

# Application of Interactive Design in Visualization of Production Decision Management

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## Abstract:

Constructing industrial Internet has become an important direction for industrial upgrading. This paper demonstrates that interactive design plays an important role in the visualization of production decision-making management. Through conceptual analysis, case studies, theoretical induction and other methods, this paper expounds the overall thinking, the application mode and the practical significance of building a visualized Business Intelligence cloud platform using interactive design. Interactive design plays a strategic role in promoting the optimization and upgrading of visualized BI cloud platform, and in the development of manufacturing enterprises, the realization of intelligent production and design innovation.

## Keywords:

Interaction Design, Industrial Internet, Data Visualization, Industrial Upgrading

## 1. Introduction

Industrial Internet has become a factor in the development of China's manufacturing industry. The idea of "Made in China 2025" is promoted nationwide in China, and intelligent and information-based industrial production method has been considering with highly attention. Through the Intelligent Manufacturing Engineering, we will focus on building the standard system of Intelligent Manufacturing and the Intelligent Factory. The disadvantages of traditional manufacturing mode are low labor productivity, low product quality and high resource consumption. In order to reduce the operating cost and product failure rate, and shorten the product manufacturing cycle effectively, developing a visual cloud platform for enterprise production decision-making management is necessary. Through the process of developing related platforms, the advantages of the principle of interactive design can be maximised. Decision-making basis, which through the experience of data visualization and the optimization of service level, is provided for managers, grasps production information in real time, realizes the overall control of operation status, and carries out production decision-making management through scientific means.

## **2. Interaction Design and Data Visualization**

### ***2.1. Overview of Interaction Design***

Interaction design is the design of how users interact with products, systems, and services. It focuses on the user experience and communicates the appearance elements, aiming to achieve "usability goals" and "user experience goals". Interaction design includes but is not limited to human-computer interaction in software design. It is an emerging discipline integrating psychology, information science and industrial design on the basis of human-computer interaction. [1]

With the development of Internet technology, current interaction design is often reflected in the optimization of user interface of intelligent products. Focusing on the impact on the end user, interaction design aims to meet the emotional needs of users and build a more comfortable and intuitive interaction system in the experience. [2] Therefore, on the basis of user-centered, interactive design pays attention to the influence of emotion and other factors on users' psychology, and guides users' use by setting user's use behavior, planning and designing visual information, structure and presentation mode, so as to provide users with a good and comfortable experience. In addition, interaction design provides various services to users based on observation and interpretation of their behaviors and requirements. Almost all design needs to provide services and optimize the experience, the core lies in people-oriented, user-centered design work. [3]

In the era of service economy, interaction design has also been introduced into many application fields such as strategic layout, decision management and technology research and development of enterprises. Meanwhile, interaction design focuses on designing solutions for specific application software, analyzing and optimizing software interface and software interaction logic. The software interface plays the role of visual communication and is the most intuitive part of the user's operation; The interaction logic is related to the in-depth study of users. By building user portraits and analyzing the purpose and habits of use, it designs simple and easy-to-use operation mode, optimizes user experience and improves usability.

### ***2.2. Research on Data Visualization***

Data visualization is a method of using computer technology and image processing technology to express abstract data in more intuitive ways such as images. With the advent of the era of big data, it is the fundamental requirement to realize data visualization that a large amount of big data, which is acquired quickly and has low value density, should be processed and intuitively reflected through comprehensive analysis. Faced with the huge and complex database, people urgently need a technology to make data easy to understand and analyze, and help people make decisions or convey ideas and information. Therefore, data visualization technology shows its outstanding advantages and visible prospects under this background.

Data visualization technology has the characteristics of interaction, multidimensional and visibility. It requires the integration and analysis of multi-dimensional data objects and presents them to users in an intuitive and easy-to-understand way. [4] Its significance lies in the realization of more convenient data processing, and allows users to obtain more valuable information with higher efficiency. On the management level, it is mainly reflected in improving efficiency, saving time cost and providing efficient production decision support for enterprise

managers. Big data cloud platform based on data visualization technology can also combine with AI algorithm. By studying user behavior, the system automatically learns and extracts common data of specific users, and then integrates to form a specific database. Over time, the system gradually provides users with more targeted information and a more personalized interactive environment.

### 3. Research on the Background of Visual Decision Platform

#### 3.1. Application Background and Main Functions of Visual Decision Platform

At present, the global manufacturing industry is undergoing an all-round and multi-level digital transformation, and the intelligent visualization decision-making platform has played a huge role in the field of manufacturing. Under the traditional mode, the production and processing of the workshop are disconnected from the plan, the production data are opaque, the potential waste is serious, the production cost is high, and the production efficiency of equipment and personnel cannot be effectively evaluated and the management precision is low.

The visual decision platform can integrate and analyze the structured data scattered in various databases, and combine the structured and unstructured database data technology to realize mass batch processing and high-speed flow processing. While integrating data, the system establishes BI data center based on data warehouse, automatically connects related data, carries out multi-dimensional dynamic analysis, and excavates the association and rule among them.

The core of business visualization decision-making platform is the visualization analysis of enterprise information data. It can also provide value-added services such as management consulting, supply chain finance and human resources upgrading for enterprises. The data stream formed by data visualization tools can be adapted to multi-type screens to realize multi-platform visualization display. (Figure 1)

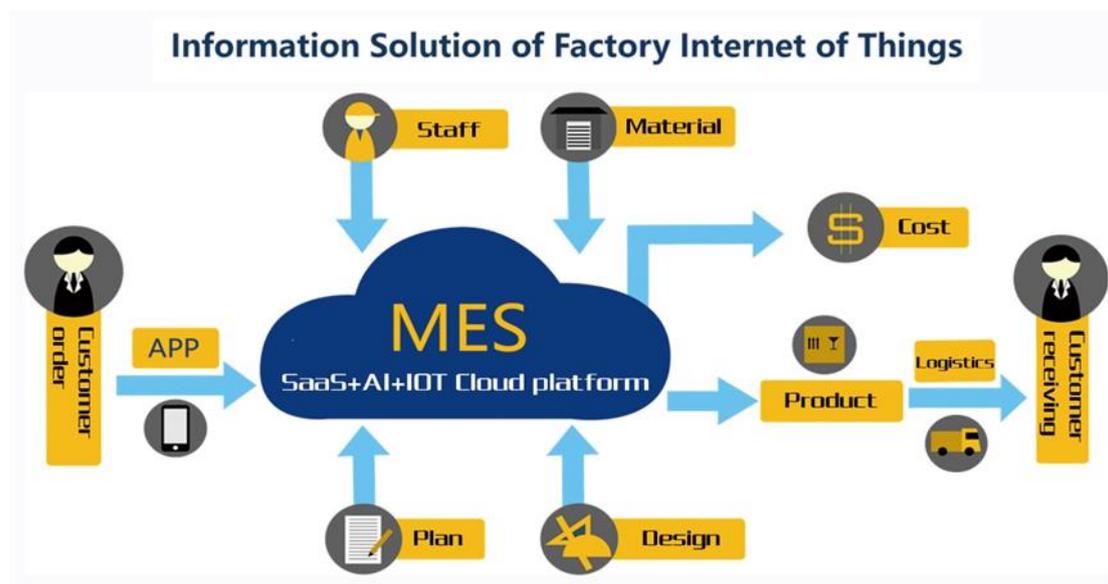


Figure 1. Information Solution of Factory Internet of Things.

#### 3.2. Application Status at Home and Abroad

Overseas production decision-making management platforms have great investment in technology research and development, so they are relatively stable in technology,

flexible in function, and have achieved comprehensive integration. For example, R/3 enterprise resource planning system developed by SAP of Germany is widely praised by the industry for its powerful function, high integration, real-time performance, flexibility, openness, reliability and universal international applicability, and occupies a broad ERP software market including China. The functions of related platforms abroad include sales, production, procurement, inventory and financial management, forming a relatively perfect system. It embodies tremendous value in enterprise management decision-making and production. Domestic management information systems also have more mature business management software, enterprise Internet services and enterprise financial service providers, such as UFI and Kingdee. They are well-known in domestic small and medium-sized enterprises, have great advantages in financial management, and can also serve as school ERP software learning providers. But User Platform, as an enterprise service provider, is more focused on small and medium-sized enterprises, with a large business scope and poor pertinence. It has more learning significance than practical significance in the use of manufacturing industry. And Kingdeer's software products focus on the domestic financial industry and are not susceptible to the manufacturing industry.

As a whole, the domestic production decision management platform is relatively weak. Most of their functions have evolved from foreign software, which does not really fit the characteristics of Chinese enterprises, and does not support localization enough to meet the needs of some enterprises. There is no personalized production management software in China. Some enterprises apply the production management system, but it cannot be developed according to the characteristics of the enterprise itself, which has certain universality and no flexibility. These systems are not sensitive to the development and changes of enterprises, are slow to respond, and the stability needs to be improved. At present, most enterprises have not realized the visualization of management information.

### ***3.3. Application Advantages of Interaction Design***

In the era of big data on the Internet, only users can gain core advantages in market competition. Excellent interaction design can make information transmission and big data visualization more efficient and humanized. There are two forms of big data visualization, one is pure display of data collation and effective information presentation, the other is the coexistence of display and interactive functions. From the perspective of interaction design, it involves interaction interface and interaction logic design.

Research shows that human beings can quickly recognize, store and recall graphic information through the visual system of the brain, instinctively transforming the concept of graphic information into long-term memory. There are various forms of data visualization, among which chart forms are more common, such as the line chart used to show the trend of data changes, the bar chart used to compare values and the pie chart used to reflect the data components and other standard charts. In addition, the data can be visualized by including advanced charts such as radar charts, boxplot charts, thermal maps, and tree charts. How to display the most valuable information to specific users after data visualization through processing and analysis is the most important concern of interaction designers.

In addition to the functions of data monitoring, collection, comparison, cloud computing and security early warning, the production decision-making management

platform of enterprises needs to meet the needs of managers for production decision-making and personnel management. Therefore, the human-computer interaction design of the platform has become another indispensable application link.

An important component of interaction design is to build user portraits. User portrait is also based on the background of large data, through the establishment of sample database for data collection and analysis, to build a labeled user model. Thus, it qualitatively analyzes users' needs and data information they pay attention to, and then provides users with more intuitive decision-making basis and better interactive experience through the interactive design method. Taking intelligent factory as an example, the users involved in the relevant visualization platform are mainly workers, workshop supervisors, enterprise leaders and customers. Considering the characteristics of users and data samples, the data contents concerned by the four user groups are different. If the results of data visualization based on the same database are directly presented to users with different requirements, the value of data visualization will be greatly reduced and it is difficult to achieve the purpose of improving production efficiency and optimizing decision-making process.

At this point, interaction design is required to analyze and present data based on visualization technology according to the specific needs of users. When presenting data to decision managers, BI data visualization platform should realize intuitive interactive display such as color warning, highlighting linkage and so on, so that they can perspective data, find problems and make decisions. The process of interaction design plays an important role in the development of visual platform for production decision management. (Figure 2)

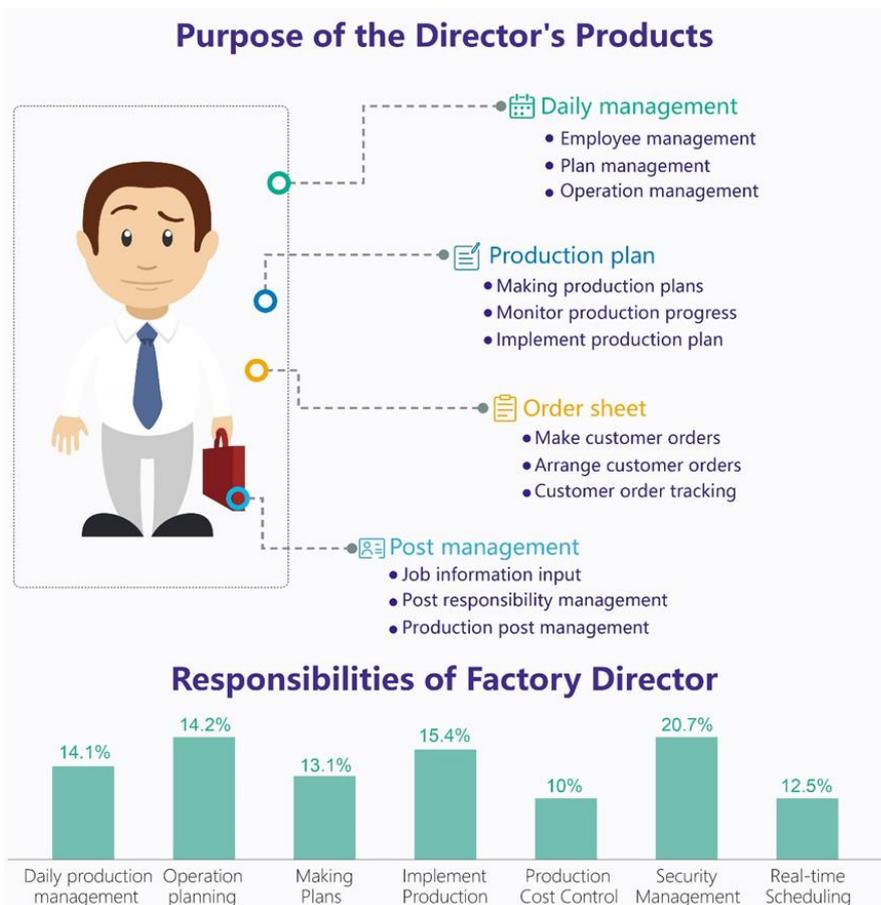


Figure 2. User Portrait of Factory Director

#### 4. Application Case Study in Commercial Production Field

With the rapid development of information technology, countries around the world are seeking technological breakthroughs and increasing product innovation. With more and more data in modern enterprises, data has become the assets of enterprises. How to use data assets to provide decision-making basis for marketing management, production management, financial management, logistics management, human resources management and so on has become the focus of enterprises' increasing attention.

The construction of visualized BI cloud platform is not only a necessary condition for realizing industrial Internet, but also a prerequisite for building intelligent factory. The research shows that there are many practical cases in the related fields at home and abroad, which create great value for the commercial production field.

BI (Business Intelligence) is a business intelligence technology and its application, which is composed of data warehouse, query report, data analysis, data mining, data backup and recovery. The emergence of BI cloud platform systematizes and visualizes the whole business chain of enterprises, such as production, procurement, inventory, sales, assets, liabilities, taxation, etc. Through the core indicators dashboard display, data early warning and other methods, the leadership can have a global management view of the company's operational status, and have mobile solutions to meet the needs of enterprise mobile management.

Taking Wuhan "ZHIPO CONNECT" Visual BI Cloud Platform as an example, the platform helps enterprises make full use of accumulated management data through large data cloud computing technology, realizes data visualization analysis, supports business layer's overall control of enterprise operation status by using visual data management, and makes early warning and puts forward decision-making suggestions and solutions to problems. It enables enterprises to have the ability of self-learning and self-judgment in the process of production and operation, and realizes the intelligent management of enterprise production process, finance, human resources, etc.

On the one hand, the visualization BI cloud platform architecture of "ZHIPO CONNECT" can not only help enterprises collect and analyze data, but also show the complete enterprise operation process to managers by combining various data visualization tools. On the other hand, it helps enterprises innovate management mode and management mechanism according to the information mining, and continuously improve the competitiveness, decision-making ability and market forecasting ability of enterprises.

Under the background of the new economy, the operation and management of enterprises have undergone profound changes. As the market is changing rapidly, enterprises urgently need to grasp the ever-changing market, accurately predict the future of enterprises and provide contingency time for the development of enterprises. It has become very important to rely on data analysis tools to grasp the market law, predict the market direction and accurately formulate enterprise strategy. It cannot meet the new requirements of enterprises to provide information-based management software for enterprises.

Therefore, the BI data visualization cloud platform system based on data mining developed by "ZHIPO CONNECT" emerges at the right moment. Combining with big data and cloud computing technology, the platform provides data mining, data analysis, data visualization, intelligent early warning automatic report, assistant

decision-making and other services for enterprise operation data, which will be more able to help enterprises adapt to the new market environment and new market competition.

Since BI data center supports multiple data sources of an enterprise, by establishing data warehouse, visualization BI cloud platform can realize global data collection based on enterprise business and data drill-through capability of any dimension. "ZHIPO CONNECT" visualization BI cloud platform also supports dynamic association analysis, collaborative filtering and other interactive methods so that business personnel and decision makers can freely conduct in-depth exploration and analysis, so as to quickly discover business problems and achieve efficient production decision management. The interaction design team independently developed the interaction function, designed the data visualization display interface and undertook the secondary development of the enterprise, providing a very simple operation process and user experience for the "ZHIPO CONNECT" visualization BI cloud platform. (Figure 3)



**Figure 3.** "ZHIPO CONNECT BI Cloud Platform" Manages the Cockpit Management Dashboard.

The interaction mode and interface of the platform are highly integrated, so that it is not limited to specific industries. It can provide data analysis function for different industries, and it can also be customized. Through abundant color matching schemes, different enterprises can combine modules according to their industry characteristics to make data analysis more efficient and convenient for decision-making. This enables enterprise decision makers to know the operation state of the business at the first time, discover problems in time and adjust strategies; On the other hand, real-time data update also greatly improves the work efficiency of analysts and saves a lot of repetitive data preparation work.

Compared with the traditional product R&D and design, the mature products that meet the requirements can only be obtained after many product production tests. Under the technological environment of large industrial data, the realization of intelligent production through intelligent design will greatly improve the design and production efficiency of products. In addition, the industrial value of big data also reflected in through the Internet to customers, research and development, production and other data information within the enterprise, between enterprises and the whole supply chain to share data resources, streamline production for flat production, shorten the product cycle, optimize inventory, forming a set of product development and design, manufacturing, supply chain and enterprise management in the integration of network collaborative manufacturing system.

However, due to various sources of big data, different data structures, complex and diverse structures, heterogeneous data types, and sparse values, the visualization cloud

platform of industrial big data has the problem of difficult information integration and integration, and is facing the challenge of system complexity. In addition, in practical industrial applications, many industrial software and advanced IoT devices do not have independent control ability, resulting in device information flow and data flow is not smooth. The promotion of intelligent industrial Internet mode using BI visual cloud platform still has great resistance, which needs to increase practical application in the industrial field.

On the platform of the development and practice, in addition to the innovation of technology and application mode, from the Angle of the optimization of interaction, improve the logic of BI visualization cloud platform and maneuverability, make enterprise managers through the platform can realize efficient production decision, management and other aspects of efficient operations, to give full play to dig and the industrial value of big data.

## 5. Conclusions

The development of Internet technology makes the intelligent industrial mode become the general trend. In the era of information explosion, it is necessary to realize effective information visualization after sorting out and analyzing the complex data. The goal of interaction design is to build an interactive system that meets the needs of users.[5] Therefore, in the industry in the process of building the Internet platform for the visualization of have played an important role in optimization platform service and user experience, make the BI cloud platform not only provide scientific decision basis for managers, through the study of AI algorithms to extract valuable data, can also through the improvement of the human visual interface and interactive way to improve the platform availability and ease of use. This is of great practical significance for China's manufacturing enterprises to realize industrial upgrading from traditional factories to intelligent factories through the construction of industrial Internet, scientific decision-making, comprehensive management and intelligent production.

## Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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