

The Impact of Digital Transformation on Performance of Pharmaceutical Enterprise

- Take Yunnan Baiyao as an Example

Jiayi Qin^{1,a,*}

¹*School of Management, University College London, London, WCE 6BT, United Kingdom*

a. zcejqi@ucl.ac.uk

**corresponding author*

Abstract: With the rapid development of digital technology, traditional innovation management theories and practices are facing great changes. Digital technologies have not only changed the way innovation is done, but also reshaped the environment in which companies operate. Digital transformation is considered by many organizations as the fastest way to change their own predicament. However, up to now, the vast majority of successful transformation of enterprises are financial or manufacturing-related, pharmaceuticals, as a closely related to human life industry, its digital transformation process has been stagnant. Therefore, this paper chooses Yunnan Baiyao, one of the earliest successful companies in this field, as a case study, and summarizes the company's transformation path and its impact on its performance, providing reference value for those companies which fail to do so. After qualitative research and calculation, this paper prove that digital transformation has a positive impact on its performance growth. Especially stepping into the stage of intelligence and digital intelligence, thanks to reasonable control of costs and accurate digital strategy development, the company revenue and overall operational efficiency has been greatly improved.

Keywords: Digital transformation, Pharmaceutical industry, Enterprise's value.

1. Introduction

With the rise of big data, cloud computing, artificial intelligence and other new industries, the human economy and society into "digital" as the core of the era. Digital, networked, intelligent development gradually penetrates people's lives in all areas, forcing traditional enterprises to carry out comprehensive change and transformation. The pharmaceutical industry, as a vital industry that can directly affect the national economy and social stability, and its future development is crucial. According to China's National Bureau of Statistics, the year 2016-2022 witnessed a surge in the number of hospitals, increasing from 29,140 to 35,394, realizing a 20.14 percent increase. However, expansion cannot meet the growing population and diversified needs, and healthcare in China continues to bear a non-negligible burden at this stage. Therefore, the development of digitalization could be an opportunity [1]. Today the most digital transformation research is focused on the financial sector, with limited exploration in the pharmaceutical industry. Meanwhile, digital transformation is

still at an early stage in China, and past scholars have tended to study its influencing factors rather than post-transformation results. This paper will fill this gap by focusing on transformation path and its enterprise's performance, exploring the intrinsic connection between them. Yunnan Baiyao, as one of the first digital innovation and transformation companies in China, has remarkable results with industry representation and data openness, thus analysis of which can provide new ideas for pharmaceutical enterprises with poor performance.

2. Case study

2.1. Development of pharmaceutical industry

The pharmaceutical industry has always been a national strategic emerging industry. In recent years, with the national policy support, technological progress and national health awareness, the industry has been rapidly developed. Zhang et al. pointed out that China's precision medicine market industry development potential is huge [2]. However, Ling has claimed that although the country strongly supports digital transformation, the digital level of the pharmaceutical industry is still low compared with other manufacturing industries due to its particularity [3]. Figure 1 illustrates this, with 70% of pharmaceutical companies still stuck in industry 2.0. There is still a certain gap between the manufacturing and R&D process of enterprises and the comprehensive automation and informatization.

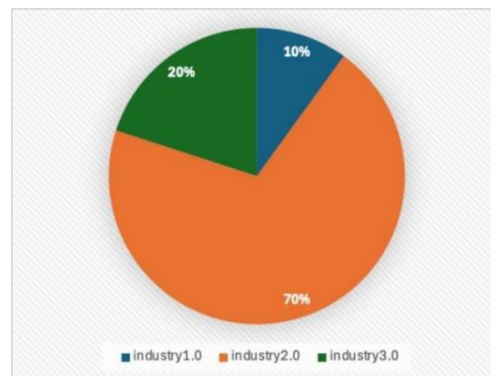


Figure 1: industrial stage distribution [4]

2.2. Background information of Yunnan Baiyao

Created in 1902, Yunnan Baiyao is recognized in the industry as the most innovative representative of China's long-established brands. The company is committed to promoting the integration of traditional Chinese medicine into modern life and responding to modern needs with product innovation. Taking the company's traditional Yunnan Baiyao bulk medicine as a starting point, in addition to innovating and launching a variety of product forms covering aerosols, plasters and stickers, tinctures, and band-aids, the company has also combined with oral care products to successfully build an oral care community based on Yunnan Baiyao toothpaste. Up to now, the company's business has expanded to natural medicines, Chinese herbal medicines, specialty medicines, medical devices, health daily products, health food and other fields, successfully completing the transformation of the traditional medicine manufacturing enterprise into a modernized big health enterprise.

2.3. Yunnan Baiyao digital transformation stage

Yunnan Baiyao, one of China's early adopters of digital transformation, approached the process gradually rather than all at once. The transformation occurred in three phases, as outlined in company reports and interviews [5-6]. The first phase involved online informatization, where offline activities and management were moved online, enabling seamless integration of production, quality, energy, equipment, and warehousing. The second phase focused on intelligent, automating, and making the production process intelligent, leveraging technologies like the Internet, cloud computing, and big data to better manage production cycles and supply chain coordination in a competitive market. The third phase is about digital intelligence, which aims to meet consumer needs for personalization, using new technologies to shift from mass production to customized solutions. Examples of these transformations are shown in Table 1.

Table 1: Three stage of transformation[7]

The First stage: Informationization stage(before 2019)
Start to run CRM (Customer Relationship Management) began to try O2O model in terms of marketing launched a financial sharing center
The Second stage: Intelligent stage (2019-2020)
Smart Factory project entered the commissioning stage launched the 'digital panax notoginseng platform'
The Third stage: digital intelligence stage (2021-present)
'digital panax notoginseng platform 2.0' Online accounting RPA robot First digital employee "Bai xiaoqi" Obtain Internet online license AI used in R&D development Run the digital Intelligence Center

In 2022, Yunnan Baiyao announced that it will center its development around a '1+4+1' strategy: the last '1' in the strategy refers to digital technology. In the future, cutting-edge digital technologies, including AI, will become the company's main theme, being invested in all aspects of research and development (R&D) and operations, with the aim of elevating Yunnan Baiyao's product innovation and business operation capabilities to a whole new level.

3. Qualitative research

3.1. Design of questionnaire

To better assess the degree of digital transformation at Yunnan Baiyao and identify its influencing factors, this paper adopts a qualitative research approach through a questionnaire survey. The respondents are employees from various departments within Yunnan Baiyao, with a total sample size of 50. To ensure consistency in understanding, the questionnaire begins with a brief introduction to the concept of digital transformation. The purpose of the survey is to evaluate the extent of digital technology adoption, employees' acceptance of the transformation, and the impact on corporate performance. The questionnaire is designed based on the PEST framework, referencing the analysis methods from Zhang & Ma and explores the influencing factors of digital transformation from political, economic, social, and technological dimensions [8]. PEST analysis was developed by Aguilar in 1967 as a tool for environmental scanning and is significant in analysing the macro factors

influencing the progress of digital transformation [9-10]. All responses will be kept strictly confidential and used solely for internal analysis, with no commercial purposes involved.

3.2. Analysis of questionnaire

The first four questions (figure 2) of the questionnaire mainly involve basic information about the employees. The majority of employees hold a bachelor's degree or higher, with representation across various departments, reflecting the enterprise's requirement for educational qualifications (Figure 2). Moreover, 40% of the employees have been with the company for 4-6 years, followed by those with 1-3 years and over 10 years of experience, accounting for 22% and 14% respectively. Most employees have participated in or been exposed to the company's digital transformation initiatives, indicating that the company has made considerable progress in its digital transformation efforts. In addition, in the question of which areas of the company have already undergone or are currently undergoing digital transformation, the response rates for "digitalization of manufacturing", "supply chain management", and "office automation" were 72%, 74%, and 72% respectively. Thus, the supply chain and manufacturing correspond closely to two key projects: the "Digital Panax Notoginseng Platform" and the "Yunnan Baiyao Toothpaste Intelligent Factory" [11]. The Digital Panax Notoginseng Platform has established a complete traceable industrial digital information chain, enabling online visualized digital monitoring and management across all links, from planting, production, storage, and to testing. The toothpaste intelligent factory The Intelligent Toothpaste Factory is a model of Industry 4.0 with over 90% automated production, marking the successful shift from the "intelligent" to the "digital" stage of manufacturing at Yunnan Baiyao.

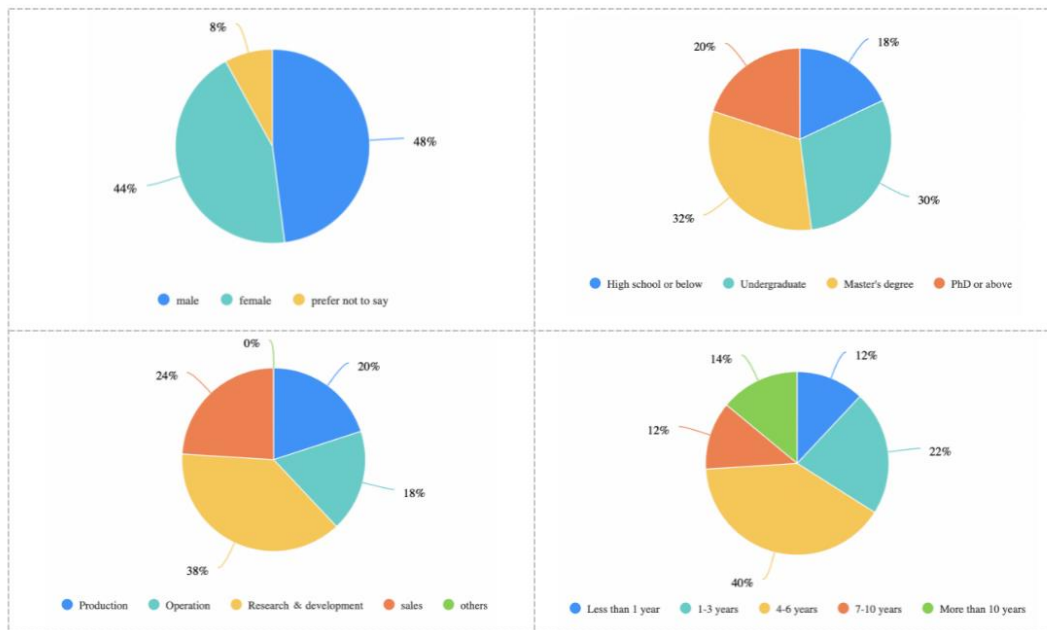


Figure 2: the result of first four questions in survey

In terms of office automation, the introduction of RPA, the ONE-BY platform and the launch of the digital employee initiative reflect the transformation to the "digital" stage. Additionally, some respondents mentioned the company's development of the "YunBai AI-X system", an AI and gene fingerprint-based drug efficacy prediction tool. This indicates that digital transformation is also extending to the company's R&D efforts [12].

Macro-environmental factors have had a relatively positive impact on the company's digital transformation. Over 60% of respondents believe that digital transformation has significantly reduced

operational costs, improved production and management efficiency, while changing the way the company interacts with shareholders. The “DianYiBao platform” launched in 2019 uses “internet + IoT” technology to connect patients, pharmacies, hospitals, and suppliers, enhancing supply chain efficiency and hospital procurement. Noticeably, while 64% of respondents feel that the digital tools and systems currently in use are nearing maturity, high costs and unstable performance remain key challenges during the transformation process. In terms of progress, employees expressed support and a positive attitude towards new technologies. Around 40% of respondents believe the company is making significant strides in scaling its digital transformation, while 54% think that key projects have already been partially completed.

4. Performance calculation

Qualitative research proves the positive relationship between digital transformation and performance, this paper will use economic value added to predict the overall value of the firm to further develop it. The EVA metric is used to evaluate the value creation of a company over a certain period, the net operating profit after tax minus the total cost of capital, and measures the economic value added by the company each year. In the process of calculating the EVA indicator, adjustments are needed for WACC, NOPLAT and the total capital invested. Currently, SASAC provides guidelines for these adjustments from an institutional perspective. This paper adjusts the relevant accounts based on the specific characteristics of the industry and Yunnan Baiyao’s operations to achieve a more accurate assessment of corporate performance [13].

4.1. Calculation of net operating profit after tax (NOPLAT)

In order to reflect the operating efficiency, it is first necessary to calculate net operating profit after tax (NOPLAT), the specific formula is as follows:

Net operating profit after tax (NOPAT) = (Total profit + Finance costs + non-operating expenses - non-operating income+ Impairment loss on assets) * (1 - Income tax rate) + Deferred income tax liabilities - Deferred income tax assets

The calculation process of NOPAT from 2016 to 2022 shows in Table 2

Table 2: The calculation process of NOPAT from 2016 to 2022 (Unit: million) [14]

	2016	2017	2018	2019	2020	2021	2022
Gross profit	3,397.5	3,621.8	3826.2	6,801.1	6,801.1	3481.6	3,377.1
Financial expense	89.7	72.5	163.3	-62.8	-231.9	-258.3	-342.9
Asset impairment loss	-0.8	64.8	58.1	-200.9	-125.5	-143.2	-664.3
Deferred income tax burden Debt increase	0.57	0.57	8.77	133.67	299.95	22.32	98.08
Deferred income tax funds Output increment	197.62	227.36	244.56	422.35	532.66	471.88	713.25
Non-operating income	89.26	7.04	7.43	12.32	8.42	10.15	13.59
Non-operating outcome	11.58	5.92	13.26	29.11	19.29	13.67	7.87
Net operating profit after	2,700.3	2,967.6	3,209.6	3,518.6	5,253.7	2,171.6	1394.3

4.2. Total capital

When calculating the total capital of Yunnan Baiyao, it is also necessary to make adjustments such as the increase in deferred income tax and the impairment loss of assets at the end of the year in order to obtain a more scientific result. The specific formula for this calculation is as follows.

Total Capital (TC)

= Owners' Equity + Short-term Borrowings

+ Non-current Liabilities Due within One Year + Long-term Borrowings

+ Bonds Payable + (Non-Operating Expenses - Non-Operating Revenues)

* (1 - (Income tax rate) + Impairment loss on assets + Increase in deferred income tax liabilities -

Increase in deferred income tax assets

The calculation process of TC from 2016 to 2022 shows in Table 3.

Table 3: The calculation process of TC from 2016 to 2022 (unit: million) [14]

	2016	2017	2018	2019	2020	2021	2022
Owner's equity	15,843.5	18,142.9	19,922.5	38,099.9	38,344.0	38,433.8	38,527.0
Non-current liability due within one year	10,00		1,799.08		917.93	100.66	93.87
Short-term loan					1,965.44	1,721.90	1,850.87
Long-term loan	6.10	2.50	2.50	3.60	36.60	89.60	2.10
Bonds payable	1,795.28	1,797.18		912.93			
Total capital	17,654.9	19,942.6	1,724.1	39,016.4	41,264.0	40,346.0	40,473.8

4.3. WACC

Weighted average cost of capital = cost of equity/total capital * cost of equity + debt capital/total capital * pre-tax cost of debt * (1 - income tax rate)

For the calculation of the cost of debt capital, which shows in Table 4, this paper selects the basis of 3–5-year medium- and long-term bank loans issued by the People's Bank of China [11].

Table 4: Pre and after debut capital cost [15]

	2016	2017	2018	2019	2020	2021	2022
Pre-tax debt capital cost	4.75%	4.75%	4.75%	4.75%	4.75%	4.75%	4.75%
After-tax debt capital cost	4.04%	4.04%	4.04%	4.04%	4.04%	4.04%	4.04%

The expected return above the risk-free rate of return depends on the investment's beta, or relative volatility compared to the broader market, the data for which shows in Table 5 and Table 6. And, the calculation of WACC is showed in Table 7.

Expected return rate of assets = risk-free interest rate + β * Equity market risk premium.

Table 5: Cost of equity capital [15]

	2016	2017	2018	2019	2020	2021	2022
Risk-free rate	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
β	0.71	0.84	0.70	0.87	0.86	1.29	0.81
Market risk premium	6.70%	6.90%	6.60%	6.10%	2.30%	8.10%	3.00%
Cost of equity capital	6.268%	7.300%	6.126%	6.813%	3.478%	11.984%	3.933%

Table 6: Capital cost ratio (unit: million)

	2016	2017	2018	2019	2020	2021	2022
Total assets	24,586.6	27,702.5	30,377.6	49,658.0	55,219.4	52,292.7	53,320.9
Total liabilities	8,743.1	9,559.6	10,455.1	11,558.1	16,875.4	13,858.9	14,793.9

Table 6: (continued).

Owner's total equity	15,843.5	18,142.9	19,922.5	38,099.9	38,344.0	38,433.8	38,527.0
Debt ratio	35.56%	34.51%	34.42%	23.28%	30.56%	26.50%	27.75%
Equity ratio	64.44%	65.49%	65.58%	76.72%	69.44%	73.50%	72.25%

Table 7: Calculation of WACC (unit: million)

	After-tax cost of debt capital	Debt Ratio	Equity capital ratio	Equity ratio	WACC
2016	4.04%	35.56%	6.268%	64.44%	5.48%
2017	4.04%	34.51%	7.300%	65.49%	6.17%
2018	4.04%	34.42%	6.126%	65.58%	5.41%
2019	4.04%	23.28%	6.813%	76.72%	6.17%
2020	4.04%	30.56%	3.478%	69.44%	3.65%
2021	4.04%	26.50%	11.984%	73.50%	9.88%
2022	4.04%	27.75%	3.933%	72.25%	3.96%

4.4. EVA calculation

EVA is the calculation of what profits remain after the costs of a company's capital--debt and equity--are deducted from operating profit. The idea is simple but rigorous: true profit should account for the cost of capital. The calculation shows in Table 8.

$$\text{EVA} = \text{NOPLAT} - \text{TC} * \text{WACC}$$

Table 8: Calculation of EVA (unit: million)

	Net operating profit after tax	Total capital	Weighted average cost of capital	EVA
2016	2,700.3	17,654.9	5.48%	1,733.7
2017	2,967.6	19,942.6	6.17%	1,736.2
2018	3,209.6	21,724.1	5.41%	2,034.8
2019	3,518.6	39,016.4	6.17%	1,112.5
2020	5,253.7	41,264.0	3.65%	3,747.9
2021	2,171.6	40,346.0	9.88%	-1,813.8
2022	1,394.3	40,473.8	3.96%	-209.4

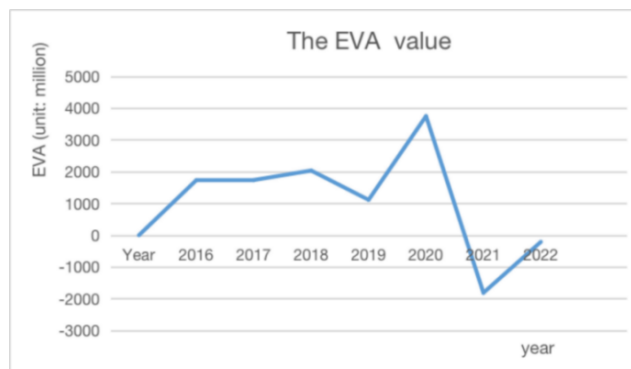


Figure 3: EVA

It can be seen that the overall value of Yunnan Baiyao is on the rise (Figure 3), illustrating that the company makes full use of new technologies to improve the overall efficiency in the implementation of digital transformation. Especially in intelligence stage, through the establishment of smart factories and panax notoginseng industry platform to achieve automated production, the company's EVA has experienced a significant increase. However, the value of EVA decreased rapidly and reached the negative for the first time. This huge shrink in capital is mainly due to changes in the net unit value of the fund held by the company. After experiencing a downturn in 2021, there is an upward trend in 2022. In general, since the digital transformation of Yunnan Baiyao, the EVA remained mostly positive, deducing that the digital transformation of enterprises truly can create prices for enterprises.

5. Conclusion

This paper explores the impact of Yunnan Baiyao's digital transformation on its performance. The data used in the study are sourced from the company's annual reports and public databases, and internal company data were not available, limiting the ability to delve into the specifics of the digital transformation implementation. Moreover, the relatively short period of digital transformation in the pharmaceutical industry makes it difficult to conduct a comprehensive and effective assessment of its long-term impact on corporate performance. Based on the available information, the company's digital transformation is categorized into three stages: informatization, intelligence, and digital intelligence. The relationship between transformation and performance has been proven to be positive in qualitative research. Further information has been obtained in the calculation of EVA, with more significant benefits observed during the intelligence and digital intelligence stages. In general, future digital transformation efforts should not only focus on adopting new technologies but also require a strategic reassessment of the business model and market positioning to adapt to the evolving market.

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