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Research on Enterprise Intelligent Financial Visualization Analysis Based on Power BI

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Abstract: *In the era of big data and digital economy, the digital transformation of corporate finance has been accelerated continuously. Traditional financial analysis presents obvious limitations in massive data processing, multi-source information integration, dynamic interactive display and real-time decision support[1]. Data-driven and intelligent financial analysis has become an inevitable trend [2]. As a lightweight business intelligence tool, Power BI provides a feasible path for the construction of intelligent finance with its core advantages such as multi-source data access, automatic cleaning, multi-dimensional modeling and interactive visualization. This paper constructs a four-stage framework of intelligent financial visualization analysis: data integration, model construction, visualization presentation and decision support. Combined with typical cases in manufacturing, new energy, consumer electronics and liquor industries, it systematically explains the application logic and implementation process of Power BI in four scenarios: multi-dimensional analysis of financial statements, business-finance integration insight, real-time monitoring of financial risks and strategic text data fusion. In view of the practical problems such as insufficient personnel ability, weak data governance, barriers between business and financial systems, and solidified analysis thinking, four optimization strategies are put forward: talent training, data governance, agile implementation and thinking upgrading. The research shows that Power BI can effectively improve the efficiency and depth of financial data analysis, strengthen information readability and decision support capacity, promote the transformation of financial departments from accounting-oriented to analysis-oriented and strategy-oriented, and provide a replicable practical scheme for the digitalization of corporate finance.*

Keywords: *Power BI; Intelligent Finance; Visualization Analysis; Business-Finance Integration; Financial Digital Transformation*

1. Introduction

In the digital economy era, data has become a core production factor and strategic resource for enterprises. Financial data is a comprehensive reflection of an enterprise's operation status, profitability, risk status and value creation ability. Its efficient integration, in-depth mining and accurate interpretation directly affect the quality of enterprise management and decision-making effect. With the diversification of business, cross-regional operation and rapid changes in the external market, financial data presents the characteristics of scattered sources, huge scale, heterogeneous structure and frequent updates. The traditional financial analysis model dominated by Excel, manual sorting and static PPT reports gradually exposes problems such as low data processing efficiency, prominent information silos, single analysis dimension, inconsistent indicator caliber and lagging decision response, which is difficult to meet the needs of refined management, real-time risk control and strategic dynamic adjustment.

Business Intelligence (BI) is a key technical carrier connecting data resources and management decisions. Developed by Microsoft Corporation, Power BI has been widely used in corporate financial analysis, operation monitoring, budget management, cost control and other scenarios due to its rich data sources, moderate operation threshold, excellent visualization effect, convenient cloud sharing and high compatibility with Microsoft ecosystem. This tool can realize the unified access of financial systems, business systems, external databases and table files, complete data cleaning, format conversion, relational modeling and indicator calculation through automated processes, and visually display analysis results in the form of interactive reports and dashboards, effectively reducing the threshold of data use and improving analysis efficiency[3].

At present, relevant domestic researches mostly focus on the single-function application or single-enterprise case of Power BI, lacking a systematic analysis framework covering the whole process, multi-scenarios and popularization, and the summary of implementation pain points and optimization paths is

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not complete enough. Based on the practical needs of corporate financial digital transformation, this paper integrates the technical characteristics of Power BI and financial analysis logic, constructs a complete intelligent financial visualization analysis system, verifies the effectiveness of the framework combined with real application cases in multiple industries, and puts forward operable countermeasures for landing obstacles, so as to provide theoretical reference and practical guidance for enterprises to promote intelligent financial construction and realize in-depth business-finance integration.

2. Theoretical Basis and Literature Review

2.1 Concept Definition

2.1.1 Intelligent Finance

Intelligent finance refers to a new financial management mode formed by the deep integration of big data, cloud computing, artificial intelligence and other information technologies with traditional financial work. It takes data as the core, realizes the automation, intelligence and visualization of financial accounting, capital management, cost control, risk early warning and decision support, and promotes the transformation of financial departments from accounting to value creation [4].

2.1.2 Financial Visualization Analysis

Financial visualization analysis uses computer visualization technology to transform abstract and massive financial data into intuitive charts, graphs and dashboards, so as to reduce the difficulty of data understanding, help managers quickly capture key information, identify laws and risks, and support scientific decision-making .

2.1.3 Overview of Power BI

Power BI is a business analysis tool launched by Microsoft, which integrates data collection, cleaning, modeling, analysis, visualization and sharing. It supports access to more than 100 data sources, provides non-code operation, and has strong compatibility and expansibility. It is suitable for financial analysis of enterprises of different scales. Power BI is composed of Power BI Desktop, Power BI Service and Power BI Mobile. It has obvious advantages: rich data sources, powerful data processing, flexible modeling, rich visualization components, perfect interaction, efficient cloud sharing and high security [5].

2.2 Literature Review

Status Foreign research on business intelligence tools started early. After long-term development, foreign scholars have formed relatively mature research results in data modeling, indicator system, visualization design and decision support. Empirical studies show that BI tools can significantly improve the efficiency of financial analysis, enhance risk management capabilities, and have formed specialized solutions in many industries [6].

Status Domestic research on intelligent finance and Power BI has developed rapidly in recent years. Most studies focus on tool application, case analysis and framework discussion. Although some achievements have been made, there are still deficiencies: lack of systematic and full-process research, insufficient analysis of challenges and strategies, and insufficient multi-industry applicability research. This paper makes up for the above deficiencies through systematic framework construction and multi-industry case verification [7].

3. Core Framework of Power BI Intelligent Financial Visualization Analysis

The application of Power BI in the field of intelligent finance is a systematic project covering the whole life cycle of data. Combined with the corporate financial workflow, this paper constructs a four-stage progressive application framework to realize the closed loop from raw data to decision value.

3.1 Multi-source Data Integration and Intelligent Cleaning

The goal of this stage is to break internal and external data silos and build a standardized, unified and high-quality financial analysis data pool. Power BI supports access to more than 100 data sources, including ERP financial systems such as UFIDA, Kingdee, SAP and Oracle, business systems such as CRM, OA and production management, databases such as SQL Server and MySQL, as well as external

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data such as Excel, CSV, Web API and cloud services. It integrates balance sheet, income statement, cash flow statement, sales details, inventory records, purchase documents, cost work orders and other data through a unified entrance to solve the problems of scattered data, repeated entry and inconsistent calibers.

With the help of Power Query editor, financial personnel can complete standardized data processing without writing complex codes: convert two-dimensional financial statements into one-dimensional tables of "account-time-amount" through unpivot; identify and eliminate duplicate records, fill in missing values and correct abnormal values; unify date formats, currency units and account names; establish associated fields between data tables. Standardized processing can significantly reduce the difficulty of subsequent modeling and ensure accurate and reliable analysis results[8].

3.2 Dynamic Data Modeling and Definition of Measures

Data modeling is the core link to realize intelligent analysis. Power BI adopts a star modeling idea, taking financial fact tables, sales fact tables and cost fact tables as the core, associating dimension tables such as date tables, accounting subject tables, organization structure tables, product tables, customer tables and regional tables, establishing one-to-many logical relationships, and forming a multi-dimensional data model that can be flexibly sliced, drilled and aggregated.

The key of model construction is to define reusable measures using DAX language, covering the core financial indicator system of enterprises: profitability indicators (gross profit margin, net profit margin, operating profit margin, ROE, ROA, core profit), operation capacity indicators (inventory turnover rate, accounts receivable turnover days, total assets turnover rate), solvency indicators (current ratio, quick ratio, asset-liability ratio, interest coverage ratio), cash flow indicators (net cash flow from operating activities, free cash flow, cash flow ratio), growth capacity indicators (operating income growth rate, net profit growth rate, net assets growth rate). Measures can be reused in all reports once defined, ensuring unified indicator calculation caliber and automatic synchronous update, greatly improving analysis consistency and work efficiency.

3.3 Interactive Visualization Design and Presentation

The visualization stage transforms the data model into an intuitive, easy-to-understand and interactive analysis dashboard to meet the needs of management for quickly capturing key information. The design follows the principle of "indicator adaptation, focus highlighting and simplicity": line charts and area charts for trend analysis; pie charts, ring charts and waterfall charts for structure proportion; clustered column charts and bar charts for comparative analysis; card charts and KPI icons for core indicators; radar charts for multi-dimensional comprehensive evaluation.

Interactive capabilities are realized through slicers, chart linkage, drill-through and bookmarks: users can conduct global screening by year, quarter, department, product line and region; click a chart to automatically filter other charts; drill down from summary indicators to detailed data to quickly locate the causes of fluctuations. The report adopts a "general-part" structure as a whole, with key financial snapshots displayed on the home page, and special topics on profitability, operation efficiency, cost structure, cash flow and risk status displayed on subsequent pages to improve information transmission efficiency[9].

3.4 Insight Distribution and Decision Empowerment

Analysis results can create value only when they enter the management process. Power BI supports publishing reports to the Power BI Service cloud, generating accessible links for viewing on PCs, tablets and mobile phones. Users can set the automatic data refresh frequency to ensure real-time update of report data; configure data alerts for key risk indicators such as asset-liability ratio, inventory turnover days and cash flow gap, and abnormal situations are automatically pushed via email or mobile terminals.

Analysis reports can be embedded in enterprise internal portals and collaborative office platforms to achieve cross-departmental sharing and business tracking. Financial analysis has shifted from regular reporting to real-time monitoring, promoting the integration of financial data into daily management links such as business forecasting, budget control, cost optimization, risk early warning and strategic adjustment, and truly realizing data-driven decision-making[10].

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4. Typical Application Scenarios of Power BI Intelligent Financial Visualization

Combined with the practice of manufacturing, new energy, consumer electronics and liquor industries, Power BI has formed four mature and replicable application scenarios.

4.1 Multi-dimensional Dynamic Analysis of Financial Statements

Traditional financial statements are presented in a static and summary form, which is difficult to meet the management's needs for tracking details, structure, trends and motivations. A manufacturing enterprise uses Power BI to dynamically disassemble the five-year income statement, showing the annual changes in operating income, operating costs and period expenses with line charts; displaying the proportion of cost and expense structure with ring charts; through interactive linkage, clicking on the sales expenses of a certain year can display the detailed composition. By constructing core indicators such as net profit after deduction and non-operating income and expenditure ratio, the quality of profit structure can be effectively identified, and the sustainability and stability of the main business profitability of enterprises can be objectively reflected. At the same time, a drill-through path is set to penetrate from total profit to product line, business unit and project-level profit layer by layer to quickly locate the source of performance changes. This model compresses dozens of pages of static statements into an interactive dashboard, significantly improving analysis efficiency and decision response speed.

4.2 Business-Finance Integration and Value Chain Insight

Financial results are driven by business behaviors, and Power BI can realize the in-depth integration of financial data and business data. LONGi Green Energy, a new energy enterprise, associates sales details, customer information, regional data with financial income statements through product code, period and other fields, constructs a business-finance integration dashboard, displays the gross profit margin of each product line, regional income contribution, expense input efficiency, large customer repayment cycle and bad debt risk, providing data basis for product strategy, market investment and credit control.

In manufacturing enterprises, Power BI integrates production work orders, material consumption, working hours records, purchase unit prices and financial cost data, calculates the actual cost of each product and batch, compares with standard costs, and visually displays material quantity variance, price variance, labor efficiency variance and manufacturing expense variance, helping production departments locate waste points, optimize processes and reduce costs. This model breaks the data barriers between finance and business, enables financial analysis to go deep into all links of the value chain, and realizes a virtuous cycle of "finance guiding business and business supporting finance".

4.3 Real-time Monitoring and Early Warning of Financial Risks

With the intensification of market environment fluctuations, enterprises' demand for real-time identification and early warning of financial risks has increased significantly. Taking the "high inventory and high loan" risk of Goertek Inc., a consumer electronics enterprise in 2022 as an example, a risk monitoring dashboard is built based on Power BI: clustered column charts are used to display the scale and trend of monetary funds and short-term loans side by side; card charts are used to show the fund return rate and loan interest rate, revealing the problem of inefficient capital allocation; line charts are used to track the growth rate of inventory and accounts receivable, reflecting the pressure of working capital occupation.

Introducing peer data such as Luxshare Precision for benchmarking, it is clear that the risk is an individual enterprise problem rather than an industry common phenomenon. Thresholds are set for asset-liability ratio, current ratio and quick ratio, and the chart automatically changes color to remind when the indicators exceed the limit, realizing the transformation of risk from post-event analysis to real-time in-event monitoring.

4.4 Integrated Analysis of Financial Data and Strategic Text

Power BI can combine hard financial data with soft strategic information to improve long-term decision support capabilities. Taking five leading enterprises in the liquor industry: Kweichow Moutai, Wuliangye, Luzhou Laojiao, Shanxi Fenjiu and Yanghe Brewery as examples, text is extracted from the "Management Discussion and Analysis" and "Future Outlook" in the annual reports, and imported into

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the model after emotional analysis, keyword extraction and structured processing.

Radar charts are used to compare core indicators such as ROE, gross profit margin and revenue growth rate, dynamic word cloud charts are used to show the frequency changes of strategic keywords such as high-end, digitalization, internationalization, green and low-carbon, and cultural empowerment, and emotional scores are linked with financial indicators to explore the correlation between management expectations and subsequent performance. This model expands the boundary of financial analysis and provides a more comprehensive basis for strategic decision-making.

5. Implementation Challenges and Optimization Strategies

5.1 Main Challenges

5.1.1 Talent capability bottleneck

Most financial staff have solid accounting expertise but lack systematic data analysis capabilities. They often struggle with Power Query processing, logical dimension modeling, and DAX formula development. The high learning curve and heavy daily workload prevent them from mastering advanced functions, so the deep value of Power BI cannot be fully realized in practice.

5.1.2 Weak data governance foundation

Many enterprises operate multiple independent internal systems with inconsistent data standards. Inconsistent coding systems for accounts, customers, and materials are common, accompanied by widespread missing, abnormal, duplicate, and inconsistent records. As a result, data cleaning and integration consume considerable time and labor costs.

5.1.3 Barriers between business and financial systems

Business and financial systems lack bottom-level data connectivity. Data synchronization is delayed, and the mapping logic between business and financial items is unclear. These issues seriously restrict the depth, accuracy, and real-time performance of business-finance integration analysis.

5.1.4 Solidified analysis thinking

Many designed reports are merely “dynamic PPTs” that overemphasize visual effects while neglecting problem-oriented diagnosis. They lack practical business interpretation, root-cause analysis, and actionable suggestions, thus failing to provide effective support for management decisions.

5.2 Optimization Strategies

5.2.1 Build a compound financial talent team

Enterprises should carry out universal Power BI training for all financial employees to improve basic skills in data acquisition, cleaning, processing and visual display. Meanwhile, key staff with strong business sensitivity and learning ability should be selected for advanced training in data modeling, DAX calculation and indicator system construction, so as to cultivate professional internal financial data analysts and form a talent echelon that supports long-term application.

5.2.2 Consolidate the foundation of enterprise data governance

It is necessary to promote the construction of enterprise-level master data management, unify coding rules and statistical standards for core data including customers, suppliers, materials, accounts and organizational units, and eliminate inconsistency caused by multi-system existence. At the same time, frontline data verification rules should be established to control data quality at the source and reduce abnormalities such as missing, wrong and repeated records.

5.2.3 Adopt an agile pilot implementation strategy

Instead of one-time full-scale launch, enterprises should select 1–2 scenarios with high management attention and prominent pain points, such as profit analysis, inventory monitoring and expense control, to carry out pilot applications. Quick results can enhance internal recognition and establish typical benchmarks. Then the application scope can be expanded step by step through agile iteration.

5.2.4 Promote the upgrading of analysis thinking to value insight

Report design should be problem-oriented and business-oriented. Key charts should be equipped with

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clear conclusions, cause analysis and actionable suggestions to clarify what data reveals, where risks lie and what measures should be taken. This will promote financial analysis to shift from pure data display to real value insight and strongly support management decision-making.

6. Conclusions

With the core advantages of multi-source data integration, automatic processing, multi-dimensional modeling, interactive visualization and cloud sharing, Power BI provides a low-cost, high-efficiency and easy-to-promote implementation path for enterprises to build an intelligent financial analysis system. The four-stage framework constructed in this paper covers the whole process of data integration, modeling, visualization and decision-making. Combined with multi-industry cases, it verifies its effectiveness in scenarios such as financial statement analysis, business-finance integration, risk monitoring and strategic support. It can significantly improve the efficiency and depth of financial analysis, break information silos, strengthen decision support capabilities, and promote the transformation of finance from accounting-oriented to analysis-oriented and strategy-oriented. In practice, enterprises should face the practical challenges of talent ability, data governance, system barriers and analysis thinking, and promote implementation through team building, data standardization, agile pilots and thinking upgrading. With the continuous development of artificial intelligence, cloud computing and big data technologies, Power BI will further upgrade towards intelligent prediction, industry templating, mobile real-time and system integration, and deeply integrate with ERP, budget systems and fund systems to form an integrated intelligent financial platform. In the future, enterprises should continuously release the value of data elements, make financial departments become the core support for enterprise strategic decision-making, risk control and value creation, and provide a solid guarantee for high-quality development.

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