Research on Crowdfunding Mechanism for 5G Internet of Things Construction for Application Communities

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Abstract. In order to crack the problem of high cost of 5G IoT construction and promote the construction process of 5G IoT, this paper explores the establishment of a crowdfunding construction mechanism for application-oriented communities. This paper analyzes the high cost and high benefit characteristics of 5G IoT and finds the reasons for the slow development of 5G IoT through the research methods of literature research and constructing mathematical models. The crowdfunding construction method for application community is proposed, and the crowdfunding model is expressed by using functions, and a perfect crowdfunding guarantee mechanism is constructed, which is expected to finally advance the 5G network construction to the real application stage. In the face of the huge construction cost of 5G IoT, this paper proposes a three-step crowdfunding construction mechanism: firstly, the initial investment sharing rules for the application community are formulated to share the construction cost of the application IoT to each member of the application community; secondly, a comprehensive trading market for 5G IoT contribution shares is established to openly trade and transfer the contribution shares to the society; finally, advanced intelligent technology and reasonable system design are applied to guarantee the contribution Finally, advanced intelligent technology and reasonable institutional design are used to protect the rights and interests of the contributors and enhance the return expectations of the contributors. Using crowdfunding mechanism, the conclusion shows that through crowdfunding, 5G network construction is expected to advance to the real application stage.

Keywords: 5G IoT · Application community · Crowdfunding mechanism

1 Introduction

The essential difference between 5G and 4G is not only to obtain faster speed, wider bandwidth and lower latency in terms of quantity, but also to upgrade the virtual network to a virtual and real convergence of the Internet of Things in terms of connotation. In short, 5G networks are and must be the Internet of Things. If the construction of 4G networks can be undertaken by operators, then operators can only bear the basic public network part in 5G network construction. The real Internet of Things, due to

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the many dimensions and high heterogeneity, operators will not be able to undertake the construction of many heterogeneous Internet of Things, whether in terms of professional capabilities or economic capabilities. In the face of the construction problem of 5G network, the traditional operator construction model is no longer applicable, and this paper proposes that the crowdfunding construction mechanism for the application community can be used to practice the construction of 5G Internet of Things. Of course, the application community is only the initial crowdfunding object for professional IoT construction. Through reasonable mechanism design, the initial community crowdfunding can be expanded to the final social crowdfunding, so that 5G network construction can become a real crowdfunding project. This paper intends to carry out research on the crowdfunding mechanism of 5G IoT construction for application communities.

2 Related Research

2.1 Research on the Characteristics of 5G IoT

Kumar & Al-Besher (2022) [1] uses IoT in e-learning systems to assess student engagement and concentration throughout online courses, combining Internet of Things (IoT) and electroencephalogram (EEG) technology to effectively predict the user's attention state and the level of teaching methods required, which can be used to improve student academic performance. Sidek et al. (2022) [2] believes that the use of IoT to improve the quality and efficiency of public services has a significant impact on government, and uses models to verify it.

2.2 Research on Crowdfunding

Victory & Rufus (2022) [3] Through an empirical analysis of the current situation of crowdfunding for African SMEs, it is believed that the lack of awareness of crowdfunding as a fundraising tool for African SMEs and the low threshold for entering crowdfunding platforms constitute the main challenges faced by African SMEs, and these challenges have a significant impact on their development. Khakimovna et al. (2021) [4] analyzed the generation and nature of crowdfunding in the investment process, and conducted several studies in order to deeply reveal the significance of corporate crowdfunding. Wang et al. (2022) [5] Based on the data of JD.com, China's leading crowdfunding platform, this paper studies the multiple configurations of green supply chain, delivery time and financing targets of technology crowdfunding projects, and shows that green supply chain, a modern management model that considers environmental impact and resource efficiency, is increasingly valued by managers and consumers, and has become an important determinant of crowdfunding success. Du (2022) [6] Based on trust theory and exposition likelihood model (ELM), using the data of 1166 agri-food crowdfunding projects on the Taobao crowdfunding platform, the impact of disclosed project attribute information on financing performance and the mediating role of project risk were investigated, and the project financing performance of crowdfunding reasons and fund uses was detailed, financing goals were low, product qualification certificates issued by authoritative institutions, multiple types of rewards, short reward delivery

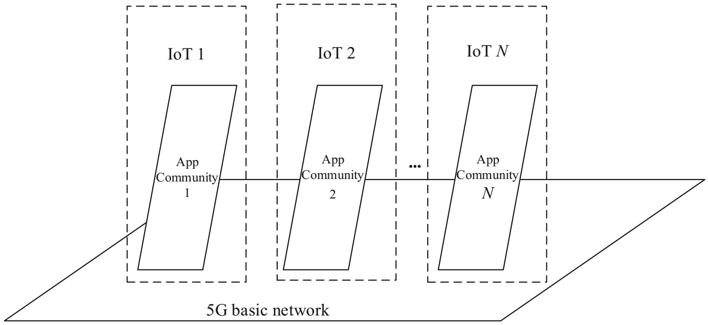

Fig. 1. 5G IoT structure diagram

time, and low investment threshold were well paid. Guillochon (2022) [7] found that using a combination of social media and traditional media attracts more investors than using a single channel. Mamonov & Malaga (2020) [8] reflects on the motivation and contribution of the Title III equity crowdfunding success factors research in the United States, commenting on recent developments in entrepreneurial finance, including initial coin offerings and initial exchange offerings.

3 Related Concepts

3.1 5G IoT

Figure 1 shows the structure of 5G IoT, specifically, on the 5G basic network platform, multi-dimensional heterogeneous application IoT networks are inserted in parallel to form an application IoT cluster attached to the basic network platform. Among them, each application IoT independently constitutes an independent application community.

3.2 Application Community

Community in a broad sense refers to a network of people maintained by a weak relationship bond, so that it can exist beyond the limitations of geographical scope. The application community mentioned in this article is a kind of weak relationship network community in a broad sense, which refers to a specific user group associated with the same type of Internet of Things. Figure 2 shows the user group relationship of an IoT application community.

4 The High-Cost, High-Yield Characteristics of 5G IoT

5G IoT is a virtual-real converged network, and its construction cost is high, far exceeding the virtual nature of 4G network. A very small part of the high construction cost of 5G IoT comes from the surge in infrastructure network construction costs, and most of it comes from the unlimited increase in the construction cost of applied IoT.

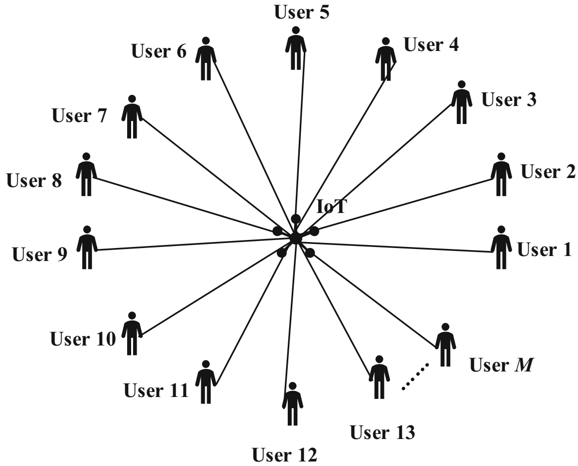

Fig. 2. The user group relationship of an IoT application community

4.1 The Cost of Network Construction Has Increased Dramatically

Soaring infrastructure network construction costs

The increase in infrastructure network construction costs is mainly due to the increase in the number of base stations and the surge in base station energy consumption. The construction cost of 5G infrastructure network is about ten times that of 4G.

Infinitely amplified application IoT construction costs

The IoT construction process for the application community includes three stages: intelligent perception, image mapping, and network linkage of the physical entities to be connected to the network. IntelliSense refers to the installation of an intelligent sensing system on a physical entity, giving the physical entity the intelligent attributes of self-sensing and other senses; Image mapping refers to mapping physical entities to cyberspace through intelligent sensing systems to form physical mirrors of digital twins in cyberspace; Network linking refers to linking physical images in cyberspace to each other to form a virtual-real convergence network for application communities. Figure 3 illustrates the network building process described above.

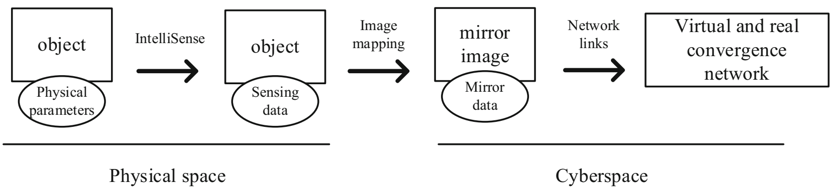

Fig. 3. The IoT build process for the application community

The construction cost of applying IoT includes the cost of intelligent perception, image mapping and network link, which can be expressed as Eq. (1).

$$C = C_1 + C_2 + C_3 \tag{1}$$

Among them, C_1 is the IntelliSense cost, C_2 is the image mapping cost, and C_3 is the network link cost.

The intelligent perception of physical entities relies on intelligent sensing systems, which are composed of a large number of sensors embedded in physical entities connected to each other. Therefore, the cost of IntelliSense (C_1) is mainly the cost of sensors, which is determined by the number of sensors and the average price of sensors, as shown in Eq. (2).

$$C_1 = p_1 mn \tag{2}$$

Among them, p_1 is the average price of sensors, m is the number of sensors embedded in a single physical entity, and n is the total number of physical entities connected to the network.

Image mapping cost (C_2) is the cost of mapping physical entities from physical space to network space, and its quantitative expression is shown in Eq. (3).

$$C_2 = p_2 n \tag{3}$$

where p_2 is the average mapping cost of a single physical entity, and n is the total number of physical entities connected to the network.

Network link cost (C_3) is the cost of linking physical images in cyberspace, quantified as shown in Eq. (4).

$$C_3 = p_3 n^2 \tag{4}$$

The p_3 is the average cost of linking two physical images, n is the total number of physical entities connected to the network, and n^{2} is the number of links between physical images.

$$C = p_1 mn + p_2 n + p_3 n^2 \tag{5}$$

As deduced from Eq. (5), the construction cost C of IoT applications will be a positive number tending to infinity.

Apply bias effect analysis of IoT cost functions

(1) Sensor effect. The partial derivative of Eq. (5) with respect to the number of sensors m embedded in a single physical entity gives Eq. (6).

$$\frac{\partial C}{\partial m} = p_1 n \tag{6}$$

It can be seen from Eq. (6) that the sensor effect applied to the cost function of IoT is not a constant, but a function of the total number n of physical entities connected to the network.

(2) Physical entity effect. The partial derivative of Eq. (5) with respect to the total number of physical entities n in the network yields Eq. (7).

$$\frac{\partial C}{\partial n} = 2p_3 n + p_1 m + p_2 \tag{7}$$

It can be seen from Eq. (7) that the physical entity effect of applying the cost function of IoT is more complex, which is both a function of the total number n of physical entities connected to the network and a function of the number of sensors m embedded in a single physical entity.

(3) Second-order effect analysis. Since Eq. (7) still contains the independent variable *n*, a second-order partial derivative can be found again, and the result is as in Eq. (8).

$$\frac{\partial^2 C}{\partial n^2} = 2p_3 > 0 \tag{8}$$

It can be seen from Eq. (8) that the construction cost of applying the Internet of Things accelerates with the increase of the total number of physical entities n connected to the network. That is, the physical effect of applying the IoT cost function has an explosive growth attribute.

(4) Cross-effects analysis. Since Eq. (6) still contains the independent variable n, cross-bias can be found again, and the result is as in Eq. (9).

$$\frac{\partial^2 C}{\partial m \partial n} = p_1 > 0 \tag{9}$$

It can be seen from Eq. (9) that the cross-effect of the construction cost of the application of the Internet of Things is positive, which indicates that the sensor effect and the physical entity effect are mutually reinforcing.

4.2 The Potential for Network Revenue is Huge

After the 5G Internet of Things is completed and put into operation, it will produce high returns, of which a very small part is a direct economic return, and most of it is a network value return and a social value return.

Direct financial returns

Direct economic return refers to the direct economic income generated through operation after the 5G Internet of Things is completed and put into use. Its present value is calculated as shown in Eq. (10).

$$W = \sum_{t=1}^{T} n w_t / (1 + \delta)^t \tag{10}$$

Among them, n is the total number of physical entities connected to the network, w_t is the direct economic return of a single physical entity connected to the network in year t, T is the life cycle of 5G IoT (unit: year), and δ is the discount coefficient (refer to the risk-free interest rate).

Network value returns

The return on network value is measured according to Metcalfe's law, that is, the network value is equal to the square of the number of user nodes connected by the network. The user node here is generalized, including both the user virtual node directly connected to the network, the physical entity mirror node directly connected to the network, and even the sensor network node (i.e., sensor) embedded in the physical entity. Accordingly, the network value return (V) of the 5G Internet of Things can be expressed as shown in Eq. (11).

$$V = k_1[(m+1)n]^2 \tag{11}$$

where m is the number of sensors embedded in a single physical entity, n is the total number of physical entities connected to the network, and k_1 is the network value return conversion coefficient.

Social value return

The return of social value is a deep reflection of the national sovereign nature of the online platform. Social value returns are mainly divided into network attribution rights and data attribution rights. The social value return (S) defined by 5G IoT is expressed as shown in Eq. (12).

$$S = S_N + S_D \tag{12}$$

Among them, S_N is the network attribution rights of 5G IoT as in Eq. (13), and the S_D is the data attribution rights of 5G IoT as in Eq. (14).

$$S_N = p_1mn + p_2n + p_3n^2 \tag{13}$$

$$S_D = P_dD \tag{14}$$

Among them, P_d is the unit data value, and D is the total amount of data generated by the 5G Internet of Things.

$$S = p_1mn + p_2n + p_3n^2 + P_dD \tag{15}$$

It can be seen from Eq. (15) that given the massive characteristics of m, n, and D, the social value return S of the 5G Internet of Things will be a positive number that tends to infinity. In fact, from the perspective of national security, the social value return of the Internet of Things cannot be overemphasized, and even higher than the network value return.

4.3 Example

Estimated cost of a vehicle networking construction

(1) Infrastructure network construction costs. Assuming that to build the Internet of Vehicles in City A, with a total area of 5,000 square kilometers, at least 80,000 5G base stations need to be built according to the coverage of 5G base stations. According to the cost of 400,000 yuan per 5G base station, the construction cost of the 5G infrastructure network is about 32 billion yuan. In principle, the cost of infrastructure network construction shall be borne by the operator or the tower company.

(2) IoV construction cost. The number of cars in City A is n = 3 million; Each car needs to be equipped with sensors that measure temperature, pressure, oil quantity, position, distance, speed, brightness, dry humidity, gas concentration and other functions, and may wish to set the number of sensors per vehicle in the early stage of intelligence m = 1000, and the average price of sensors $p_1 = 100$ yuan; In addition, the image cost of each car mapped to the network space $p_2 = 10{,}000$ yuan, and the link cost between the two car mirrors $p_3 = 2$ yuan. By substituting the above parameters into Eq. (1)–Eq. (4), the calculation yields:

$C_1 = p_1 mn = 0.3$ trillion yuan
$C_1 = p_1 mn = 0.3$ trillion yuan
$C_3 = p_3 n^2 = 18$ trillion yuan
$C = C_1 + C_2 + C_3 = 18.33$ trillion yuan

Only from the calculation results in the early stage of intelligence, the construction cost of the Internet of Vehicles in City A is mainly based on the cost of network link C_3. If we consider that in the later stage of intelligence, the number of sensors m per vehicle will reach an astronomical figure, the cost structure of the construction of the Internet of Vehicles will change to be based on the cost C_1 of intelligent perception.

Given that the construction cost of the Internet of Vehicles (18.33 trillion yuan) far exceeds the cost of infrastructure network construction (32 billion yuan), operators or tower companies will not be able to bear the construction costs of the Internet of Vehicles.

Earnings return expectations

Set the life cycle of the Internet of Vehicles in City A T = 10 years, the direct economic return of the connected bicycle in the Tyear $w_t = 3000$ yuan, the discount coefficient δ = 3% (roughly refer to the interest rate of long-term government bonds), the conversion coefficient of network value return k_1=10^{-6}, the unit data value P_{d}=10^{-5} yuan/bit (equivalent to 1 point/KB), and the total amount of data generated by the Internet of Vehicles D = 10^{18} bits. Other parameters are set as the same as the cost example, that is, n = 3 million vehicles, m = 1000, p_1=300 yuan, p_2=10,000 yuan, and p_3=100 yuan. Substituting the above parameters into Eq. (10)–Eq. (14) respectively yields:

$W = \sum_{t=1}^{T} nw_t/(1+\delta) \approx 0.08$ trillion yuan
$V = k_1[(m+1)n] \approx 9$ trillion yuan
$S_{\mathrm{N}} = p_1 mn + p_2 n + p_3 n^2 = 18.33$ trillion yuan

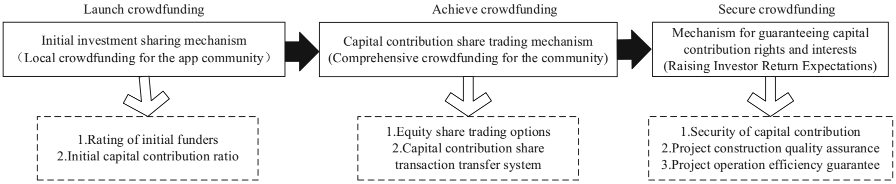

Fig. 4. The overall framework of the 5G IoT crowdfunding construction mechanism

$S_D = P_d D = 10$ trillion yuan
$S = S_N + S_D = 28.33$ trillion yuan

From the calculation results of the initial stage of intelligence, the total return on the revenue of the Internet of Vehicles in City A reached 37.41 trillion yuan. Among them, the first place is social value return S, accounting for 75.73%; followed by network value return V, accounting for 24.06%; The least is the direct economic return W, which is only 0.21%, which is almost negligible.

On the whole, although the direct economic return of the Internet of Vehicles in City A is far less than its construction cost, its total income return significantly exceeds the construction cost. Accordingly, the construction of the Internet of Vehicles is generally cost-effective and feasible.

5 Crowdfunding Mechanism for 5G Internet of Things Construction

5.1 The Overall Framework of the 5G IoT Crowdfunding Construction Mechanism

In the face of the huge construction cost of 5G Internet of Things, this paper proposes a crowdfunding construction mechanism for the application community. Specifically, there are three progressive steps: the first stage is to launch crowdfunding, that is, to share the initial investment to the application community; The second step is crowdfunding, that is, the transfer of capital contribution shares to social transactions; The third link is to ensure crowdfunding, that is, the use of advanced intelligent technology and reasonable system design to protect the rights and interests of investors. The overall framework of the crowdfunding construction mechanism is shown in Fig. 4.

5.2 Initial Investment Allocation for the Application Community

As mentioned earlier, application communities refer to specific user groups associated with the same type of IoT, including enterprises, public institutions, community organizations, public sectors, and individual users. The first link of crowdfunding construction is to set up the initiator of the 5G IoT construction project for all users in the application community, and the initiator will share the initial capital of the application IoT construction to all users according to certain rules.

Rating of community members' funding qualifications

(1) Qualification rating evaluation system. Without losing the generality, quantitative

performance indicators can be formulated from four dimensions, including financial efficiency, asset operation, solvency and development ability, and qualitative evaluation indicators can be formulated from six dimensions, including the basic quality of the leadership group, product market share, basic management comparison level, quality status of on-the-job employees, level of technical equipment updating, and industry or regional influence. The evaluation system is shown in Table 1.

Based on the evaluation system in Table 1, the qualification level of community members is calculated in summary. The final calculation is shown in Eq. (16).

$$G = \omega_1 g_1 + \omega_2 g_2 \tag{16}$$

St. $\Sigma\omega_i = 1(\omega_i \in [0, 1], i = 1, 2)\Sigma\omega_i = 1(\omega_i \in [0, 1], i = 1, 2)$

Among them, G is the qualification level of community members, g_1 is the total score of quantitative performance indicators, g_2 is the total score of qualitative evaluation indicators, and ω_i (i = 1, 2) is the weight of first-level indicators.

Table 1. Community members contribute to the qualification level evaluation system

Level 1 indicators/weight	Level 2 indicators/weight	Level 3 indicators/weight
Quantitative performance indicators (g_1/ω_1)	Financial benefits/ω_{11}	Return on net assets/ω_{111}
		Return on total assets/ω_{112}
	Asset operation/ω_{12}	Total asset turnover/ω_{121}
		Turnover of current assets/ω_{122}
	Solvency/ω_{13}	Gearing ratio/ω_{131}
		Interest multiples earned/ω_{132}
	Develop competencies/ω_{14}	Growth rate of operating income/ω_{141}
		Capital accumulation rate/ω_{142}
Qualitative evaluation indicators (g_2/ω_2)	The basic quality of the leadership group/ω_{21}	-
	Product market share/ω_{22}	-
	Basic management comparison level/ω_{23}	-
	The quality of on-the-job employees/ω_{24}	-
	The level of technical equipment update/ω_{25}	-
	Industry or regional influence/ω_{26}	-

(2) Quantitative performance indicator scoring. The scoring system for quantitative performance indicators is shown in Table 2. The last column is scored as a three-level indicator score.

Based on the scoring system in Table 2, the total score of the quantitative performance indicator is calculated according to Eq. (17) g_1.

$$g_1 = \omega_{11}(\omega_{111}\varphi_{111} + \omega_{112}\varphi_{112}) + \omega_{12}(\omega_{121}\varphi_{121} + \omega_{122}\varphi_{122}) + \omega_{13}(\omega_{131}\varphi_{131} + \omega_{132}\varphi_{132}) + \omega_{14}(\omega_{141}\varphi_{141} + \omega_{142}\varphi_{142}) \tag{17}$$

St.

$$\Sigma\omega_{1j} = 1\left(\omega_{1j} \in [0, 1], j = 1, 2, 3, 4\right)$$

$$\Sigma\,\omega_{1ji} = 1\left(\omega_{1ji} \in [0, 1], j = 1, 2, 3, 4, i = 1, 2\right)$$

(3) Qualitative evaluation index scoring. The scoring system of qualitative evaluation indicators is shown in Table 3. The last column is scored as a secondary metric score.

Table 2. Quantitative performance indicator scoring system

Level 1 indicators	Level 2 indicators	Level 3 indicators	Score
Quantitative performance indicators (g_1)	Financial benefits	Return on net assets	φ_{111}
		Return on total assets	φ_{112}
	Asset operation	Total asset turnover	φ_{121}
		Turnover of current assets	φ_{122}
	Solvency	Gearing ratio	φ_{131}
		Interest multiples earned	φ_{132}
	Develop competencies	Growth rate of operating income	φ_{141}
		Capital accumulation rate	φ_{142}

Table 3. Qualitative evaluation index scoring system

Level 1 indicators	Level 2 indicators	Score
Qualitative evaluation indicators (g_2)	The basic quality of the leadership group	φ_{21}
	Product market share	φ_{22}
	Basic management comparison level	φ_{23}
	The quality of on-the-job employees	φ_{24}
	The level of technical equipment update	φ_{25}
	Industry or regional influence	φ_{26}

Based on the scoring system in Table 3, the total score of the qualitative evaluation index is calculated according to Eq. (18) g_2.

$$g_2 = \omega_{21}\varphi_{21} + \omega_{22}\varphi_{22} + \omega_{23}\varphi_{23} + \omega_{24}\varphi_{24} + \omega_{25}\varphi_{25} + \omega_{26}\varphi_{26} \tag{18}$$

St.

$$\Sigma\omega_{2j} = 1\left(\omega_{2j} \in [0, 1], j = 1, 2, 3, 4, 5, 6\right)$$

Rules for apportioning the proportion of contributions of community members
(1) Contribution ratio. The contribution and contribution ratio of community members can be calculated according to the relative share of assets of each member. This is shown in Eq. (19).

$$K_i = G_iA_i / \sum_{i=1}^{N} G_iA_i (i = 1, \ldots, N) \tag{19}$$

Among them, K_i indicates the contribution contribution ratio of the i-th member of the application community, G_i indicates the funding qualification level of the i-th member, A_i represents the total value of assets held by the i-th member, and N represents the total number of members of the application community who are eligible to contribute.

(2) Contribution quota. The contribution contribution amount is the capital contribution ratio calculated according to Eq. (19), and the construction cost C of the application Internet of Things is distributed to each member of the application community. The assessment amount is calculated as shown in Eq. (20).

$$C_i = K_iC(i = 1, \ldots, N) \tag{20}$$

Among them, C_i represents the contribution quota of the ith member of the application community, and C is the construction cost of the application Internet of Things.

5.3 Socially Oriented Share Trading

The construction cost of 5G Internet of Things is extremely huge, and relying only on the application community to share it within will undoubtedly bring extremely huge financing pressure to community members. In order to alleviate the pressure within the community, it is necessary to explore how to sell the investment share to the whole society.

Equity share trading options
The transaction transfer of the capital contribution shares of community members is a pure market behavior, which is completely in accordance with the independent will of both parties to the transaction. Community members can choose to hold the capital share of the 5G Internet of Things, so as to enjoy the rights and interests of the 5G Internet of Things as a scarce resource; It is also possible to transfer part or all of the capital contribution to the society, and the corresponding scarce resource rights and interests

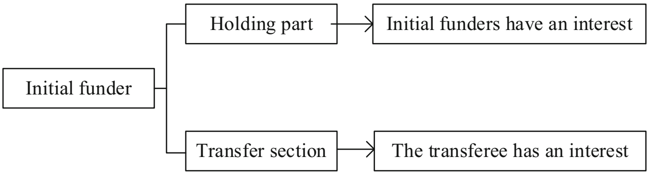

Fig. 5. Equity share trading options

will also be transferred to the transferee. The selection path for community members is shown in Fig. 5.

Capital contribution share transaction transfer system

In order to standardize and facilitate the transaction transfer of capital contribution share, optimize the investment structure of 5G IoT crowdfunding projects, and specially design the transaction transfer system of 5G Internet of Things capital share.

(1) Trading venues. In line with the principle of full public trading, a special 5G IoT investment share trading venue should be set up. Specifically, the state can refer to the establishment measures of the stock exchange, and the state will uniformly establish a comprehensive trading market for 5G Internet of Things investment shares covering all application industries.

The national unified trading platform established by the state has the following advantages: first, it can establish the authority and credibility of the trading market, which is convenient to attract traders from the whole society to enter the transaction with confidence; Second, it can concentrate the resources of all application industries, reduce transaction search costs, improve market transaction efficiency, and maximize crowdfunding effects; Third, it is convenient for the unified supervision of the state and conducive to the unified regulation of market transactions.

(2) Transaction entity. The 5G IoT investment share transaction entities can be roughly divided into two categories, the first category is the application community members who hold the initial investment share, and the number of them is relatively limited; The second category is the number of members of society who voluntarily participate in the transaction of capital contribution shares, and there is no upper limit to their number. In principle, all members of society, except for specific institutions and persons expressly prohibited or restricted by law, have the right to participate in the open market transaction of the 5G IoT capital share.

(3) Trading mode. It can roughly learn from the trading model of the securities market to realize electronic automatic intelligent trading of the 5G Internet of Things investment share. The specific transaction process is roughly as follows: the buyer and seller register in the trading market and complete identity authentication → the seller will mark the capital contribution share he intends to sell on the platform → the buyer will price the capital contribution share he intends to buy on the platform → the system will automatically match the transaction share of the buyer and seller in accordance with the principle of price priority within the specified time limit → the transaction share will be delivered to the account.

5.4 Mechanism for Guaranteeing the Rights and Interests of Capital Contribution

Security of capital contribution

(1) Improve the capital security system. The amount of financing for the construction of 5G IoT is huge, and it is necessary to establish a project regulatory agency with sufficient authority to supervise the credit of project sponsors, strictly supervise the use of funds, and severely punish various forms of abuse, embezzlement, embezzlement and waste of construction funds.

(2) Develop blockchain credit guarantee technology. Develop a capital management platform based on blockchain intelligent technology to make complete flow records of the financing process of 5G IoT construction without omission and tampering; All capital contributions and trading activities are automatically executed on the platform in accordance with blockchain smart contracts, and are completely recorded without omission and tampering; All the process of using funds is automatically executed on the platform in accordance with the blockchain smart contract, and is completely recorded without omission and tampering; Each capital contribution of the investor is marked and managed by the platform and real-time tracking, and the actual use track of each capital contribution of the investor can be checked in real time.

Project construction quality assurance

(1) Establish a hierarchical relationship of project management. The construction of 5G IoT mainly involves three parties: the construction entity (Party A), the contractor (Party B), and the construction party (Party C). The three-party entity forms a one-way management hierarchy to ensure that the project construction intention is fully achieved (see Fig. 6).

(2) Establish the relationship between the rights and obligations of relevant subjects. A clear relationship of rights and obligations is formed between the construction entity (Party A), the contractor (Party B) and the construction party (Party C) to ensure the orderly development of the project construction process (see Fig. 7).

Project operation efficiency guarantee

(1) Establish a project operation management structure. The operation of 5G IoT projects mainly involves three parties: the initial investor (Party A), the public investor (co-Party A), and the professional operation organization (Party B). The three parties form

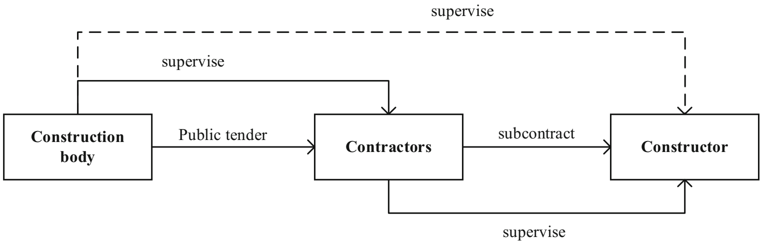

Fig. 6. The management hierarchy of 5G IoT construction projects

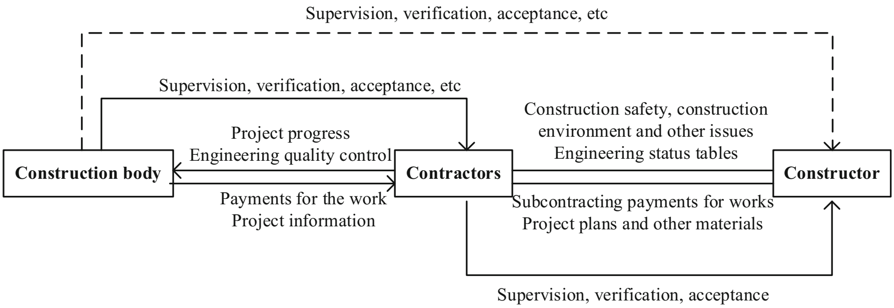

Fig. 7. The relationship between rights and obligations between subjects involved in project construction

the project operation management structure with division of labor and responsibility, providing organizational guarantee for operational efficiency (see Fig. 8).

(2) Establish a mode of public use of the project. The high-output characteristics of 5G IoT projects make them open to the whole society. Among them, the initial funder and the public funder, as the owners of the project, can have the right of first refusal; Other social users can use 5G IoT in a queuing mode (see Fig. 9).

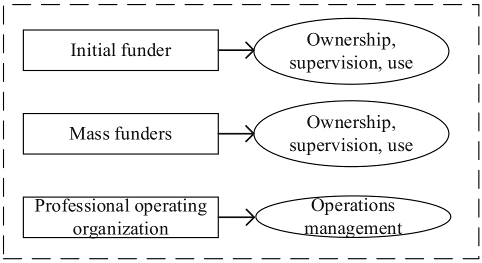

Fig. 8. Operation management architecture of 5G IoT projects

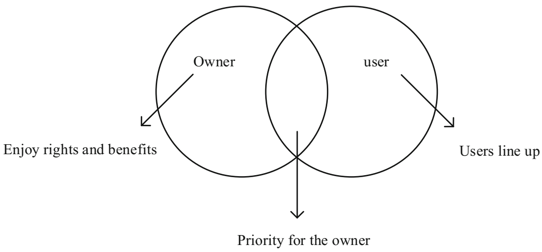

Fig. 9. Public usage model of 5G IoT projects

6 Conclusion

In view of the high cost of 5G IoT construction, operators are no longer able to afford the construction of 5G IoT projects regardless of professional or economic capabilities. In order to solve the problem of 5G Internet of Things construction, the crowdfunding construction mechanism for the application community was discussed. The following research conclusions were formed:

(1) 5G Internet of Things has significant characteristics of high cost and high benefit. Among them, the construction cost of applying the Internet of Things tends to be infinitely amplified, far exceeding the construction capacity of operators. The completion and operation of 5G Internet of Things will generate high returns, most of which are social value returns and network value returns. Compared with the two, the revenue return of 5G Internet of Things obviously exceeds the construction cost, and the network construction is generally cost-effective and feasible.
(2) In the face of the huge construction cost of 5G Internet of Things, a crowdfunding construction model for the application community is proposed. The model framework includes three progressive steps, the first of which is to share the initial investment for the application community and initiate crowdfunding; The second link is to transfer the share of capital contribution to social transactions to achieve crowdfunding; The third link uses advanced intelligent technology and reasonable system design to protect the rights and interests of capital contributions and endorse and guarantee crowdfunding.
(3) The rules for apportioning the initial investment for the application community are, first, to evaluate the qualification level of community members; Second, the capital contribution ratio is calculated according to the relative asset share of each member; Finally, according to the contribution ratio, the construction cost of the application Internet of Things is allocated to all members of the application community.
(4) The rules for transferring capital contribution shares for social transactions are: first, uniformly establish a 5G IoT capital contribution share comprehensive trading market covering all application industries; Second, clarify the subject of market transactions, unless expressly prohibited or restricted by law, all members of society have the right to participate in transactions; Finally, learn from the experience of the securities market and adopt the electronic automatic intelligent trading mode.
(5) In order to fully protect the legitimate rights and interests of investors and eliminate the worries of investors, it is proposed to adopt a fund management platform based on blockchain intelligent technology to strictly control the safe deposit and reasonable use of capital funds. At the same time, reasonable institutional arrangements are adopted to strengthen project construction quality management, improve project operation efficiency, and stabilize the return expectations of investors.

In summary, following the designed crowdfunding mechanism may successfully solve the huge problem of high cost of 5G Internet of Things construction, thereby advancing 5G network construction to the real application stage.

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References

1. Kumar K, Al-Besher A. IoT enabled e-learning system for higher education [J]. *Measurement: Sensors*, 2022, 24:100480, 5p.
2. Sidek N, Ali N, Alkawsi G. An integrated success model of Internet of Things (IoT)-Based services in facilities management for public sector [J]. *Sensors*, 2022, 22(9):3207, 32p.
3. Victory O C, Rufus A I. Development of small and medium scale enterprises (SMEs) in Africa through crowdfunding [J]. *International Journal of Business and Economics Research*, 2022, 11(5):287-294.
4. Khakimovna R N, Kizi K M S, Teten D, et al. The role of crowdfunding in investment process and interaction of crowdfunding platforms [J]. *ACADEMICIA: An International Multidisciplinary Research Journal*, 2021, 11(4): 232-241.
5. Wang, L.; You, W.; Zhou, Y.; Meng, F. How does green supply chain management promote the success of crowdfunding projects? Empirical research based on the QCA method [J]. *Sustainability*, 2022, 14(19):12312, 21p.
6. Du, J. Project attribute information and initiator's commitment in crowdfunding message strategy: An empirical investigation of financing performance in agri-food crowdfunding [J]. *Sustainability*, 2022, 14(19):12702, 18p.
7. Guillochon J. The role of media, policy and regional heterogeneity in renewable energy project crowdfunding [J]. *Energy Economics*, 2022, 115:106349.
8. Mamonov S. & Malaga R. A 2020 perspective on "success factors in title III equity crowdfunding in the United States"[J]. *Electronic Commerce Research and Applications*, 2020, 40:100933, 2p.