Research on the Application of Data Visualization Design in CBA League News

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Abstract. In the context of the era of intelligence, the capacity and function of data is expanding, and is playing an irreplaceable role in the field of sports news. This paper studies the data expression mode of sports news. From the point of user needs and the characteristics of visual data, this paper discusses the methods and suggestions of data visualization design in CBA league news, in an attempt to form an intuitive, efficient and convenient visual form of sports news, which can promote the multi-dimensional development of visual symbols in sports news, and promote the progress of data analysis and prediction. The data visualization has become the core competitiveness of sports news.

1 Introduction

The influence of the era of big data has spread to every corner of public life, but simple data cannot convey information in a timely and efficient way. With the continuous development and maturity of data collection and visualization technology, how to show miscellaneous data in popular visual language has become a new research field. The resulting data visualization has become an important branch of information science and design. Among all the major news categories, sports news always attracts a high level of attention. Sports events such as the Olympic Games, China Football Association Super League and CBA have gradually become a part of public life in China.

The Chinese Men's Basketball Professional League is a multi-year home-and-away basketball league sponsored by the Chinese Basketball Association (CBA), which is the highest basketball league in China. In recent years, with the continuous development of big data analysis technology, data support is inseparable from athletes' competitive performance, coaches' tactical arrangements and referees' decisions. Data visualization provides powerful help for data transmission. It is a method to convey data connotation and an effective way to explore and understand data. Data visualization involves interdisciplinary cooperation in design, computer graphics and human-computer interaction.^[1] In the field of sports news, data as a driving force has given birth to sports data news, helping journalists to report a complex story through infographic.

2 Data Visualization of Sports News Driven by User Demands

2.1 The Demand for Intuitive Acquisition Caused by Diversified Mass Data

In the era of data explosion, data analysts and visual designers are required to have a deeper understanding and analysis of data, and at the same time, they also need to deliver the results to the audience more effectively, intuitively and popularly, as shown in figure 1.

Figure 1: The relationship between shot distance and defender distance, dribbles and touch time of NBA player

Especially in the data-rich field of sports news, visualization design has a higher priority. To be specific, in the basketball sports news, the goal is no longer to restore the results and process of the game to the audience with large texts or game videos. The standard to measure a basketball game is no longer simply the superposition of basic data such as points and rebounds. Through technical means, such as dynamic capture, image recognition, thermal imaging, the game data is extended to every player and every corner of the court. Every game produces a lot

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of basic and advanced data, such as Win Shares (WS), Offensive Box Plus/Minus (OBPM), PER (Player Efficiency Rating), the ratio of a player directly attacking the basket and jump shot and the corresponding success rate, etc.

The audience's ability to receive information is limited. The efficiency of image recognition is far higher than that of text recognition, so it is necessary to improve the way of data transmission and the efficiency of data communication. Data visualization has emerged in the demand of audience to receive information efficiently.

2.2 The Demand for Efficient Reading Caused by Fragmented Reading Habits

The pace of modern life is very fast. Traditional text needs to adapt to the times and adjust according to the needs of today's audience for news data content, highlighting the characteristics of accuracy, speed and understandability. Under the guidance of such objective needs, the content and form of data visualization gradually become clear, and become an emerging research field of sports news worthy of attention. For the corresponding audiences, competitive sports are not only a kind of spiritual sustenance, but also a kind of life adjustment. Such characteristics determine the entertainment of sports news. Visual presentation of data news can help the medias to grasp the needs of audiences in a short time and stimulate their desire to read.

Only by mining the hidden information and logic relations under boring digital symbols and narrating them through various forms of data charts, the fragmented reading needs of readers can be satisfied. At the same time, taking fragmented reading as an opportunity, it can stimulate the audiences' deep interest in a more rational and objective way, and indirectly promote the development of China's basketball career.

2.3 The Demand for Convenient Sharing Caused by the Social Entertainment Atmosphere

Nowadays, the social nature of various internet medias is the focus of public attention. The demand for sharing and interaction among news receivers is increasingly strong, which puts forward higher requirements for sharing content.

From the perspective of the transmissibility of social networks, visual data is more persuasive and attractive than traditional text forms. It can give consideration to the professionalism and interestingness of news, which is conducive to improving the accuracy and breadth of communication. Visual sports news pursues convenience, easy to read and share. All these characteristics determine the dissemination of visual data news on social platforms, which is more likely to cause topics and discussions on social media.

3 The Value of Data Visualization in CBA League News

3.1 The Profound Influence of Data Visualization in Sports News

3.1.1 Data Has Become the Core Competitiveness of Sports News. In the 1980s, the United States applied computer technology into basketball, volleyball and other sports games, so that it could comprehensively analyze the technical characteristics, habitual routes and tactical changes of athletes, and at the same time take the lead in data visualization. The National Basketball Association (NBA) is the undisputable no.1 professional basketball league in the world, and one of the important reasons is to organize the relevant information and data resources of the game. In addition to the official website, the NBA's database, <http://stats.nba.com/>, which fans use as an introductory manual, has data on every game played since the NBA was founded in 1946, and there are other online platforms that provide advanced data.^[2]

The data is a concentration of the game and a complete checking, so the data become the important source of sports news and core advantage. Such as Tencent sports NBA database, it has the detailed schedule, ranking, data statistics, data comparison, teams and players rule description, through a variety of static and dynamic data chart to display data in the NBA. CBA, due to weak technology and insufficient data sources, has outdated interface design, weak interaction, and has never had a perfect database for the audience inquiry.

3.1.2 The Visual Symbols of Data Develop from One - dimensional Accumulation to Multi - dimensional Compound. Early in the CBA, the league's commercialization degree is low. The game's statistical data was record just by hands, which mainly included the unidimensional data, such as points, rebounds, assists, the data dimension and quantity were very limited. Most of the audience's perception of the game is in a state of "stream of consciousness", such as a player who scores more will be considered a leader in the team, and this knowledge is often partial. With the support of new technology and design means such as image recognition, more states of players are recorded. Scores and assists are no longer expressed by simple numeral. Graphic forms such as scatter chart and radar chart are more and more widely used in sports news. Through the display of multi-dimensional composite data, the audience has a more macroscopic and accurate understanding of the whole game and the performance of players, as shown in Figure 2.

Figure 2: Tencent Sports -NBA player comparison interface

3.2 Data Visualization Design Promotes the Development of Analysis-prediction Function of CBA League Data Statistics

3.2.1 The Analysis Dimension of Statistical Data Has Evolved from Basic Data to Detailed Microscopic Data. Synergy Sports, a data-mining firm specializing in the NBA, put out a special tally from Michael Jordan: 80.2 percent of the Chicago Bulls' offense went through him; 54.3 percent of his shots came from the right side of the court; when the opponents had all the interference, his shots was 46.3 percent and so on.^[3] Before a high-level CBA game, the micro analysis of oneself and the opponent is indispensable, every detail of data may become the key to win the game. To sum up trends and laws from the vast amount of data, imagination or numbers alone are not enough to form theoretical support, so data visualization is particularly important. Communication efficiency in teams will be improved, and audiences will have a stronger sense of immersive experience when they get such information.

3.2.2 Establish a Perfect Player and Team Evaluation System with the Help of High-level Data. High-level data refers to the statistical model that uses basic data to calculate through various algorithms to generate new detailed data, which can more comprehensively reflect the offensive and defensive capabilities of a player or a team.^[4] With the deepening of the audience's understanding of the basketball game, the evaluation dimensions of the game gradually become diversified. High-level data visualization will guide the audience to have a deeper understanding of the game data and expand their knowledge in the professional basketball field, as shown in Figure 3.

Figure 3: NBA Raptors and Warriors players offensive and defensive efficiency capabilities distribution

At present, the data record table of FIBA used by CBA league is a pure input mechanism. It is simply the product of paper and pens, which cannot reflect the contribution of players in the game in a comprehensive way. In CBA reports, players' performance and high-level data are often discussed, however, due to inaccurate data or lack of data visualization, it is difficult to find a suitable point for discussion, and the information received by audiences is of low quality. In the long run, it is difficult to build a more advanced fan culture system.

3.2.3 Promote the Intuitive Analysis of the Highlights and Trends of the Game. Forecasting is one of the core values of sports news data. There are many factors that influence whether the audience watches the match, such as the strength gap between the two sides, the historical competition record and so on. Before watching the match, the audience always has expectations and hopes to form personalized prediction of the trend which based on the existing information. In the NBA database, there is a column of player data comparison, in which the basic data of per game, recent victory or defeat, and season data comparison are presented graphically. However, this comparison is absent in the CBA database. Data visualization should meet the needs of users in terms of both content and receiving mode, so as to effectively improve the experience.

4 Data Visualization Design Methods in CBA League News

4.1 Traditional Data Chart Design Methods

Data visualization is the expression of data. Multiple presentation of visual charts is extremely important, for example, font spacing, line spacing, font thickness and color and so on. The application of form principles such as grouping, alignment, repetition and comparison makes data arrangement neater and more concise, so that interactive experience can be more relaxed and flexible.

At present, data visualization in CBA league news is still in the early stage. Static charts are widely used, and interactive participatory design are rarely seen. Such as bar chart, pie chart, broken line chart, area chart and so on. Bar chart is a statistical chart with length as variable,

which can directly show the comparison of different numerical data; pie chart shows the proportion of each element; broken line chart shows the trend of event change, but their common disadvantage is that there is only one variable and the amount of information is very simple. There are also problems such as misuse of charts and data errors, etc.

The traditional data chart design can be summarized into four data visualization methods:

1. Area and size: to distinguish the length, height or area of the same type of graph to express the comparison between different data values.
2. Color: the intensity or size of the data value is expressed by the depth of the color.
3. Graphics: using meaningful graphics makes the data chart more vivid and easy to understand.
4. Domain space: using map as the background to understand macro data more intuitively.

4.2 Information Design Method

4.2.1 Static Infographic. The traditional chart can be understood as a one-dimensional static infographic. The multi-dimensional static infographic reintegrates the content of the data, not confined to traditional points, lines and planes, but combined with a variety of creative design elements.

Specific to the field of professional basketball, the main forms of multi-dimensional static infographic are scatter chart, thermal chart, stack chart, data map, time axis and so on. The scatter chart shows the distribution of data points in the rectangular coordinate system plane, as shown in Figure 4.

Figure 4: The chart of NBA's shot distribution in 2000-2001 and 2018-2019, which clearly shows the changes in the number of shots outside the three-point line

Shooting heat chart shows the shooting situation of players or teams in the game. The total shooting percentage and shooting situation of each position are displayed by dots of different colors. The size of points represents the number of shots and the color represents the percentage of hits. This method is widely used in NBA, but rarely in CBA. CBA often uses stacked graphs to show the strength comparison and winning rate analysis of both sides. Through the color display of confrontation between the two sides. We need to use flexible visual forms to drive the dissemination of sports news, interpret data from various angles, express media views, and convey emotions

and ideas.

4.2.2 Dynamic Infographic. Dynamic infographic can carry data with large amount of information and complex content, and its main functions are to present data, demonstrate process, sort out relationship, analyze and forecast. Because it is a data model with logic and structure generated by computer, its visualization form will not change due to the change of data, it has stability and adaptability. Its form covers a wide range of forms, including interactive charts, videos, animation, participatory games and so on.

Compared with static infographic, dynamic infographic greatly increases the amount of information, expands the space of sports news visualization. It is divided into non-interactive and interactive.

The presentation of non-interactive dynamic infographic is independent, and doesn't need interactive operations by users. For example, the dynamic ranking bar chart moves up and down according to the time sequence to show the change of data value. This kind of dynamic infographic can insert a large amount of data in a few minutes of display time, and show the trend of data change, so that the audience can form the event development context in a short time. NBA has used them to convey the team's historical ranking, player score ranking and other data for many times, which is easy to spread in the social network and obtain good communication effect. The interactive dynamic infographic will accordingly change by users' operations. Users can interact by clicking on the screen.

4.3 Interaction Design Method

4.3.1 User Research: Understand the Real Needs. It is the core value of data to understand users' behavior habits and hobbies. In the editing process of sports news, the real needs of users are easy to be ignored. The data that the audience care about and the high degree of recovery of the game may not be displayed in the news page, resulting in incomplete and imperfect user experience. Each type of competitive sports has its own particularity, so the user research under CBA data news direction is particularly important.

First of all, a large number of real and effective user data are obtained through questionnaires and interviews. The requirements are decomposed one by one and presented hierarchically to form a hierarchical list of requirements. A group of first level requirements can be subdivided into an array of secondary requirements, and the secondary requirements can be further subdivided.^[5] In the hierarchical demand list, it maps with the relevant competition data one by one, so as to find the point of data visualization. Secondly, through eye movement analysis and other technical means to grasp the visual center of gravity and assist data visualization design. When users are browsing sports news, due to their own habits and the layout of interface element and other factors, there will be certain differences in the browsing order and dwell time

of each area in the screen, and a relatively fixed browsing mode will be formed. This mode has important reference significance and provides evaluation criteria for the usability of data visualization design.

4.3.2 Personas: Build Location of the Target Users. The breakthrough point of finding users' needs lies in finding the typical examples. Personas is a target user model based on a series of attribute data, which mainly consists of two parts: sociological and demographic attributes, such as age, gender, income; vertical domain attribute, that is, the domain of the product can divide the attributes of users. Specific to the CBA data news field, the user's age, basketball knowledge, team preference, understanding degree, attention angle and other dimensions need to be divided. Different levels of CBA data news readers have different characteristics. Sorting them out, dividing them and constructing detailed personas will have guiding significance for data visualization design.

4.3.3 User Journey Map: Disintegrate Behavior, Dig into Requirements. After sufficient user research and personas, the contact and behavior of each user are visually expressed to understand how users gradually achieve their goals, which will form a complete user journey map.

User journey map is a design tool to sort out user scenarios and experiences. First, a demand is analyzed horizontally according to user behavior, and then each behavior node is analyzed vertically. In this process, fuzzy requirements can be decomposed into user roles, scenes, behaviors and other elements, which can be visually expressed to locate the pain points in the experience process.^[6] Watching a CBA game and news is a complete behavior process, mainly including: understanding the competition information, watching the game, resuming after the game, browsing the web page, selecting data classification, data comparison, and expanding news. The division of user needs to be very detailed, such as data screening, player data layout logic, player data comparison, regular season and playoff data comparison and so on. To make a good data news and its visualization works, it is necessary to understand the nodes of each user's behavior process, find the requirements in the details.

5 The Development Prospect of Data Visualization Design in CBA League News

5.1 Using the New Technology and Method, Inject vitality into CBA League news

Basketball game is a dynamic visual feast. The expression of dynamic information is more infectious and participatory than that of static information. The single dimensional data form is bound to be gradually replaced. The traditional CBA league news is mainly based on text and statistical chart, but lacks the data news conforming to

the technical characteristics of the times, such as VR technology, dynamic capture, image synthesis, dynamic graphics, animation rendering and so on. A CBA player hits the goal in the final moment of the finals. It is difficult to mobilize the fans' emotion only by a text report. However, if it is a 360° dynamic image, a period of tactical analysis animation, or even using VR technology to let the fans experience the big heart moment in the game, they are enough to make the fans ebullient.

5.2 Enrich the Interaction of Visual Data and Enhance the Social Attribute of CBA League News

Traditional data charts are mainly static charts, which have single visual form, lack of interactivity and weak communication effect. In interactive visual data news, readers can choose the content of intention according to their own needs, combined with audio, map, animation and other visual forms to help readers understand complex sports data and improve the degree of participation and interaction.

In the future CBA visual data news, users can customize the type and range of data, and the system will automatically generate dynamic videos reflecting the data changes, which will become an opportunity point for the geometric growth of social networking. At the same time, the development of QR code technology in recent years has provided an entrance and opportunity for social news media. It is the general trend of sports news development to strengthen the integration of data visualization works and social media, and pay attention to the development of mobile terminal.

6 Conclusion

Sports news plays an important role in the field of news. CBA is also an indispensable part of Chinese professional sports league, and has a large audience group. Now the data news needs to find ways to improve the connection with the audience, and the data visualization has become an important carrier. Due to its unique advantages, by using interactive all-media presentation such as text, picture and audio, it can provide the audience with immersive professional basketball news, improve the user's reading experience, and improve the popularity and influence of CBA League. This will be the breakthrough for the audience to understand Chinese basketball. Now the practitioners of CBA league news and visual designers should do is to obtain data from multiple channels, combine well with existing technology, use data to tell basketball stories, improve users' cognitive depth and participation, and contribute to the development of China's basketball industry.

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