[1]Xiaofang Fu

Research on Training Mechanism and Energy Efficiency of Art Design Talents Based on Student Information Clustering Under the Background of Big Data

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Abstract: - Using student data clustering in the context of big data, this study explores the energy efficiency and training processes of art design skills. To overcome the shortcomings of existing talent information service platforms, it highlights the significance of smart school-based dynamic information services and multi-integration visualisation systems. This study lends credence to the idea that big data may revolutionise the educational landscape and calls for strong information fusion management systems to keep up with the changing needs of businesses. The study's overarching goal is to help students transition more smoothly from high school to college by utilising sensing technology and developing standardised platforms. The results highlight the interdependence between educational institutions and urban growth, highlighting the importance of dynamic management and ongoing data updates for successful talent cultivation. As a whole, this strategy will help bring smart city expansion into reality by improving public employment services and bolstering intelligent talent management.

Keywords: Training research, art design students, big data, energy efficiency

Introduction

There have been dramatic shifts in the art design educational environment in the age of big data. There are new opportunities to improve training processes and energy efficiency in fostering art design abilities through the integration of modern data analytics approaches into educational frameworks. Student information clustering, a technique that uses big data to group students into groups according to different characteristics, allows for more efficient and tailored teaching approaches, and this study intends to examine these aspects via its prism.

Big data is the rapid, diverse, and authentic accumulation of massive amounts of data from many sources [1]. Student demographics, academic achievement, behavioural data, and even social contacts are all part of the vast array of information that education big data includes. Improving decision-making, tailoring learning experiences, and educational results are all possible through the use of big data analytics in the classroom [2]. Teachers may better meet the needs of their students by identifying trends and patterns in this data and using that information to create individualised plans of action.

Data mining technology known as "student information clustering" groups students into sets according to how similar their data profiles are. Algorithms like k-means, hierarchical clustering, and DBSCAN are employed in this method to group students with shared traits [3]. Academic achievement, preferred methods of learning, degree of participation, and family income are all examples of such factors. Educators can improve the efficiency of the learning process by grouping students into smaller groups and creating individualised training programmes to meet the needs of each group [4].

A special combination of imagination, technical know-how, and analytical reasoning is necessary for success in art design programmes. Because art design students come from such a wide variety of backgrounds, traditional classroom approaches don't always work. More adaptive and personalised training systems that address students' unique needs are now within reach, thanks to big data [5]. Educators may build individualised learning plans by analysing data from a variety of sources to find out how each student learns best and where they stand.

The term "energy efficiency" is used to describe the process of making the most of available resources in order to maximise learning results while minimising waste. Not only does this include making the most of classroom space and tools, but it also entails fine-tuning pedagogical practices and managing students' time effectively [6].

[1]School of Art and Design, Henan University of Engineering, Zhengzhou 451191, China

E-mail: fuxiaofang1980@163.com

By revealing underutilised resources and operational bottlenecks, big data analytics may be an indispensable tool for improving energy efficiency.

Several advantages may be gained by using clustering and big data approaches into art design Syllabi. To begin with, it paves the way for the creation of individualised educational interventions by facilitating the detection of unique student profiles. One strategy is to provide students with great technical ability more creative opportunities, while another is to provide students with high creativity but low technical skills more technical instruction [7]. The second benefit is that it lets teachers track their students' development in real time and adapt their lessons accordingly [8].

Although clustering and big data have enormous promise for improving art and design education, there are a number of obstacles and factors to think about first. Safeguarding students' personal information is a major obstacle. To secure sensitive information and stay in compliance with applicable legislation, educational institutions must establish strong data protection mechanisms [9]. It is also important for teachers to learn how to properly analyse and understand large data. To do this, one may need to further their education and acquire skills in data analytics and associated technologies [10].

The use of clustering and big data in art design education has been shown effective in several case studies. Research at a prestigious art school, for instance, used k-means clustering to classify students according to their preferred methods of instruction and other performance indicators. Improved student achievements and satisfaction were the results of using the generated clusters to build individualised learning programmes [11]. Another research used hierarchical clustering to find at-risk pupils and then used interventions to help them stay in school and succeed [12].

In the era of big data, there are intriguing prospects for the future of art and design education. More nuanced and complex insights into student learning may become possible as data analytics tools advance [13]. To improve the grouping and analysis procedures even more, future studies may look at how to use AI and machine learning methods [14]. There is also room for innovation in the realm of cross-disciplinary applications, whereby art design curricula might benefit from the incorporation of big data findings from disciplines like neurology and psychology [15].

To improve the teaching processes and energy efficiency of art design education, a revolutionary solution has been proposed that integrates big data with student information clustering [16]. Teachers may better meet the requirements of their students by creating individualised and impactful training programmes based on data-driven insights. Students and schools stand to gain a great deal from this, but there are some obstacles that must be overcome first, such as concerns about data privacy and the requirement for specialised skills. The use of big data in art design schools has the potential to greatly enhance the effectiveness and efficiency of teaching aspiring artists as the discipline develops further.

Ultimately, this study highlights the significance of embracing fresh, data-driven methods of education in this digital era. Big data and clustering approaches provide educators with new opportunities for personalised learning, resource optimisation, and the development of creative and talented art design professionals.

2. Materials and Methods

When using the talent development paradigm, pupils are unable to articulate specific objectives for their education. The aspiration to "taking the university" is firmly entrenched in the hearts of individuals, especially among pupils in the high school stage. A multi-integration visualisation system is an integral aspect of smart school research and demonstration of top-level design management and multi-regulation information fusion technology. There is no way to quickly gather and interpret massive amounts of data, and the data offered by the current talent information service platform is somewhat stagnant. Even more challenging is the provision of dynamic information services, as is the attainment of genuine "transparency" between managers and talents. Digitalization, networking, intelligence, interaction, and technical synergy are the defining features of smart cities. Particularly noteworthy is the extremely high degree of connectedness and interoperability seen in urban systems. There is an emphasis on people-oriented sustainable innovation at the educational, cultural, social, and economic levels. Advances in the information society have spurred seismic shifts in the technological landscape. Numerous sensing technologies, including automatic recognition, sensors, remote sensing, wireless transmission, and others, find widespread application in both industry and daily life. This helps further smart city visions of complete pervasiveness and interconnectedness of all things and people. Figure 1 depicts the initial meeting of a company's effort to build an information fusion management system.

Figure 1. Launch meeting for the information integration management system

Education in people management is grounded in the real demands of societal and individual progress. After all factors have been consistently assessed using the four-point system, we may examine the effects of price competition on different factors more thoroughly. In the section devoted to the argument, the concept of price competition standardisation is used. Six distinct parts make up the training evaluation. Tabulated in Table 1 is the particular breakdown. You can see the connection between normalised value and talent development assessment in Figure 2.

Table 1. Submission table for talent cultivation assessment

Training assessment factors	0-10	10-20	20-30	30-40	40-50
Standardized significance	0.17	0.29	0.42	0.63	0.72

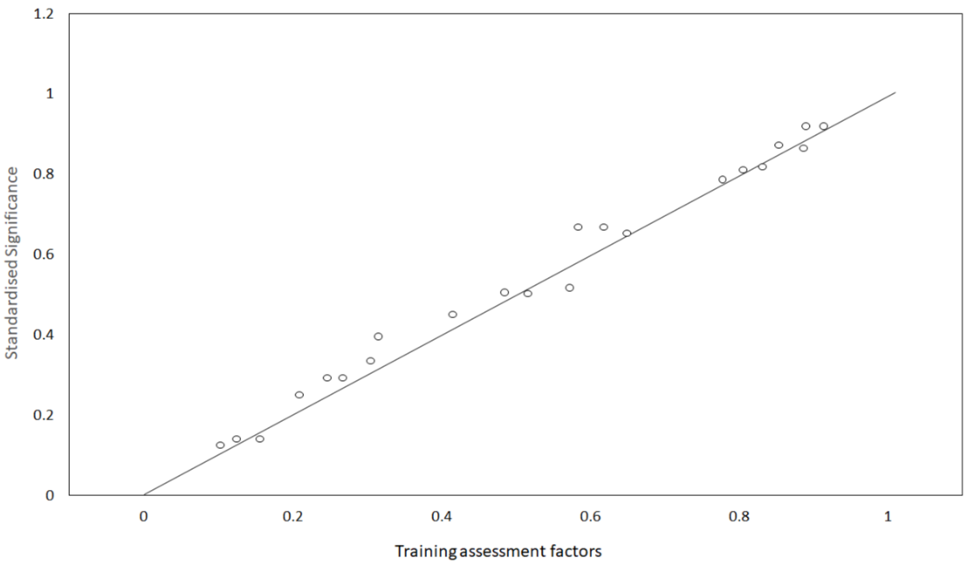

Figure 2. Assessment of talent development and its relationship to normalised value

Create a plan and carry it out methodically. It is a methodical effort to encourage the computerization of public sector employment skills. Talent planning should be a part of the process for creating public sector employment talent informationization goals. Make sense of the local industrial structure and economic development status in order to establish reasonable goals for long-term development. Students in high school are able to successfully complete a wide variety of review papers and homework assignments. But once they get to college, no one tells them what they need to know. Students don't have a firm grasp on what lies beyond college, and the worlds of work and society appear incomprehensible. For smart city projects involving "multi-regulation" via informationization, a multi-information fusion visualisation system is a crucial tool for finding solutions and providing support. Over a certain period of time, the website's data, including the number of talents, educational background structure, age structure, title structure, job performance, and more, stays largely unchanged. Dynamic updates cannot be accomplished. There has been a tremendous amount of data generated, and both the aforementioned details and the demands of businesses as employers are constantly evolving. In the construction industry, we must perpetually seek out new information and gain experience. The talent information fusion management system's network structure is shown in Figure 3.

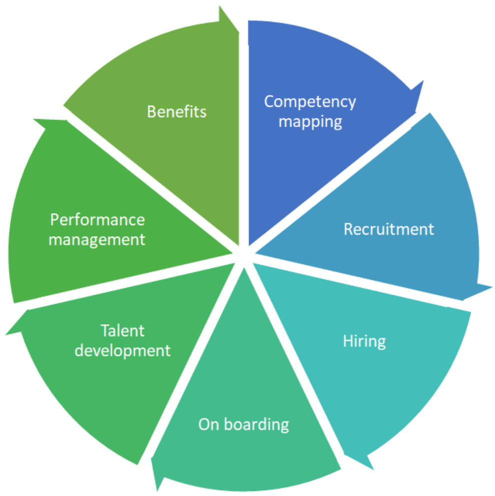

Figure 3. Managerial network architecture system for talent information integration

A company's level of information integration management competition can be expressed as follows, providing a simple metric for evaluating its talent system development and information fusion management:

$$BD_j = \frac{DT_j}{T_j} = \sum_k (1 - \sum_r q_{jr} n_{kr}) / \sum_k \square \qquad (1)$$

Modify, determine the weight of the connection and the threshold, and then put any value:

$$DJ_j = \frac{\sum_k (\frac{D_{jk}}{D/M} \ln (\frac{D_{jk}}{D/M})}{M \ln(M)} \qquad (2)$$

Infrastructure, data, platform, and application layers make up the four primary tiers of the system architecture. Here are some input samples and the intended output:

$$Q_j = \frac{g_j}{\sum_{j=1}^{M} g_j} \qquad (3)$$

Online recruitment channels have outperformed more conventional methods during the last three years of business recruitment, according to the survey data. New mobile recruitment channels have been popping up at a steady rate. Year after year, the percentage of recruitment websites continues to rise, surpassing that of job fairs by a wide margin. Table 2 shows the channels that were used to introduce enterprise talent in 2018.

Table 2. proportion of channels that are utilised to introduce individuals to entrepreneurs.

Channel for presentation	**Ratio (%)**
Site for hiring industry experts	68.5
Full-service online recruiting	49.2

Relying on outside agencies	46.3
hiring on campus	40.8
Market for talent	35.5
Online platforms	29.6

Many diverse domains are involved in the building of smart cities, each with its own unique set of challenges and opportunities. It is important to keep the horizontal variances across the different fields to a minimum. The integration of resources and the collaboration of businesses can only be achieved with the construction of a common fundamental technological foundation, application, and service platform. These problems require immediate attention. In order for the Internet business to re-emerge and overcome the economic crisis, technical innovation and revolution have become a critical breaking point. The abolition of the economic crisis, the development of vital high-tech enterprises, and the seizing of technological leadership positions have become the primary drivers of smart city growth. When it comes to developing pupils' initiative, the conventional training strategy falls short. Because of all the cramming that goes on in high school, some students have developed the bad habit of just taking what their teachers say at face value. We should be able to effectively localise expanding functions according to local situations if we adopt the unified index system of the whole country. Upon the realisation of synchronous information networking in different locations, a mechanism for cross-regional information interconnection and interoperability should be put in place to overcome regional limits and build and enhance an information public service platform. All types of workers and public employment people service institutions will be able to use this as an inquiry service, and it will also connect various areas. An information fusion management perceptual service model is shown in Figure 4.

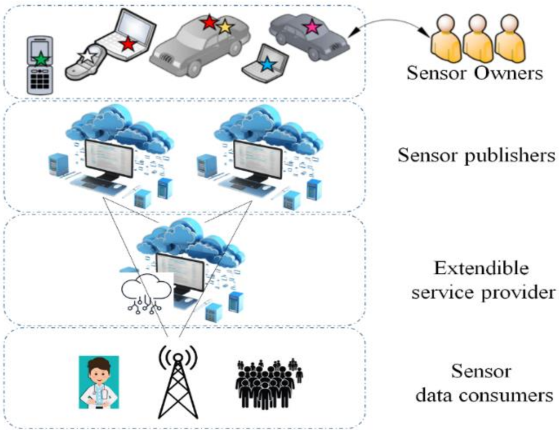

Figure 4. Model of perceptual services

Within the learning echelon, students in higher grades are responsible for distributing projects to those in lower grades, while teachers delegate responsibilities for extracurricular professional projects to students in their last year of school. Students' problem-solving skills and ability to study independently are assessed through this process. Many college professors struggle with a lack of familiarity with the new curriculum due to a lack of understanding of its concepts and requirements. Syllabi on managing teacher information fusion are summarised in Table 3.

Table 3. Analysis of teacher preparation for data integration and management

	Perspective on the curriculum	**Materials for the syllabus**	**Syllabus execution**	**Syllabus assessment**	**Syllabus modification**
Mean mark	6	9	6	5	4
Rate in %	63.8	58.1	62.4	50.2	60.6

Within the framework of smart school building, we investigate methods and approaches to "multi-integration" information fusion, sharing, and visualisation through the use of a single multi-protocol technological standard and operational mechanism. Analysis and integration of intelligent transportation, application, safety, and management standards can inform standardisation operations that optimise combinations by refining commonalities. For the purpose of building smart schools, a framework is put in place to standardise technical aspects, applications, and services. There are a number of social paradoxes that have grown more apparent in China's urban growth as the pace of urbanisation has accelerated. For cities to seek development, economic reform and industrial restructuring are significant paths. In order to address the issue of not having a reference or effective technical framework for building a multi-disciplinary integration platform against the backdrop of smart schools, the employer is seeking a wide range of talents, including those in business management, professional and technical fields, skilled labour, social work, and e-commerce. An innovative approach to city planning, the intelligent school emerges to address the challenges of modern city planning.

Cities around the nation can use it as a guide when building their own "multi-disciplinary integration" platforms. Achieving intelligent management in population, industry, and public services becomes a reality for smart cities with its help. Here is how each cycle's average value is determined:

$$Z_k(u) = \varphi\left(\sum_{j=1}^{m} W_{kj} Y_j - \theta_k\right) \quad (4)$$

Each component in the output layer has its real output determined by:

$$P_k(u) = f\left(\left[\sum_{j=1}^{m} X_{jk} y_j (u - \tau_{ij})\right] - U_{jk}\right) \quad (5)$$

At last, set the thresholds and weights for connections:

$$T(\tau, f) = \int_{-\infty}^{+\infty} i(u)\omega(\tau - u)e^{-j2\pi f} dt \quad (6)$$

In addition to serving as a meeting spot for the community, the school is also a marketplace. For each period in two cycles, find the average increase and initial exponential smoothing value.

$$Z_{f-o_n} = \sum_{j=1, j\neq o}^{O} \sum_{m=1}^{N} \sqrt{q_{j_m}} i_{j,o_n}^{U} X_{j,o_n} T_{j_m} \quad (7)$$

3. Result Analysis and Discussion

Not only is there rivalry in today's social economy and technology for the amount and structure of skills, but there is also competition for the invention and creativity of talents. For graduate employment data, systems should be put in place to integrate and share resources. For the benefit of both college grads and better management, we should seek to increase the visibility of graduate job networks and the services offered by these networks. Experienced professionals in the field of big data should be highly skilled in data processing, analysis, and visualisation. Big data training is an organised endeavour. Scientific talent demand forecasting isn't enough; matching training and training for work requirements are also essential. Gathering, analysing, and fusing multi-dimensional data is a crucial part of building the multi-dimensional information fusion visualisation system.

An intelligent application of next-gen information technology—the Internet of things, cloud computing, etc.—forms the backbone of a smart school. The dynamic between governments, businesses, and individuals will shift as a result of this. Improving the efficiency of urban operation and creating a better urban life for residents can be achieved by a swift and intelligent reaction to diverse needs, such as protecting the environment, public safety, urban services, industrial and commercial activities, and people's livelihoods. The objective, from an IT standpoint, is to construct an ideal and sophisticated intelligent system that will allow the school to run smoothly, accurately, and conveniently. The system's architecture is illustrated in Figure 5.

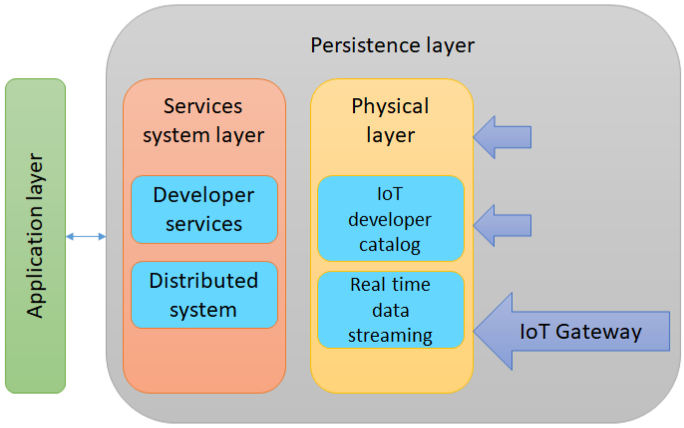

Figure 5. Intelligent design for educational systems

We investigate the interplay between smart city information resources, multi-level data from different agencies, and standardised, operational processes. A data directory system that spans multiple disciplines is set up. Here is how to determine the hidden layer units' outputs:

$$Q_{f-o_n} = \sum_{j=1, j\neq o}^{O} \sum_{m=1}^{N} Q_{j_m} \left\| i_{j,o_m}^{U} X_{j,j_m} \right\|_2^2 \quad (8)$$

The appropriate information is gathered in accordance with the mathematical concept in order to specify in depth the process of information gain:

$$cell_{\,qt-o_t} = \underset{m, m\neq cell_{qt-(o_t-1)}}{argmax} \left(\sum_{n=1}^{N} Q_{f-o_n}\right) \quad (9)$$

Technically speaking, building smart schools primarily aims to address "information islands" and low-level redundant creation of segmentation. Additionally, this is where smart cities' "comprehensive perception and intelligent collaboration" will come to fruition. For the smart school information fusion index, the results of the significance test and structural parameter estimate are displayed in Table 4. Shown in Figure 6 are the values of the information fusion parameters and the relationships between them.

Table 4. Estimation of information fusion parameters and significance test performed.

Path explanation	Blend feature	Path quantity
Education capability	6.21	6.48
Elevation capability	4.15	4.66
Administration capability	6.52	5.19

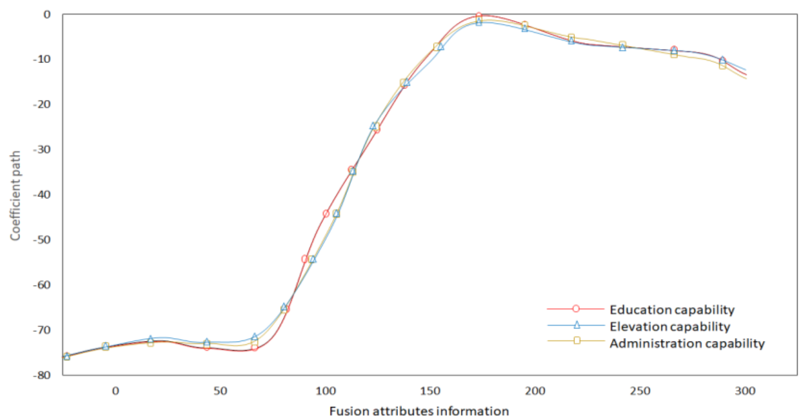

Figure 6. Path linkages and parameters for information fusion

In addition to allocating more resources to informatization and intelligence, understanding the importance of talent cultivation is crucial for constructing a smart school. Talent is the bedrock of technical insight and innovation since it is a liquid resource with tremendous value-added potential. Complete the informationization of job services and management of jobs by progressively establishing a national or even regional platform for graduates to access employment services. Students performing at a high level will form the team's foundation at the upper level of education. Students with lower levels can receive assistance in completing both regular and extracurricular learning assignments. We will develop a system for big data training and competitions by utilising technologies that link networks. Construction of multi-gauge data systems, collection of multi-gauge data, integration and processing of multi-gauge data, and storage of multi-gauge databases are all covered in detail, along with practical training, case analysis, theoretical advancement, and skill negotiation. In order to fulfil the unique demands of multi-gauge data collection, processing, and fusion, and the use of multi-gauge information fusion visualisation systems, a multi-routine information fusion solution was developed. This solution incorporates the entire process, from building to managing to using and even enjoying it. To illustrate the extent to which the information fusion speech management curriculum accomplishes its instructional goals, Table 5 provides a survey and statistics.

Table 5. Research on the goals of using information fusion and speech management methods in the classroom

Understanding level	**Completely understood**	**Incomplete understanding**	**Not applicable**
Nominated quantity	15	28	27
Ratio (%)	21.4	40.0	38.5

When it comes to technological standards in particular, standardisation is crucial. The terms "smart school" and "digital school" do not encompass the same geographic area. It emphasises the importance of school for human existence and the value of every individual for school by utilising information and communication technology to its fullest potential. The government is making every sacrifice possible to manage and distribute resources in order to assist the creation of smart cities, given the current state of affairs. Network architecture and hardware transformation receive substantial annual investments of labour, materials, and capital. A proposal for an intelligent school and subsequent building activities are soon to follow. Included in a novel approach to growth, it personifies the role of self-innovation. It boils down to massive shifts in production, consumption, transportation, and public services. We are currently investigating new avenues for the commercial development of talent service networks and constructing a diverse public employment personnel service information platform. A human resources SMS service platform is being built using new information service methodologies. Standard standards are promptly updated with valuable and completely utilised pilot outcomes. In the end, we advocate for a standardised paradigm for building smart schools and conduct demonstration pilots in a more extensive and comprehensive sector.

Talent mobility is substantial because of variables such regional wage disparities, industry-specific variations, and imbalances in economic development among regions. The option to look for work online has grown in importance. The significance of a talent network in the job search is growing. Geographical variances, relatively independent information exchange, incomplete or outdated information, and a lack of centralised services are just a few of the issues plaguing current talent websites. New demands are too much for them to handle. Improving the functionality of talent websites, integrating resources, and developing new service modes are all critical priorities. Improving the quality of professionals, raising the technological level of informatization construction, and increasing the investment of informatization funds for public employment staff are the essential guarantees for the smooth implementation of informatization. System maintenance funds should be included in the budget at the same level as special employment funds, and investments in computer and network hardware, software acquisition, development and application expenditure, and public employment service informatization should be ramped up. The talent information construction architecture is illustrated in Figure 7.

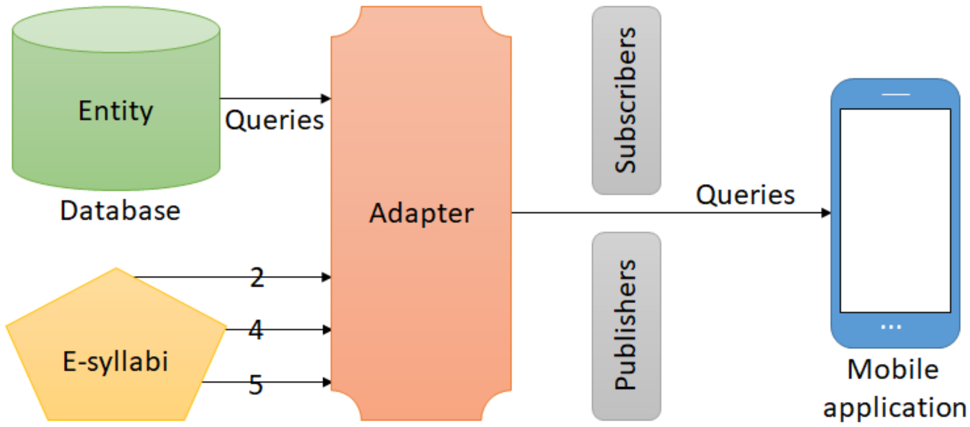

Figure 7. Architecture for the production of talent information

A society's material richness is a reflection of its social and economic development, which in turn determines the level of development in its educational institutions. Follow these steps to determine the level of information fusion every cycle:

$$\mu_{t,e} = \frac{1}{NO}\sum_{n=1}^{N}\sum_{o=1}^{O}\left|X_{t,e}(n,o)\right| \quad (10)$$

Together, the building of smart cities and the standardisation of smart school construction are essential. Particularly, standardisation efforts should be carried out with precision, and the unique content of smart school construction should be split according to various development modes and beneficial regions of each school. The way that is most commonly used is to calculate information gain. The degree of information acquisition is calculated using the following formula:

$$\sigma_{t.e} = \left[\frac{1}{NO}\left|\sum_{n=1}^{N}\sum_{o=1}^{O}\left|X_{t,e}(n,o)\right| - \mu_{t,e}\right|^{2}\right]^{1/2} \quad (11)$$

$$N(X) = \frac{X}{E}S_{WM} + (1-\frac{X}{E})S_{OFF} \quad (12)$$

It is impossible for a single information technology to address every issue with smart city construction, even while IT does offer technological potential for such endeavours. From a structural perspective, it encompasses things like standard specifications, information resources, application services, security systems, and infrastructure. It encompasses not only ecological but also social, cultural, political, and economic aspects. Building on the foundation of a multi-standard data system, the storage form, coordinate system, and file format are all enhanced to incorporate multi-standard data gathered from different departments. The base map data is transformed into a standardised format with standardised coordinates and storage. In this process, a string of data is constructed and saved, including regularisation, inspection, storage, verification, and symbolization. For both theoretical and practical learning, the open big data pedagogy is used online. Businesses can be sure that they will have access to enough top-notch big data talent when they need it thanks to this method, which helps students quickly understand the material.

4. Conclusion

Examining art design talent training methods and energy efficiency via the prism of student data clustering, this study demonstrates the revolutionary power of big data in the classroom. The techniques highlight how smart schools rely on dynamic information services and visualisation systems with many integrations. Research shows that existing talent information service platforms aren't keeping up with data needs, thus companies and sectors will require a flexible data integration management platform to keep up. Sustainable innovation in education may flourish in the smart city framework, which is defined by digitization, networking, intelligence, and interaction. The study's overarching goal is to help students overcome the absence of clear educational objectives by combining different sensing technologies and developing a standardised technical and service platform. This will help them go from high school to college prepared. By demonstrating the interdependence between educational institutions and urban growth, the results stress the importance of dynamic data management and ongoing updates to facilitate talent cultivation. Public employment services and intelligent talent management stand to benefit from the multi-information fusion solution that has been suggested, which should help bring smart city development one step closer to reality.

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