

Research on Human Resource Competency Model of Logistics Enterprises Based on Temporal Ontology

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Keywords: Temporal Ontology, Logistics Enterprises, Human Resources, Competence.

Abstract: Research on Human Resource Competency Model of logistics enterprises based on temporal ontology, a general temporal ontology model is constructed, and a temporal data representation method of human resources based on temporal ontology is proposed and applied to the prediction process. The temporal data representation method can show the time information in the data more carefully, and combined with SWRL rules, the accuracy of reasoning results is higher.

1 INTRODUCTION

Logistics enterprises can not improve the overall modernization level and their competitiveness overnight. They must take key fields, key technologies and core talents as the breakthrough. Talent is one of the basic elements of logistics enterprises. The competition among enterprises has gradually evolved from the competition of industrial technology content and management level to the competition of enterprise talents. The middle and senior managers of enterprises are the core employees of enterprises, which often directly determine the success or failure of enterprises. The recruitment of middle and senior managers is the main channel for enterprises to obtain key talents, which directly affects the healthy growth and future development of logistics enterprises. Enterprises often invest a lot of human and financial resources in the recruitment fair of middle and senior managers. Therefore, the success of recruitment is not only related to the introduction of suitable talents, but also affects the future development of enterprises, it is also related to the cost-effectiveness of enterprises. At present, when recruiting middle and senior managers, logistics enterprises often judge the personnel matching degree based on simple job analysis and combined with the applicant's educational background, professional knowledge, skill level and work experience, rather than making recruitment decisions through comprehensive consideration of the applicant, and there is no effective evaluation of the applicant's internal motivation and core competence, There is no application of competency

model in the recruitment of middle and senior managers in logistics enterprises (SKILLEN, 2014).

Logistics enterprises are the basic components of modern logistics industry. It has the characteristics of many employees, strong market flexibility and wide distribution, but its development degree does not occupy an advantage in the competition of logistics market for a long time, its development speed is slow and its development level is not high. China's logistics enterprises have a long way to go in speeding up their own modernization and modernization, strengthening exchanges and cooperation with foreign logistics giants in terms of talents, technology, management and ideas, focusing on their main business, improving service level and strengthening international competitiveness. The research content of this topic can not only guide the recruitment practice of logistics enterprises for middle and senior managers, but also promote the transformation of the recruitment mode of the whole industry to a more scientific and perfect direction (Wang, 2013).

At present, the competition of talents has become the main aspect of the comprehensive competitiveness at the national and enterprise levels. For an enterprise, talents have increasingly become an important embodiment of its core competitiveness and an important indicator of the comprehensive strength and overall level of the enterprise, which makes the introduction and maintenance of key talents of the enterprise particularly important. In particular, logistics enterprises, because they belong to labor-intensive industries, have large talent mobility and low attention to talents for a long time,

resulting in a serious lack of high-quality all-round talents in the logistics industry. Therefore, middle and senior managers in key positions often play a decisive role in the rise and fall of enterprises. How logistics enterprises can recruit managers who are consistent with the enterprise's strategic culture and values, the highest matching with vacant posts and have the best performance level in the future, and improve their competency level and contribution to the organization to the greatest extent is an urgent problem for each logistics enterprise. It can make a scientific prediction of its future performance in combination with its previous performance. This leads to the lack of scientificity and practicability of employment decision-making, which will not only lead to the rejection of some really suitable candidates, but also reduce the recruitment efficiency and accuracy. In view of the shortcomings of the traditional recruitment model of logistics enterprises, a new talent recruitment model is needed to guide the recruitment of middle and senior managers of logistics enterprises. The competency model provides an effective method for the recruitment of middle and senior managers in logistics enterprises. According to the actual situation of China's logistics enterprises, combined with the relatively mature competency model, this paper studies the method of using competency model in the recruitment of middle and senior managers in China's logistics enterprises, studies and summarizes three main competency models of logistics enterprises, and summarizes the core competency characteristics that have an important impact on the performance of middle and senior managers in logistics enterprises, and establish a recruitment system accordingly. The recruitment system of middle and senior managers in logistics enterprises based on competency model can not only make logistics enterprises recruit managers with the best matching degree according to their own strategic culture, but also improve the competitiveness of enterprises as a whole. (LEE, 2017)

In the field of management, the earliest research on competency was carried out by Taylor, the "father of scientific management". His research on "scientific management" was called "management competencies movement" at that time. Taylor's view is that the management of enterprises can be studied with the knowledge of physics. As early as 1911, Taylor observed the practical activities of factory workers. After long-term research, he found that there was a big gap between different employees in completing the same work. The work efficiency and quality of better performing workers and worse performing workers are very different. Therefore, he proposed for

the first time to evaluate the daily work of workers through the application of time and action analysis, so as to delimit the constituent elements of workers' competency. On this basis, a more complete and standardized operation process is constructed, and finally the purpose of improving workers' work efficiency is achieved.

2 HUMAN RESOURCE COMPETENCY MODEL OF LOGISTICS ENTERPRISES

The research on the competency model of human resources in logistics enterprises in China began in 1998. An article on competency appeared for the first time in the Journal of psychology. In the article "evaluation and quantitative evaluation method of management cadres in the communication industry", the job evaluation of managers in the post and telecommunications industry was applied according to the targeted competency characteristics. In the late 1990s, Chinese scholars began to conduct theoretical research on the competency model in order to explore a competency model that can be used by Chinese enterprises and help enterprises improve management efficiency and overall competitiveness according to the specific situation of China.

In 2003, Professor Wang Chongming and Professor Chen minke of Zhejiang University summarized the basic competency characteristics of middle and senior managers through the practical application of the "position analysis method based on Competency Model" and the interview and investigation of middle and senior managers in more than a dozen domestic science and technology enterprises, and pointed out that due to the different positions and managers, Their competency characteristics are also different. In addition, by constructing the competency model of enterprise managers under China's economic conditions at that time, Professor Wang Xiaojun proposed eight dimensions that middle and senior managers should have competency characteristics. And try to predict the future performance of managers (PHAN, 2017).

In 2004, Professor Yao Xiang and Professor Wang Lei of Peking University conducted a questionnaire survey on the project managers of it R & D department, summarized the competency characteristics and internal requirements of IT enterprise project managers, and discussed how to apply the competency model to the recruitment and training of IT enterprise project managers. In 2005,

professors Zhang De and Wei Jun of Tsinghua University studied the customer managers of commercial banks. This paper discusses the competency model corresponding to the customer manager of commercial banks, and summarizes six basic competencies that the customer manager of commercial banks should have by interviewing managers of several commercial banks. In 2006, Professor Wang Chongming and Professor Liu Xuefang of Zhejiang University studied the competency model of family enterprise successors, this paper puts forward the key competency items that family business successors should have and the evaluation criteria of whether family business successors are qualified or not. In the same year, Zhao Hui, Huang Xiao and Wei Xiaojun studied the competency of Party and government leading cadres, basically summarized the professional quality and competency of Party and government leading cadres under the current situation in China, and established the competency model of Party and government leading cadres. (CHICCO, 2016)

In 2007, Zhao Shuming and Du Juan studied the competency elements and evaluation criteria of enterprise managers, put forward the evaluation theory of the competency of middle and senior managers, summarized the previous research on management competency, and laid a foundation for the future research on manager competency (MANIU, 2013).

In recent years, domestic researchers' research on competency model theory has gradually expanded to all fields and levels, and are committed to the further development and application of competency model. Competency model has gradually been used by more organizations in human resource management practice. At that time, under the background of the transformation of enterprise organization and management mode, the overall professionalization of managers and the high enthusiasm of management theory research, western countries have made rapid progress and great achievements in the research of competency and competency model, and their theoretical achievements have been fully applied in the practice of enterprise human resource management. The research on competency and competency model in China began under the background of the comprehensive reform of state-owned enterprises in the process of economic system transformation, mainly through the introduction and reference of foreign theoretical achievements and research. Some progress has been made in the exploration of the application of relevant theories to practice, but there is still a big gap compared with

foreign countries, A systematic and comprehensive theoretical system has not yet been formed.

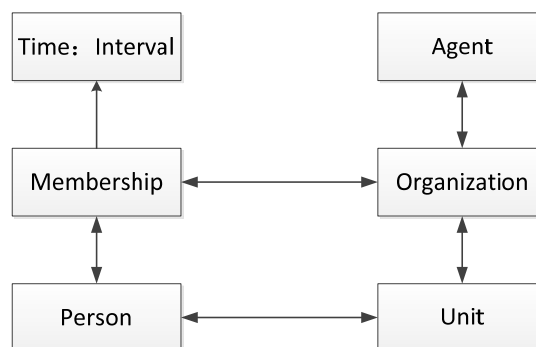


Figure 1: Improved organizational ontology structure.

3 CONSTRUCTION OF HUMAN RESOURCE COMPETENCY MODEL OF LOGISTICS ENTERPRISES BASED ON TEMPORAL ONTOLOGY

In terms of content, employee data mainly has two time types:

(1) Effective time: refers to the time when an event or object occurs or exists in reality. If an employee starts in 2017 and leaves in 2018, the data about the employee is only valid between 2017 and 2018.

(2) Transaction time: refers to the time when an event or object is recorded, updated, or deleted in the data.

In addition, employee data also has other time characteristics, including absolute / relative, concave convex, multi granularity, periodicity, etc.

3.1 Absoluteness/ Relativity of Time

The absoluteness of time refers to the time expressed in numbers. For example, the employee's entry time is "September 18, 2018". Relativity means that there is no precise time expression. If employees who are employed before 2018 are selected, the relative time is before 2018.

3.2 Concavity and Convexity of Time

It refers to the continuity and discreteness of time. From the perspective of salary, the annual salary of employees will change every year, so the salary change is continuous. From the perspective of

professional title, there is no obvious law of professional title promotion, and the time is uncertain. Only when the promotion conditions are met can there be promotion qualification. In addition, employees may be promoted once or twice during their tenure, or even not. Therefore, the promotion of employees' professional titles is discrete.

3.3 Multi Granularity of Time

The length of time indicated by the data is different. The time cycle of human resources includes short-term, medium-term and long-term. The corresponding time granularity can be divided into day, month and year.

3.4 Periodicity of Time

It refers to the regular fluctuation of the time represented by the data. For example, a large number of employees flow in enterprises every June.

From the comprehensive analysis of the content and temporal characteristics of employee data, combined with the time ontology modeling meta language, based on BFO (basic formal ontology) and owl time, supported by time relationship and centered on time formal expression, expand relevant classes and attributes, and establish human resources temporal ontology including time attributes and constraints. It represents the dynamic change process of things and highlights the tensity in the change process.

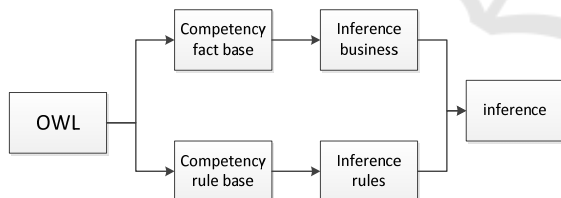


Figure 2: Framework of reasoning mechanism based on competency rules.

BFO is an upper ontology, in which the concepts are given the meaning of human resources field: BFO is used to represent the concept and relationship of salary and professional title change process. BFO divides all entities into two categories: continuous and current. Subclass of continuous class: generically dependent continuous class is a collection affected by influencing factors in the change process, such as employee salary, professional title; Independent continuous is a collection of influencing factors, such as performance. Subclass of current: process class represents the change process, such as salary change,

professional title change, etc; The temporary region class represents the start / end time (zero - dimensional temporary region) and duration (one - dimensional temporary region) of the change process.

Although BFO allows users to establish different domain ontologies with similar understanding methods and the same concepts, so that these ontologies can be compatible, BFO only provides the relationship between overall concepts and lacks the specific time relationship between entities. Therefore, owl time is used as a supplement to the time relationship between entities. The core of owl time is the Allen interval relationship. Allen interval relationships represent 13 relationships between time intervals, namely before, after, meets, met by, overlaps, overlapped by, starts, started by, during, contains, equals, finishes, finished by. However, Owl - time cannot represent the periodicity of time. In addition to the relationship between intervals, there are two types of relationships: the relationship between time points and time intervals, and the relationship between time points. For time point and time interval, there are three relationships: point before interval, point after interval and point between intervals, which are represented by time: before, time: after and time: inside attributes respectively; There are three relationships between time points: before, after and equal, which are represented by time: before, time: after and time: equal attributes respectively. The supplementary time: equal attribute indicates the equality relationship between time points. When two ontologies are integrated, the problem of heterogeneity between ontologies needs to be solved. If heterogeneous types are synonyms, a mapping relationship is directly established between them. According to the literature, the synonym of zero - dimensional temporary region in BFO is time point, and the synonym of one - dimensional temporary region is time interval. The instant and interval in owltime represent the time point and time interval respectively. So map BFO: Zero - dimensionaltemporal region to time: instant; Map BFO: one - dimensionaltemporalregion to time: interval. The change process needs time description, so BFO: process and time: temporalentity are mapped through the attribute BFO: occupi - estemporalregion.

Use SWRL to express the tensity in the rules, and explain the salary rise rules and professional title promotion rules. The rules are formulated according to the employee manual of the Internet company.

(1) Salary increase rules: salary increase is made according to working years, performance, length of

service, professional title promotion and other factors.

(2) Professional title promotion rules: professional title promotion is formulated according to the time of obtaining professional title, employment time, certificate, thesis and other factors. The promotion of professional titles is regarded as a dynamic event, which simplifies the representation process when indicating re-election. It does not need to match whether the annual professional titles meet the conditions, but only depends on the length of service. If there is a professional title promotion during the period, corresponding examples will be added in BFO to simplify the complexity of reasoning. The temporal ontology model and SWRL rules are reasoned by reasoning engine. The temporal ontology instances and SWRL rules in the ontology knowledge base are transferred to drools through `swrldrools` tab, and then the drools inference engine is started to infer to obtain new knowledge. Finally, the new knowledge is transferred back to the owl original ontology as the instance or instance attribute of the original ontology.

The constructed human resources temporal ontology is used to represent temporal data, that is, ontology instantiation. Taking the employee salary change part as an example, the temporal ontology of human resources is explained as follows: for example, the salary change of employee No. 10006 from 2017 to 2018 is shown in Figure 5. Every time the salary changes, an instance of BFO: process is generated. The instance consists of three parts: (1) the time of change (temporary region). This part describes the time specifically, including year, month, day, duration and time relationship. If the employee's salary remains stable after this change and will not change until the current time, add the `time:hasend` attribute (2) Independent continuous salary is expressed in BFO: salary (3) The influencing factors of the change include paper, promotion, work year, tenure, performance, etc. these factors affect the salary change of the next year.

The construction of SWRL rules combines the concepts in temporal ontology, complements the missing relationship in temporal ontology, and makes up for the lack of reasoning ability of temporal ontology. For example, rule 3: worked for W1 - W2 years, worked as senior engineer for at least y years and m months, and the salary increased by s yuan. The working years are calculated according to the employment time. `swrlb:greaterthan` is used to limit the working years, i.e

```
workYear(? pers - on,? w) ^
swrlb:greaterThan ( w2,? w) ^
```

```
swrlb:greaterThanOrEqual (? w, w1 );
The title is senior engineer, using
bfo:participatesInAt-SomeTime(? person,? q)
^
bfo:hasOccurrentPart (? q,? stage ) ^
title (? Stage ("senior engineer") means;
BFO: occupies - temporalregion (?)? stage,?
interval) ^ time: hasTemporalDuration(? interval,?
dur)^time:years(? dur,? y) ^
time:months(? dur,? m) ^swrlb:greaterThan(?
y,y) ^
```

4 CONCLUSION

In this paper, a general temporal ontology model is constructed, and a temporal data representation method of human resources based on temporal ontology is proposed and applied to the prediction process. The temporal data representation method can show the time information in the data more carefully, and combined with SWRL rules, the accuracy of reasoning results is higher. Since only continuous time intervals are considered in the construction of temporal ontology model, we can consider expanding temporal ontology in the next step, so that the temporal ontology model can represent time intervals with gaps; the temporal data representation method proposed in this paper can be considered for temporal data modeling in other fields.

ACKNOWLEDGMENT

"The Application of Competency Model in Recruitment of Middle-Senior Managers in Logistics Enterprises"(Project No.2021CSLKT3-093) of the scientific research plan of China Society of Logistics Annual Research in 2021

REFERENCES

- Chicco D, Masseroli M. Ontology-based prediction and prioritization of gene functional annotations[J]. IEEE/ACM Transactions on Computational Biology and Bioinformatics,2016,13(2):248-260.
- Lee C I, HSIA T C, HSU H C, et al. Ontology – based tourism recommendation system [C] // International conference on industrial engineering and applications. Nagoya, Japan: IEEE,2017:376-379.
- Maniu I, Maniu G. A human resource ontology for recruitment process [J]. Review of General Management, 2013, 10(2):12-18.

- Phan N, DOU Dejing, WANG Hao, et al. Ontology-based deep learning for human behavior prediction with explanations in health social networks [J]. Information Sciences, 2017, 384: 298-313.
- Skillen K L, Chen Liming, NUGENT C D, et al. Ontological user modeling and semantic rule-based reasoning for personalisation of help-on-demand services in pervasive environments[J]. Future Generation Computer Systems, 2014, 34: 97-109.
- Wang Xiaohuan, WONG T N, FAN Zhiping. Ontology based supply chain decision support for steel manufacturers in China [J]. Expert Systems with Applications, 2013, 40(18): 7519-7533.

