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Strategies for Enhancing the Adaptability of Vocational Education IoT Application Technology Talents from the Perspective of Game Theory

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Abstract

The explosive growth of the Internet of Things industry and the structural contradiction in talent cultivation have given rise to a complex game relationship among schools, enterprises, and students. This article constructs a three party dynamic evolutionary game model, revealing core game factors such as imbalanced distribution of interests, institutional design flaws, conflicts in subject roles, and information asymmetry in school enterprise cooperation. Research has shown that net profit from enterprise participation is a key variable driving cooperation, and student rights protection and third-party evaluation mechanisms can effectively improve the efficiency of game equilibrium. Through the three in one reform framework of "policy incentives collaborative mechanisms subject empowerment", measures such as differentiated subsidies, industry demand warning platforms, and flexible credit systems are proposed to promote the game from zero sum competition to symbiotic value-added.

Keywords

IoT talent; Integration of industry and education; School enterprise game; Evolutionary game model; Adaptive measures.

1.Introduction

With the continuous improvement of 5G and AIoT technologies, the IoT industry is experiencing explosive growth. According to Gartner's 2023 report, the global number of IoT terminal devices has reached 20.7 billion units. [1] The rapid development of the current Internet of Things industry poses new challenges to the talent training system. The Ministry of Education's "Digital Economy Talent Demand Forecast Report" shows that by 2025, China's IoT talent gap will reach 16 million people, with a supply-demand ratio of 1:4.3.[2] According to the "2023 IoT Employment Market Report" by Zhilian Recruitment, there is a structural imbalance in

talent in the IoT industry, with an excess of junior operation and maintenance personnel, and a serious shortage of compound R&D talents and cross disciplinary solution engineers. [3]

Existing research has revealed the structural contradictions between talent supply and demand from multiple dimensions. Wang Wei revealed a significant time difference between the education system and industrial practice based on empirical research, and pointed out that the 3-5 year curriculum lag period reflects the difficulty of traditional discipline construction mechanisms in adapting to the acceleration of technological iteration. [4] The path of industry education integration proposed by Zhang Ming is essentially a systematic solution to this time delay problem. [5] By establishing a two-way flow mechanism of school enterprise resources, it not only shortens the knowledge transformation chain but also promotes dynamic updates of educational standards. However, in the process of school enterprise cooperation in education, stakeholders such as schools, enterprises, and students often form complex game relationships due to differences in goals, uneven distribution of benefits, and deficiencies in institutional design.

This article constructs a tripartite game model between schools, enterprises, and students to explore the dynamic path of school enterprise cooperation, enhance the willingness of school enterprise cooperation to cultivate talents, and lay the foundation for improving the adaptability of talent cultivation.

2. Analysis of Game Factors

2.1. Imbalance between interest demands and cost sharing

The obvious conflict between corporate economic rationality and educational public welfare is one of the main factors leading to the game. Enterprises pursue short-term profits, while the integration of industry and education requires a large amount of long-term investment in equipment, teaching staff, training costs, etc. [6] However, the high turnover rate of graduates leads to insufficient return on investment. Under the traditional school enterprise cooperation model, enterprises need to bear the cost of student internships, but only a small number of students ultimately stay, creating a dilemma of "educating people and making wedding dresses for others". In addition, the implementation of incentive measures such as tax incentives and fiscal subsidies supported by policies is difficult, further weakening the enthusiasm of enterprises.

There is also a certain deviation between school resource dependence and assessment orientation. Schools rely on enterprises to provide practical resources and employment channels, but the education evaluation system focuses more on formal indicators such as hardware construction and the number of training rooms, neglecting the actual effectiveness of skill training. Some universities, in order to meet the assessment targets, have only superficially cooperated with enterprises, and even experienced the phenomenon of "seeking projects but not operations", result-

ing in a mismatch of resources.

In vocational colleges, there is also a disconnect between students' career development needs and talent cultivation. Students expect to enhance their employment competitiveness through the integration of industry and education, but some course offerings lag behind the iteration of industrial technology, and internship content is disconnected from job requirements, resulting in insufficient motivation to participate. In addition, the insufficient protection of students' rights and interests such as salary during their internship also exacerbates their resistance to school enterprise cooperation.

2.2. Defects in institutional design and operational mechanisms

In the process of school enterprise cooperation, insufficient policy coordination and lack of incentives are also factors that lead to the game. The lack of coordinated policies in multiple sectors such as education, human resources and social security, and industry has led to high coordination costs for school enterprise cooperation. The systems for intellectual property protection and market access are not perfect, and companies are concerned about technology leakage or competition risks.

The dynamic adjustment mechanism is not perfect. The mismatch between professional settings and industry demand is prominent. The long adjustment cycle of school majors makes it difficult to respond to the talent demand of emerging industries such as artificial intelligence in a timely manner, resulting in a disconnect between training and employment needs. [7] Some universities still use traditional curriculum systems and lack industry participation in standard setting, further exacerbating structural contradictions.

In the process of talent cultivation, the evaluation system is not yet perfect. The current evaluation is mainly led by the government and schools, with few evaluations from third parties such as enterprises and industries on the quality of talent cultivation, and insufficient feedback. For example, schools pay more attention to the number of collaborative projects, and the evaluation of students' skill improvement effectiveness is only superficial, while enterprises passively participate due to the lack of evaluation discourse power.

2.3. Main role and power game

In the process of talent cultivation, enterprises hope to lead talent cultivation programs to meet production needs, while schools tend to maintain educational autonomy, which limits the depth of cooperation.

The current model neglects the subjectivity of students, who are passive recipients and lack attention to their career planning and learning feedback. For example, the credit transfer mechanism is not flexible, and students' achievements in participating in corporate projects or innovative practices are difficult to convert into academic grades, which reduces their motivation.

2.4. Cultural and information asymmetry

In terms of organizational culture, schools focus on theoretical inheritance, while enterprises emphasize practical efficiency. There are barriers between the two sides in terms of technical standards and teaching syllabus integration. There is also a contradiction between the confidentiality of enterprise production processes and the openness of school teaching, which hinders the deep sharing of technical resources. [8]

There is a lag in the transmission of market demand. The lack of effective feedback on industry development trends, job skill changes, and other information to the education sector has resulted in insufficient foresight in talent cultivation. Some universities still focus on traditional manufacturing as a training area and have not been able to meet the demand for upgrading intelligent manufacturing.

3. Construction of Game Model for School, Enterprise and Students

3.1. Three party game subject and strategy space

The main players in the game include schools (S), enterprises (E), and students (T). The selection of the three party strategy can be divided into the following situations: schools choose to invest resources to optimize courses, share scientific research achievements, and engage in deep cooperation or formal cooperation to meet assessment indicators; Enterprises choose to actively participate in forms such as investing equipment and mentor resources, or only provide basic internship positions as a passive response; Students choose to actively participate in activities such as investing time and improving skills, or passively cope by only completing the minimum internship requirements.

Based on the above settings, design the following profit function:

Enterprise income=Technology achievement transformation income R_{e1}+Talent reserve income R_{e2}- Cooperation cost C_e;

School revenue=policy subsidy R_{s_1}+employment rate improvement R_{s_2}- resource input cost C_s;

Student benefits=salary premium brought by skill improvement R_{t1}+career development opportunities R_{t2}- time cost C_t.

3.2. Dynamic evolutionary game analysis

Based on the assumption of bounded rationality, a three party evolutionary game model is constructed by replicating dynamic equations and evolving stable strategies. The growth rate of the strategy is set to F (x), and the dynamic equation for the replication of the cooperative strategy chosen by the enterprise is as follows:

$$F(x)=x(1-x)[(R_{e\_1}+R_{e\_2}-C_e)-y(R_{s1}+R_{s2})-zR_{t1}] \quad (1)$$

Among them, x represents the probability of enterprises choosing deep cooperation strategies, y represents the probability of schools choosing deep cooperation strategies, and z represents the probability of students choosing active participation

strategies. Only when the net profit of enterprise cooperation (R_e1+R_e2-Ce) is greater than 0, will they be willing to actively cooperate; When y decreases, schools only adopt formal forms of cooperation, and enterprises need to bear additional coordination costs. When z decreases, students' passive coping will reduce the talent reserve income of enterprises and weaken the value of cooperation.

In the game model, external policies can be added to optimize and adjust the cost of enterprise participation, thereby increasing net income.

4. Strategies for Enhancing the Adaptability of Vocational Education IoT Application Technology Talents

Based on game theory analysis, it is necessary to solve the game dilemma from four aspects: policy coordination, mechanism innovation, subject empowerment, and technological support, and enhance the adaptability of talent supply and demand.

1. Improve the policy incentive system and solve the cost sharing dilemma

Adopting differentiated subsidy mechanisms for enterprises and providing tiered tax reductions based on talent retention rates for enterprises deeply involved in the integration of industry and education, in order to reduce the loss of "educational externalities". A risk sharing fund shall be jointly established by the government, schools, and enterprises to compensate for losses incurred by enterprises due to technology leaks, student defaults, equipment wear and tear during internships, etc.

2. Build a collaborative mechanism and strengthen dynamic adjustment capabilities

Establish an industry demand warning platform, rely on big data analysis to track real-time technological changes in fields such as the Internet of Things and AIoT, and dynamically adjust the professional curriculum system. Improve the third-party evaluation system, introduce industry associations and top enterprises to participate in the formulation and quality evaluation of talent training standards, and establish a mapping mechanism of "course credits skill certificates job abilities".

3. Refactoring the main role and enhancing students' game power

Pilot flexible credit system, converting enterprise project practice and technical certification into credits, breaking down the barrier of "classroom learning practical application". Sign a rights protection contract, enforce the signing of a tripartite internship agreement, clarify the minimum salary, intellectual property ownership, and breach of contract compensation clauses.

4. Technology empowers information sharing and bridges organizational cultural gaps

Build a digital twin training platform, reproduce the real production scenarios of enterprises through virtual simulation technology, and solve the contradiction between enterprise technology confidentiality and teaching openness. Build a cross organizational knowledge community, establish a school enterprise joint knowledge base, share technical documents and case libraries, collaborate with enterprises to develop open source technical manuals, and promote the deep integration of theo-

retical teaching and industrial practice.

5. Conclusions

The contradiction between the rapid development of the Internet of Things industry and the lagging talent cultivation is essentially a problem of resource mismatch between the education supply side and the industry demand side. Due to differences in goals and institutional deficiencies, schools, enterprises, and students are caught in a game dilemma of "input-output" imbalance. By constructing a dynamic evolutionary game model, it was found that resolving the contradiction of cost sharing is the core. For example, providing tiered tax reductions based on talent retention rates can reduce the losses incurred by enterprises due to "externalities of education"; The collaborative mechanism between industry and education needs to rely on the industry demand warning platform; Student empowerment requires incorporating enterprise project practice into the credit system through a flexible credit system, and mandating the signing of salary guarantee contracts to reduce participation risks; In terms of technological integration and innovation, the digital twin training platform can reproduce scenarios such as smart factories, solving the contradiction between technical confidentiality and teaching openness, while cross organizational knowledge communities can promote the co construction of open source technical manuals. Through the above measures, credible institutional guarantees can be provided for the integration of industry and education.

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