

# Conservation Situation and Social Network Analysis of Industrial Heritage in Tangshan City, China

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## ABSTRACT

Due to rapid urbanization development, industrial heritage is gradually being replaced by luxury residential buildings. Heritage is an asset of collective interests and made up of inherited tangible and intangible attributes. Since the late twentieth century, much attention has been paid to the analysis of industrial heritage, as it stands witness to the significant influence of industrial civilization on the economy, social development, and human production. The objectives of this research are to evaluate the economic, cultural, and historical values of industrial heritage in Tangshan, China and renew this heritage from the perspective of the cultural industry. Combination analysis of qualitative and quantitative methods is used to reflect the conservation situation of industrial heritage in this city and also evaluate the accessibility of these heritage to show their potential for renewal based on the data from surveys and statistical yearbooks. The results show that the present situation of the conservation of industrial heritage in Tangshan is developing rapidly, and the cultural industry becomes not only an attractive means for promoting the development of iron and steel, coal mining, and cement industry, but also inheriting industrial culture of these industries. Meanwhile, based on the quantitative analysis results, indicating that Kailuan Coal Mine and Tangshan Railway Site receive the highest concern from the government from the perspective of transportation for their conservation and renewal. This research can provide scientific basis for the value assessment and future renewal of industrial heritage for other heavy industry-based regions.

**Keywords:** *Industrial heritage, Value assessment, Renewal, Social network analysis*

## INTRODUCTION

Heritage is an asset of collective interests and made up of inherited tangible and intangible attributes. These attributes can benefit society's present and future (Dela & Anral, 2019). World heritage is a legacy from the past that links nature conservation with the preservation of cultural property. In 1972, the United Nations Educational, Scientific and Cultural Organization (UNESCO) adopted a document

that recognized the ways in which people interact with nature, and the fundamental need to preserve the balance between humans and nature. According to the UNESCO World Heritage Centre (2021), across the globe there are 1154 forms of heritage belonging to 167 nations. This heritage can be divided into three categories: cultural heritage (representing 78% of the total), natural heritage (19%), and mixed heritage (3%). One form of cultural heritage is industrial heritage. The International Committee for the Conservation of the Industrial Heritage defines industrial heritage as an industrial site that is of historical, technological, social, or scientific value.

Industrial heritage consists of buildings and machinery, workshops, mills and factories, mines and sites for processing and refining, warehouses and stores, places where energy is generated, transmitted and used, transport and all its infrastructure, as well as places used for the social activities related to industry, such as housing, religious worship, or education (Udeaja et al., 2020). The conservation of industrial heritage is related to politics, economics, culture, and architecture, and is an irreplaceable feature of one city (Aburamadan et al., 2021). Furthermore, policy measures that guarantee the conservation and renewal of cultural heritage contents are often lacking (Petti & Makore, 2019). Since the late twentieth century, much attention has been paid to the analysis of industrial heritage, as it stands witness to the significant influence of industrial civilization on the economy, social development, and human production.

In light of globalization and economic integration, the research and conservation of industrial heritage has gradually increased. The International Committee for the Conservation of the Industrial Heritage (TICCIH) was established in 1978. This global organization was the first to seek to research and conserve industrial heritage, with the conservation of industrial heritage originating from industrial archaeology in the United Kingdom. The establishment of TICCIH promoted the significance of industrial heritage, and conservation movements spread throughout the world. In recent years, industrial heritage conservation has attracted increasing attention in China. Since 2017, 163 pieces of industrial heritage have been included in the Ministry of Industry and Information Technology's National Industrial Heritage List (Ministry of Industry and Information Technology of the People's Republic of China, 2021).

Due to rapid technological development, in some areas, industrial heritage is gradually being replaced by luxury residential buildings. However, given that the historic sites of industrial heritage are a way to retell the past to the benefit of society, the conservation of historic environments can be used to preserve the intrinsic value of the past and to accommodate new social and economic demands. Industrial heritage has historical, social, and economic value for two reasons. First, industrial heritage is a way to record detailed historical information and can allow us to reflect on stages of human civilization and technology development. Second, the creativity, inspiration, or imagination behind industrial heritage represent the characteristics and national spirit of the era. Therefore, the conservation of industrial heritage preserves human culture and emphasizes its role in the formation of the characteristics of regional development.

As one kind of cultural heritage, the renewal of industrial heritage integrates cultural elements through, for example, the use of symbols to magnify social and economic development, in a process known as cultural integration. The industrial heritage that forms part of urban culture is expanded through processes of urban development. One knowledge-intensive industry is the cultural industry. As the cultural industry is an operational part within social culture, it has the same attributes as social science, and it can be divided into the production of cultural products and provision of cultural services. The development of the cultural industry is closely linked to national development. The Outline of the People's Republic of China 14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives for 2035 published in 2021 stated that the development of cultural industry is an important driving force in regional industrial development (Xinhua News Agency, 2021). As one form

of cultural industry, the preservation of industrial heritage may also be affected by aspects of cultural industry.

This research chooses the industrial heritage in Tangshan, China as a case study. Tangshan City, located in the north-eastern region of China, owes its role as one of north-east China's heavy industrial bases. Although the conservation of cultural heritage in this city has made an achievement, there are still some problems existing. The present research focuses on the industrial heritage of this city to provide a scientific base for the development of industrial heritage in China and the promotion of cultural industry.

The objectives of this research are fully analysing the economic, social, and historical value of industrial heritage in Tangshan, China, and renewing these values from the perspective of cultural industry, and evaluating its present conservation status. Furthermore, identifying and evaluating values of industrial heritage is a basis for further conservation methods development. Such an evaluation can also result in guidelines for the renewal of industrial heritage. And the significance of this research lies in two aspects. Firstly, the combination of cultural industry with industrial heritage renewal is a newly developed industry that could meet people's requirement on spiritual culture, and has the functions of service, the proposed innovative cultural industry-based methods will help to reflect the history and value of these industrial heritage sites. Secondly, this research provides suggestions and guidelines for the future management of conservation and renewal from the perspective of the cultural industry, exploiting innovative renewal methods will enrich regional planning systems.

## **LITERATURE REVIEW**

### **Theory of industrial heritage conservation analysis**

With growing attention on world heritage, as one form of cultural heritage, industrial heritage is related to the fields of politics, economics, culture, and architecture, and is a crucial concern for nations and governments. Industrial heritage as a branch of cultural resources, research is mostly related to its significance and values for social development (Claver et al., 2021). Industrial heritage can be divided into types of material form, such as industrial antiques, architectural complexes, and industrial sites, and into different intangible forms (Dela & Anral, 2019). The material forms of sites include constructed complexes, mechanical workshops, production workshops, processing and refinery sites, storerooms, transportation infrastructure, and educational and religious sites (Liu et al., 2018). The intangible form of sites includes memories, oral expressions, or habits (Le & Yuan, 2021).

The value of industrial heritage lies in social and economic development within cities (Bartolini & DeSilvey, 2020). Heritage can attract business investments that create economic revenues from the tourism market, and it also provides employment opportunities to positively support the conservation of heritage. And sometimes, the conservation of heritage makes preparation for urban development or redevelopment.

The theory of the conservation of industrial heritage emerged in the United Kingdom in the latter half of the twentieth century (Shao, 2017). As some industrial heritage sites have been gentrified, conservation analysis has been adopted in urban regeneration projects (Anders, 2018). The conversation of industrial heritage is embedded in its value (Echeverry et al., 2021). Many industrial heritage sites retain traces of their human history and the technological and technical progress that occurred in them (Su et al., 2018). The Great London Industrial Archeology Society was established in 1968 with the aim of recording the historical remains of industrial London (ICOMOS, 2006). Such conservation advocates for the cultural, historical, and economic significance of obsolete spaces, and it often goes together with

urban regeneration projects as the heritage entails the creation and legitimization of a new set of cultural meanings. However, the problem now is how to progress the conservation from a conceptual to an operational level, including the conservation from the holistic, integrated, and value-based dimensions.

The conservation history of industrial heritage is related to economic, social, and cultural development. Max and Calvin (2001) examined policy issues connected with a programme of economic redevelopment that centred on the conservation and renewal of the industrial heritage of Blaenavon Industrial Landscape in South Wales. After analysing the values of heritages on promoting economic development, this research also discussed some trade-offs between the maintenance of cultural values and site commodification. Thus, the controversy becomes a point that needs to be highlighted. Shackel and Palus (2006) also focused on the controversial and argued that control by government agencies, the conservation of heritage often ignored the value from history for residents and community development. This is because industrial heritage is a way to connect to the industrial history remaining at the site, and protect industrial architecture as monuments to the past is essential. Hogberg (2011) suggested that a silo building be preserved with some large storehouses, so that the area offered more of a kaleidoscope, which can be more fashionable than some redeveloped industrial areas in Europe. This research pointed out that the conservation of heritage is essential, and it should relate to the values of heritage itself.

The analysis of industrial heritage conservation in China also started in the twentieth century (Qin & Lin, 2021). With the objective of agglomerating and merging the behaviour and psychology of different social groups, the conservation provides support for regional development and provides continuous impetus for industrial development. The readjustment of China's economic structure has accelerated the proportion of cultural industry in the overall economy. Based on the theory of cultural industry, the protection of cultural and industrial heritage can be divided into material and non-material protection. Material cultural heritage includes historic artefacts, and its protection is generally focused on the protection of physical form or on redevelopment (Aktürk, 2022). The material heritage is significant as it creates avenues for socio-economic incomes for local populations and promotes the protection of heritage assets. For example, the exhibition of cultural heritage in museums, with public and private museums can take different approaches. And the intangible heritage, such as indigenous languages and cultural landscape, holds cultural significance in understanding the values, meanings, memories, and past narratives of communities (Aktürk, 2022). In 2018, China's National Bureau of Statistics published the Classification of Culture and Related Industries. This expands the application and management of cultural industry in China, and the material forms of historical and cultural heritage included in the classification become key elements for national cultural development. The renewal of industrial heritage is growing, and includes industrial museums, industrial landscaped gardens, and integrated cultural industry development.

### **Industrial heritage assessment and renewal**

Urbanization in China is rapidly accelerating. In the late twentieth century, industries established during the modern era faced severe recession. In cities across China, the sites of these traditional industries were replaced or technically transformed by modern building design. Many industrial sites are gradually being destroyed rather than conserved. For example, a survey was conducted in some immovable industrial heritage in Liuzhou, Guangxi, China. The results showed that the Guest house of Liuzhou Machinery Factory built in 1930's, Liuzhou Air Compressor Factory established in 1958, and Liuzhou Sanliu Chemical Factory founded in 1975 had been out of use or abandoned for many years due to technical reconstruction, relocation, or closedown (Xu & Tan, 2019). This has resulted in a contradiction between the conservation of industrial heritage and contemporary urbanization. With the growth in information technology industries, some traditional industrial sites need to be upgraded or rebuilt. Due to the demands of urban development, industrial heritage has largely been demolished or reconstructed in cities across China. The value of industrial heritage lies in the sites themselves and in

the historic information they provide. These sites represent the fulfilment of the requirements of material life, with industrial heritage symbolizing the development of urban civilization. Neglecting the influence from history, culture, humanity, and nature perspectives to evaluate industrial heritage may present a one-sided result when proposing conservation methods (Claver et al., 2021). Urgent attention must be paid to evaluate the values of industrial heritage from the perspectives of history, culture, humanity, and nature, to merge industrial heritage conservation with the social and cultural requirements.

Some research revealed that industrial heritage can be conserved or renewed into new patterns (Liu et al., 2021). Due to this, there is an urgent need to pay attention to the conversation renewal of merging cultural industry with heritage conservation, and a way to merge tradition and modern times, and meanwhile, a transition from industry to tertiary. The conservation of industrial heritage has received similar treatment to the preservation of historic artefacts, which neglects its value in the promotion of urban development.

Research into the assessment of the value of industrial heritage can be summarized into two categories: historical value analysis and social or cultural industry value analysis (Yan et al., 2021). This research can be divided into qualitative or quantitative analysis based on data availability. Taking qualitative approaches, Zhang et al. (2011) used technological value as a key factor in the assessment of industrial heritage, while Jing and Rui (2014) focused on economic value. Le and Yuan (2021) focused on the intangible value of industrial heritage and recommended the improvement of intellectual property conservation in China. Meanwhile, Lu et al. (2019) analysed the historical information value. This qualitative research mostly analysed the values of industrial heritage theoretically and focused on the morphological attributes of heritage and the changes of historical development.

Besides these, some scholars have taken a quantitative approach. Multi-criteria decision analysis considers the technological development of industrial heritage sites. Mousumi (Dutta & Husain, 2009), for instance, used this method to grade heritage sites in Calcutta. Lin and Hu (2013) used multiple regression analysis to quantify perceptions of industrial heritage, while Dell'Ovo et al. (2021) used a multicriteria approach to evaluate a multi-purpose building in northern Italy and Xie (2015) developed a life cycle model to analyse the value of industrial heritage value analysis. Quantitative analysis can answer both conservation history and generate new values from a more holistic vision. And this helps to integrate social, economic, environmental, urban, and political policies for heritage asset analysis. Comparing these two approaches, qualitative research has tended to focus on the relationships between perceptions and place, while quantitative analysis is based on numerical data.

Based on the value assessment, industrial heritage renewal is highlighted in recent years. China has developed industrial heritage conservation methods, such as transforming industrial heritage into museums, landscaped gardens, and sites of integrated exploitation and utilization. Most conservation analysis methods are from qualitative aspects, for example, literature review, surveys or interviews (Gao et al., 2021). However, a combination of qualitative and quantitative methods can support the conservation and redevelopment of industrial heritage by exploring, for example, transportation links, location, and tourism potential.

Network analysis theory offers certain advantages in determining the functional properties of a network quantitatively. This method is useful in evaluating industrial heritage's relationship with others, from the perspective, for example, transportation, or location. Furthermore, network analysis is effective in reflecting a cycling index, the total throughflow, the turnover rate and time, the interactions, and relationships between any two components of a system, and structural attributes such as the degree of dependence, degree of completeness, core-periphery structure, degree of closeness, and degree of betweenness within the overall network (Doménech & Davies, 2009). This quantitative approach can be used to good effect in industrial heritage conservation analysis. In summary, qualitative analysis can provide the theoretical basis for the evaluation of industrial heritage, and quantitative analysis can reflect

the elements that may influence the development of heritage. The merging of these two epistemological approaches offers a mixed methodology to better assess the value of industrial heritage.

## RESEARCH METHODOLOGY

### Data collection

The methodology framework of this research depicts the values assessment and heritage renewal in Tangshan. Combining qualitative and quantitative methods can effectively reflect the conservation status of industrial heritage. Based on the data from List of Industrial Heritage Protection of China (First Edition) published in 2018, there are six industrial heritages in Tangshan in total, and they are listed in Table 1.

The primary data is collected through surveys qualitatively. The survey is conducted based on the issues, 1) The location information of industrial heritage, including its distance from the city centre, transport networks, and residential areas, 2) The development status of the industrial heritage, including its history of transformation and its functions, 3) The intangible value of the industrial heritage. Then also statistical yearbooks are used to help check the information of industrial heritage from history, location, and economic value.

Next, the accessibility of transportation among industrial heritage, or with other traffic hub is deduced based on the primary data and used as secondary data to conduct quantitative analysis and describes the conservation situation of industrial heritage from the perspective of tourism. Through checking the public transportation route from the city centre, transport hub, and scenic spot to the industrial heritage in the city, the route can be treated as the relationship between any two destinations. As there is only one bus in this city, the routes collected are only based on bus lines, and the walking distance is less than 800 meters. And the route is only restricted to the direct route between any two destinations. Combining these relationship data with social network analysis methods, the linkage among this industrial heritage or between the heritage with other destinations can be identified.

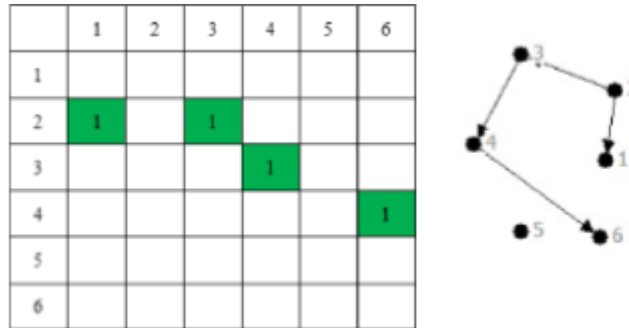
**Table 1 Names of 6 industrial heritage in Tangshan City, China**

No.	Names	Founded year
1	Kailuan Coal Mine	1878
2	Tangshan Railway Site	1881
3	Luan River Iron Bridge	1892
4	Qixin Cement Plant	1889
5	Tangshan Porcelain Plant	1914
6	Tang Xu Railway Repair Plant	1880

### Social network analysis method

Social network analysis was developed based on the sociometry techniques introduced by Moreno and Jennings (1945). This approach is used to analyse the relationships between actors rather than the actors themselves (e.g., individuals, groups, and organizations). Then, using site survey methods, social network models of each province or city can be established after determining the actors and the flows. In every model, the nodes are the actors such as industrial heritage, business centres, or city parks, and the paths are the transportation flows among their nodes. Based on the list of members of each province and the paths between them, the adjacency matrix A is established, which describes all direct paths among

the members of the network. The I columns of the matrix represent receivers of a resource, and the I rows represent senders. If at least one relationship exists between two nodes in the network, the corresponding element of the matrix has  $a_{ij} = 1$ ; if not,  $a_{ij} = 0$ . The symbiotic network system constitutes a series of nodes (members of the network) and paths between them. Using the data in adjacency matrix A and version 6 of the UCINET software (<http://www.analytictech.com/ucinet/>), each social network model is developed (see Figure 1).



**Figure 1. Social network model of an example**

Centrality analysis is used to characterize the network's overall degree of centralization and nodal degree (i.e., the number of nodes connected to a given node). Network centralization measures the network's and each member's degrees of dependence on certain "central" nodes. "Nodal centralization" reflects the extent to which the network is centred on one or a few nodes; "betweenness centralization" reflects the extent to which the resources in the network are controlled by one or a few nodes that serve as conduits (intermediate transfer points) between two or more nodes. Centralization ranges from 0 to 1. In networks with a star structure, the whole network depends on a single central core member, and the degree of centralization is 1; in a loop network, all members are equally central, and the degree of centralization is 0. The degree of centralization equals the sum of the differences between the maximum nodal degree in the network and the nodal degree of each other node; this sum is then divided by the sum of the maximum possible difference between the maximum nodal degree in the network and the nodal degrees of each other node. The degree of centralization of the network (C) is calculated as follows and the equations are referred to Doménech and Davies (2009).

$$C = \frac{\sum_{i=1}^n (C_{\max} - C_i)}{\max \left[ \sum_{i=1}^n (C_{\max} - C_i) \right]} \quad (1)$$

Where  $n$  is the total number of nodes in the network,  $C_{\max}$  is the degree of the node with the highest nodal degree (i.e., the highest number of connections with other nodes), and  $C_i$  is the nodal degree (number of connections) of node  $i$ .

## **FINDINGS**

### **Value assessment of industrial heritage in Tangshan**

From a historical perspective, the present situation of the conservation of industrial heritage in Tangshan City is developing rapidly. As an industrial city, the utilization of coal promotes economic and social development. Kailuan Coal Mine Plant is the typical representative of industrial heritage in Tangshan from the historical, cultural, and technological dimensions. It opened the coal industry in China and promoted industrial development throughout the whole country. Also, Qixin Cement Plant is the first plant that engaged in cement in China. These plants both gave impetus for industry development in China.

From an economic dimension, the conservation of industrial heritage brings in special tourism resources. From 1995 to 2015, the tourism industry of Tangshan developed significantly and became a dominant industry in the city. For example, the establishment of the Kailuan Coal Mine Museum, Qixin Cement Plant Museum both attract tourists. Meanwhile, some kinds of industrial tourism, study tourism, or scenic tourism have been exploited and become a special symbol for city economic development. Otherwise, as a sign of a city, industrial heritage conservation should meet the requirement of low environmental pollution and low resources input. Therefore, cultural industry becomes not only an attractive means for promoting the development of iron and steel, coal mining, and cement industry, but also inheriting industrial culture of these industries.

From a cultural aspect, the industrial heritage in Tangshan has its own attributes in architecture style. The museum of Kailuan Coal Mine has the neoclassical architectural style. The exterior is red brick and loose interweave. The Qixin Cement Plant Museum integrates the elites of all the plants and makes maximum retention of the original space. Furthermore, the productive facility, production technology, and process flow of this heritage represents a higher technical level at that time and can be used to learn for contemporary analysis.

### **Industrial heritage renewal in Tangshan**

Transforming industrial heritage into museums is a way for heritage renewal. In Tangshan, Qixin Cement Plant is now being transformed into a museum called China Cement Industry Museum. This heritage is the origin of the Chinese cement industry, and it produced the first bucket of mechanism cement in China. With the movement of this plant, the workshop has been retained in the original place, then a cement industry museum is built here. Also, Kailuan Coal Mine is conserved as the Kailuan Museum that introduces the procedure of coal mining and its transportation. Tang Xu Railway Repair Plant is planning to be rebuilt into the China Railway Source Museum. As the origin of the Chinese railway industry, Tangshan boosts to produce China's first standard-gauge railway, China's first self-run railway company, Chinese first railway plant, and the first railway station. The Railway Museum will be a mark for this city to tell the cultural history of industry's development.

It is not enough for museums only displaying exhibitions, because it is a vital spot to remark the history values and social progress. A lot of high-end technology or new intelligent technology have been introduced in museums, for example, multi-dimensional films and virtual reality technology have been made to show the real history and the working conditions previously. Meanwhile, some copy tools or equipment have been opened to the audience to operate old machines. The introduction of all these new technologies or thoughts is a way to narrow the gap between teenagers with their elder generation who were working at the same situation.



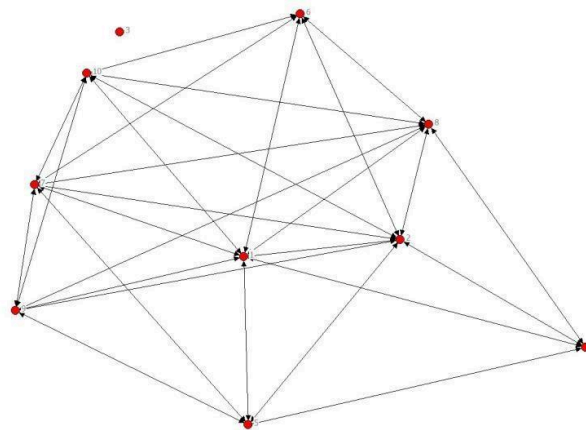
Another renewal approach is transforming industrial heritage into a cultural creative zone. Besides a cement museum, Qixin Cement Plant has also been used as an industrial-themed creative zone. The creative zone is reconstructed based on the original plant workshop. In the zone, some artist studios, performer art spaces, and catering places with certain artistic characteristics are introduced to develop the modern culture, innovation, and tourism industry for this city.

Although there are some art themes in this zone, it is still needed to concentrate more industries, for example, artist residence advertisement or publishing fashion design, to attract tourists. Therefore, the cultural industry embedded in this heritage can relate to some newly attracting works of art. Moreover, the interactive experience in the zone should also be promoted to arouse the inspiration of tourists. The local residence or workers moving out has resulted in the tellers of the history and neglecting historical values of this heritage.

From the quantitative perspective, the transportation condition among the industrial heritage or between heritage with other famous spots in this city has been chosen as the accessibility of renewal for the heritage. Besides the 6 industrial heritage sites, 4 destinations are added to represent the city tourism spots in Tangshan. The nodes in this research include 10, they are industrial heritage, city centre, traffic hub, and scenic spots in this city, the names of the nodes are listed in Table 2.

**Table 2 A list of 6 industrial heritage and 4 other destinations in Tangshan City, China**

No.	English names	No.	English names
1	Kailuan Coal Mine	6	Tang Xu Railway Repair Plant
2	Tangshan Railway Site	7	Tangshan Wanda Plaza
3	Luan River Iron Bridge	8	Tangshan Fengjing Traffic Hub
4	Qixin Cement Plant	9	Tangshan Beijiao Traffic Hub
5	Tangshan Porcelain Plant	10	Tangshan Nanhu Scenic Spot



**Figure 2 The model of the accessibility conservation of industrial heritage in Tangshan (Source: Authors made is using UCINET 6.0)**

The conceptual model of industrial heritage and other destinations in Tangshan has been established in Figure 2. The figure shows that node 3 (Luan River Iron Bridge) has no direct route with other destinations, as it is located far away from the downtown area. Therefore, it is impossible for tourists to make a tour there through public transportation. Node 1 (Kailuan Coal Mine) and Node 2 (Tangshan Railway Site) have the highest number of direct routes with other destinations, and these two heritages are near each other. They are located near the city centre and attract tourists to conduct city tours through buses, and student tourists to make study travel. The number of routes of Node (Qixin Cement Plant) and Node 5 (Tangshan Porcelain Plant) with others is four and five, separately. These two

heritages are placed at the old city centre of this city, with the movement of city centre, the public transport between them with other bustling areas are not connected directly. And this results in undeveloped tourism of the cultural creative zone of Qixin Cement Plant. The transformation of Node 6 (Tang Xu Railway Repair Plant) has not been finished, and it is represented based on a planning scheme.

This model provides a basis for the centrality analysis of the nodal degree. The degree of Node 1 (Kailuan Coal Mine) and Node 2 (Tangshan Railway Site) are the highest, and their nodal degree is 8.00 and takes a proportion of 0.143. Then are Node 6 (Tang Xu Railway Repair Plant) and Node 5 (Tangshan Porcelain Plant). The proportion of Node 4 (Qixin Cement Plant) is only half of that of (Kailuan Coal Mine) and Node 2 (Tangshan Railway Site). For other destinations, Node 1 (Kailuan Coal Mine) and Node 2 (Tangshan Railway Site) connect all the other traffic hubs or scenic spots and can become the most attractive destinations for tourists through public transport. And this shows that these two heritages receive highest concern from the government from the perspective of transportation for their conservation and renewal.

## **CONCLUSION**

This research analyses the economic, social, and historical value of industrial heritage in Tangshan, China. And it renews these heritage from the perspective of utilization, transformation, and transportation. Qualitative analysis can provide the theoretical basis for the evaluation of industrial heritage, and quantitative analysis can reflect the elements that may influence the development of heritage. This research tries to merge these two epistemological approaches and offers a mixed methodology to better assess the value of industrial heritage. Qualitative analyses and social network analysis methods are used to reflect the renewal of industrial heritage and evaluate the accessibility of these heritage to show their conservation quantitatively. The findings of this research are that the present situation of the conservation of industrial heritage in Tangshan is developing rapidly, and cultural industry becomes not only an attractive means for promoting the development of iron and steel, coal mining, and cement industry, but also inherited industrial culture of these industries. Meanwhile, based on the quantitative analysis results, indicating that Kailuan Coal Mine and Tangshan Railway Site receive the highest concern from the government from the perspective of transportation for their conservation and renewal.

As a case study analysis, the selected sample will be restricted to the 6, they are Kailuan Coal Mine, Tangshan Railway Site, Luan River Iron Bridge, Qixin Cement Plant, Tangshan Porcelain Plant, Tang Xu Railway Repair Plant officially listed sites of industrial heritage. As a result, this research will only reflect the conservation of industrial heritage in this traditionally industrial region of northern China and may not reflect the current condition of industrial heritage conservation elsewhere in the country. Therefore, the research may be only restricted to the industrial heritage with heavy industries or plants and is not representative of the variety of industries across China.

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