deep learning, visual, forecasting, and prescriptive analysis, as well as artificial intelligence, are becoming increasingly important. As a result, businesses would be advised to protect their consumer touch points in order to collect pertinent data and to thoroughly examine every aspect of structure in order to identify any areas where data may be a source of advantage over rivals.

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3. Methodology

This paper takes Apple as an example to explore the impact of Digital transformation on business performance. By comparing the company's performance before and after digital transformation, this article aims to gain a deeper understanding of the advantages and challenges of embracing digital technology. These research findings can provide guidance for other organizations that hope to adapt to the digital age.

Apple's Digital transformation can be traced back to 2007. Since the first iPhone series came out, Apple has been using the digital strategy until today. During the Digital transformation, Apple also launched iPad tablet computers, iPod music players, iTunes, App Store, etc. Apple is also continuously increasing its investment in digital marketing.

To study the impact of Digital Transformation on Apple's business performance. By comparing the company's performance before and after the Digital transformation, we can identify the specific ways and areas of impact. Usually, we can determine the impact of a certain strategy on a company by observing its financial statements. Therefore, the research approach of this study will be dominated by quantitative research.

For enterprises, Digital transformation may be the improvement of product technology level or the improvement of operational efficiency, usually accompanied by the increase of research and development costs. The business performance of a company can usually be measured by indicators such as sales revenue, sales costs, operating expenses, and operating income [13].

If we need to intuitively feel the changes of an enterprise before and after Digital transformation, the enterprise's research and development costs will generally increase significantly after the strategy. Research and development costs are part of operating expenses. If the technological content of the product changes, then Apple's annual sales should also undergo significant changes, and operating income will also change.

Therefore, if we consider the impact of this policy on Apple's business ability before and after the Digital transformation. So what should be tried is to treat the statements of operations in Apple's corporate annual report as panel data. It is known that Digital transformation took place in 2007, so take 2007 as the dividing point. The panel data in 2007 and before 2007 is a data set, and the panel data after 2007 is another data set. Observe descriptive statistics on two datasets, net sales, cost of sales, research and development cost, and operating revenue, and compare their quantitative changes.

In addition, the correlation coefficient between the above variables and operating revenue should be observed, mainly through correlation testing, to reflect the degree of influence of research and development cost on operating revenue and to confirm the significance and correlation strength of the impact of research and development cost on operating revenue. The Pearson correlation coefficient formula is as follows:

If the correlation coefficient r between R&D costs and operating revenue is larger, it indicates that the Digital transformation has a positive impact on Apple's operating capacity.

The main research tools used in this study were Excel and SPSS version 26. the main mathematical and statistical methods used were descriptive statistics, correlation analysis, reliability analysis, and linear regression analysis.

4. Data Collection

The data is sourced from Apple's financial statements disclosed from 1992 to 2022. The main financial data that is being studied comes from CONSOLIDATED SYSTEMS OF OPERATIONS, and the research subjects include Net sales, cost of sales, operating expenses, research and development cost, and operating income.

DOI: 10.54254/2754-1169/106/20241670

5. Data Analysis

5.1. Descriptive

Based on the descriptive statistics, we can observe, as a whole, some data of Apple's consolidated operating statement from 1992 to 2022. This includes "Sales" means net sales, "COS" means costs of sales, "R&D" means expense of research and development, "SGA" means expense of sales, general and administrative and "OI " (US dollars in million). Table 1 shows the consolidated operating statements that Apple has disclosed, from 1992 to 2022, and these panel data can help us to compare with the subsequent descriptive statistics. This helps us to understand and infer the changes in Apple's overall operational performance before and after the digital reform.

Table 1: Descriptive Statistics from 1992-2022

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Sales	31	388586	5742	394328	101994.29	121437.611
COS	31	219555	3991	223546	61845.06	71861.057
R&D	31	25948	303	26251	5034.26	7274.482
SGA	31	24186	908	25094	7224.29	7451.505
OI	31	120820	-1383	119437	27856.58	35569.788
Valid N (listwise)	31					

Source: Annual Report of Apple

Table 2 and Table 3 show the changes in descriptive statistics of Apple's corporate performance before and after the digital transformation, respectively. In the methodology we believe that Apple's digital transformation started in 2007, the exact date would be November 2007, and the landmark event was the official launch of iPhone 1. Apple was probably one of the first companies to undergo digital transformation, and it is likely to be a model of successful digital transformation. Therefore, it is predictable that Apple's business performance after the digital transformation should be better than before the digital transformation.

The table of descriptive statistics shows the observed changes in corporate performance over two time periods, before the digital transformation, i.e., 1992-2007, and after the digital transformation, 2008-present. Since Apple's financial results are usually disclosed in September each year, the corporate performance in 2007 can be categorized as before the digital transformation. What can be seen by direct comparison is that the growth in overall corporate operational performance after digital transformation is very significant. In each of the metrics, 'sales', 'COS', 'R&D', 'SGA' and 'OI', the minimum value after digital transformation exceeds the maximum value before digital transformation, which means Apple's sales, cost of goods sold, R&D cost, selling expense, overhead, general expense and operating income have all improved to a great extent after digital transformation. This means that Apple's digital transformation might be successful overall.

Table 2: Descriptive Statistics from 1992-2007

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Sales	16	18836	5742	24578	9920.19	5235.264
COS	16	12435	3991	16426	7025.06	3643.078
R&D	16	479	303	782	524.69	136.190
SGA	16	2055	908	2963	1521.69	538.080
OI	16	5790	-1383	4407	782.69	1429.441
Valid N (listwise)	16					

Source: Annual Report of Apple

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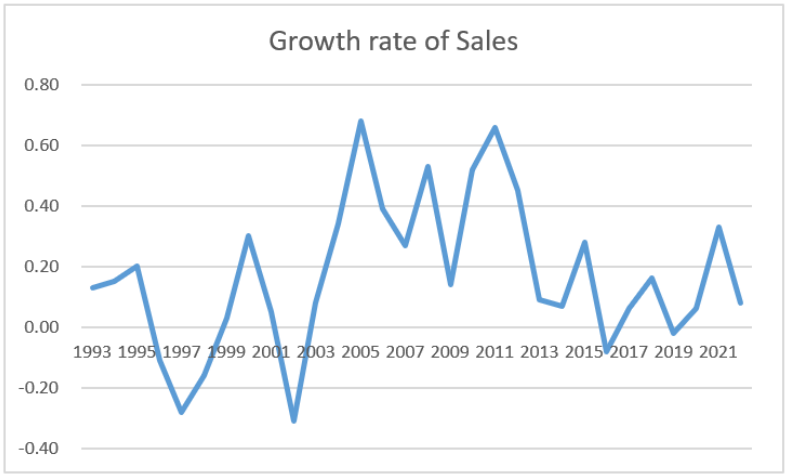
Table 3: Descriptive Statistics from 2008-2022

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Sales	15	356837	37491	394328	200206.67	107462.408
COS	15	199252	24294	223546	120319.73	62876.433
RD	15	25142	1109	26251	9844.47	8083.551
SGA	15	21333	3761	25094	13307.07	6470.191
OI	15	111110	8327	119437	56735.40	31268.332
Valid N (listwise)	15					

Source: Annual Report of Apple

However, overall descriptive statistics make it difficult to accurately identify detailed challenges, such as specific annual growth rates for each metric, as well as the specific impact of digital transformation on the business and the correlation between each data set.

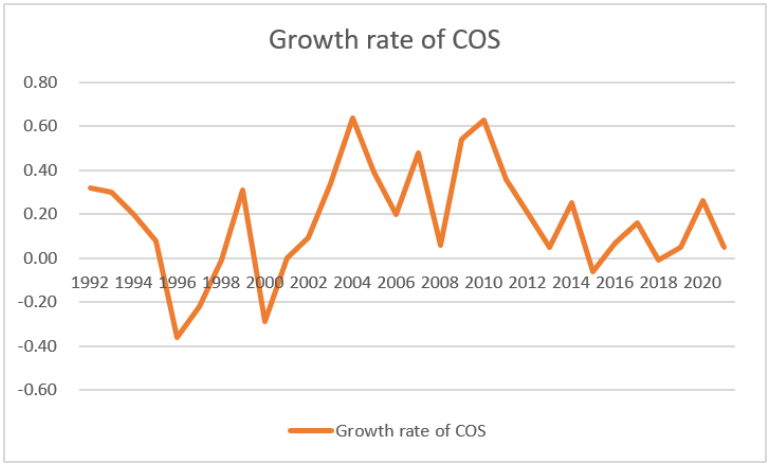
Figure 1 shows the growth rate of Apple's enterprise sales from 1992 to 2022, a value that is not exactly smooth. What we can observe, however, is that prior to the digital transformation, Apple appears to have gone through a phase of growth that was not smooth. After the digital transformation, Apple maintained a positive growth in total sales in general from 2008 onward, and the growth rate was very high from 2008 to 2012. Thus, the impact of digital transformation on the growth rate of corporate sales is generally positive.



Source: Annual Report of Apple
Figure 1: The growth rate of Sales

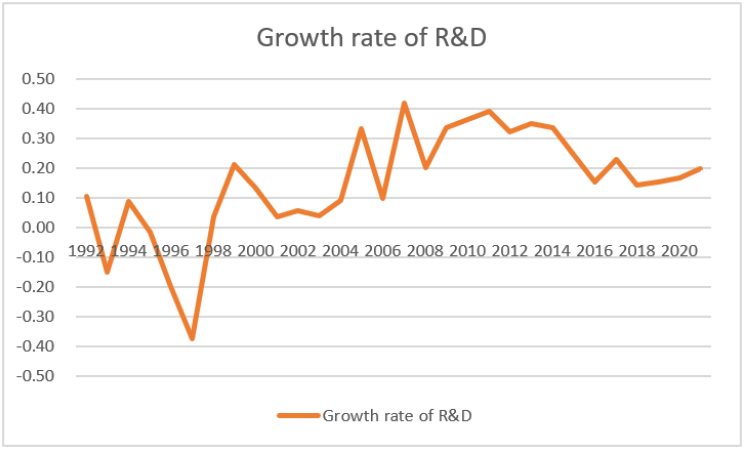
Figure 2 shows the change in the growth rate of the cost of goods sold from 1992 to 2022. Normally, the growth rate of sales and cost of goods sold by a company are convergent overall. Because both the sales and the cost of goods sold by a firm will increase due to the increase in sales volume. Considering that a company's main business will have multiple product lines, the different percentages of each product may lead to the overall sales and cost of goods sold growth rates are not exactly the same. However, in a general profit model, the growth trend of sales and cost of good sold of a company is generally convergent.

DOI: 10.54254/2754-1169/106/20241670



Source: Annual Report of Apple
Figure 2: The growth rate of Cost of Good Sold

The R&D cost of a company should be observed in this model because digital transformation usually means that companies will invest more in R&D than in the past. For Apple, whose products are likely to be leading in the smart device industry, mobile device industry, and electronic device industry, and therefore its products should also usually have a high level of technology, the change in R&D cost investment should be reflected in the sales revenue. Figure 3 shows that Apple's corporate R&D spending has been higher each year than the previous year, with a more pronounced increase around 2007, and that the significant increase in 2006 was probably in preparation for the launch of iPhone 1 in 2007. After the digital transformation in 2007, Apple's R&D spending has been growing at an annual rate of more than 15%. This may mean that digital transformation and digital development are long-term strategies for Apple and that the strategy will be a key position for Apple.



Source: Annual Report of Apple
Figure 3: Growth rate of Research and Development Expense

The growth rate of Apple's sales and general and administrative expenses is also in an overall increasing trend. When the overall sales revenue of a company increases, it also means that the sales volume of the company is increasing, and then the selling and administrative expenses in this process are also increasing. In fact, a comparison of Figures 4, 1, and 2 shows that Apple's sales, cost of goods sold, sales, and general and administrative expense growth rates are generally converging over that time sample. Moreover, the digital transformation of a company is usually reflected not only in the company's products but also in the management of the company, which could be digitalized as well.

DOI: 10.54254/2754-1169/106/20241670

This process may lead to higher costs, but the performance of the business, sales, and operating income will also be better.

Source: Annual Report of Apple

Figure 4: Growth rate of Sales, General and Administrative Expenses

The operating income of a business is equal to the sales of the business minus the cost of goods sold and operating expenses. Operating expenses are equal to the sum of R&D expenses, sales, general and administrative expenses. Therefore, the operating income of a company can give a more intuitive picture of its performance over a period of time. The study divides the growth rate of Apple's operating income into pre-digital transformation and post-digital transformation. Because of the pre-digital transformation, Apple's operational performance as a whole was not excellent. In fact, Apple's operating income was at a very low level before the digital transformation compared to after the digital transformation, and in some years, the growth rate of operating revenue was very high, perhaps more than ten times that of the previous year. This dramatic change can be seen in Figure 5. If the changes in operating income before and after the digital transformation are put in the same graph, the changes in operating income after the digital transformation will not be clearly shown. It also shows the changes in Apple's operating income after the digital transformation, especially before 2012. Apple's corporate performance is excellent, with an overall operating revenue growth rate of over 40%. From the perspective of changes in operating income, after the digital transformation in 2008, Apple's operating income has generally maintained a clear growth trend. After 2008, Apple's operating income was much higher than before 2008.

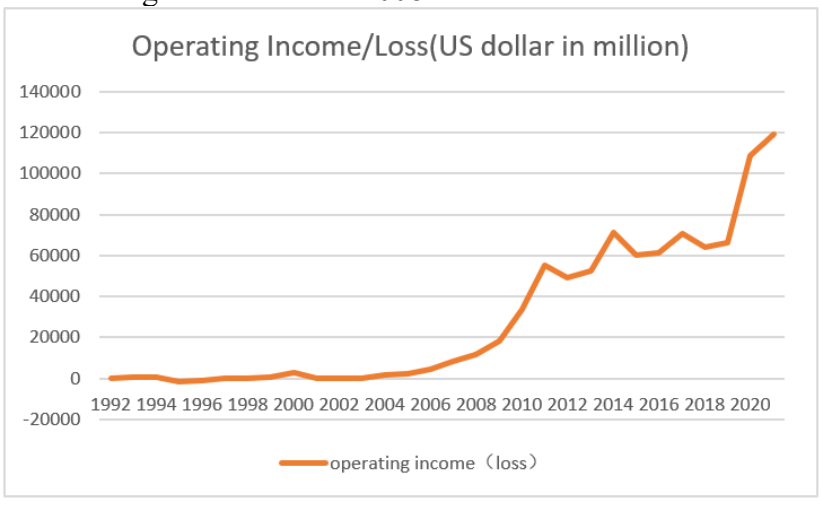


Figure 5: Growth rate of Operating Income in 1992-2022

DOI: 10.54254/2754-1169/106/20241670

In the descriptive statistics, we have been able to observe the overall impact on Apple's performance before and after the digital transformation at a relatively superficial level. In terms of results, after the digital transformation, Apple's sales growth rate and operating income growth rate have been generally in a positive state since 2008, which means that the digital transformation has been beneficial for Apple's performance. However, we still need to exclude some adverse effects. For example, the impact of the country's development on the company may not need to be taken into account, as Apple's sales and revenue growth rates are so high that they are already greater than the annual growth rate of the U.S. GDP. It also needs to be confirmed whether the R&D costs in the operating statement reflect specific changes in Apple before and after the digital transformation and whether the impact of this financial indicator on operating income and sales revenue is significant.

5.2. Reliability Analysis

The reliability analysis was based on Cronbach's Alpha for the observations of the sample, and the Cronbach's Alpha value in this sample was 0.799, which is greater than 0.7, which means that the data in this sample has excellent consistency (Table 4).

Table 4: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.799	0.995	6

Source: Annual Report of Apple

5.3. Person Coefficient

Table 5: Reliability Statistics

		Year	sales	COS	R&D	SGA	OI
Year	Pearson Correlation	1	.959**	.964**	.894**	.970**	.937**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	23	23	23	23	23	23
sales	Pearson Correlation	.959**	1	.999**	.950**	.996**	.991**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	23	23	23	23	23	23
COS	Pearson Correlation	.964**	.999**	1	.947**	.996**	.984**
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	23	23	23	23	23	23
R&D	Pearson Correlation	.894**	.950**	.947**	1	.959**	.923**
	Sig. (2-tailed)	.000	.000	.000		.000	.000
	N	23	23	23	23	23	23
SGA	Pearson Correlation	.970**	.996**	.996**	.959**	1	.978**
	Sig. (2-tailed)	.000	.000	.000	.000		.000

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Table 5: (continued).

	N	23	23	23	23	23	23
OI	Pearson Correlation	.937**	.991**	.984**	.923**	.978**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	23	23	23	23	23	23
**. Correlation is significant at the 0.01 level (2-tailed).							

Source: Annual Report of Apple

From Table 5 of Person correlation coefficients, the strength of the correlation between each variable has been shown. What we can find is that these data, including 'Year', 'Sales', 'Cost of goods sold', 'Research and Development expense', 'Sales, general and administrative expense' and 'Research and Development expense', 'Sales, general and administrative expense' and When these data are combined two by two, they all have a Person coefficient greater than 0.9, which means that these data are strongly correlated with each other and the correlation is significant at the 0.01 level. Each of the operating metrics is growing, and they are very strongly correlated with each other, and the growth trends of these metrics are similar. This means that Apple's sales are increasing when the indicator of interest, research and development expense, is increasing, which means that the company's R&D investment is paying off and Apple's digital transformation is a positive strategy and behavior.

5.4. Regression Model

Tables 5 and 6 show the summary and coefficient of a linear regression model. The model approach is based on the least squares. Income is the dependent variable and 'SGA', 'R&D ', 'COS', 'Sales' and 'Year' are the independent variables. What can be observed is that the significance of this model is very strong, and what can be known from the R-value of the model is that the correlation between the independent variables and the dependent variable within the model is very strong, and what can be known from the R-square value is that the independent variables in the model can explain all the dependent variables in the model.

Table 6: Model Summary of Multiple Regression Model of Operating Income

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	1.000a	1	1	140.148
a Predictors: (Constant), Year, RD, COS, SGA, Sales				

Source: Annual Report of Apple

However, what can be confirmed by the coefficients of the multiple linear regression is that all the independent variables, except Sales, have a negative impact on operating income. The variables 'SGA', 'R&D', 'COS' because of their own attributes, they have a negative impact on operating income because the higher the cost, the lower the revenue. Yet time also has a negative effect on operating income. It can then be speculated that the positive impact of SALES on operating income may be greater than the positive impact of other variables on operating income, which causes the positive impact of other variables on operating income to become insignificant.

DOI: 10.54254/2754-1169/106/20241670

Table 7: Coefficients of multiple regression model of Operating Income

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-21690.645	14836.645		-1.462	0.156
	Sales	1.001	0.005	3.419	215.873	0
	COS	-1.002	0.009	-2.024	-113.423	0
	R&D	-0.999	0.015	-0.204	-64.649	0
	SGA	-1.013	0.056	-0.212	-18.013	0
	Year	10.824	7.432	0.003	1.456	0.158
a Dependent Variable: OI						

Source: Annual Report of Apple

6. Conclusion

The purpose of this report is to discuss the effect of digital transformation on corporate performance by analyzing data from Apple's Corporate Operations Report from 2001 to 2022 using a quantitative research methodology. In the model, R&D expenditures are used as a proxy for the degree of digital transformation, while operating income is used as a proxy for corporate performance. The impact of R&D costs on Apple's operating income was found to be positive and positive. Therefore, the impact of digital transformation on corporate performance is also positive in Apple [14].

Apple's success may be attributable to a number of factors, but it is still uncertain whether the company is a solid industry example. These may be external variables, such as market share. The study only analyzed a small sample of Apple, whose corporate strategy and operational behavior are not completely representative of the industry as a whole; therefore, the impact of digital transformation on the business performance of companies, in general, must be investigated using a larger sample.

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