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# Sustainable Value-Sharing Mechanisms of the Industrial Internet of Things Platforms: A Case Study of Haier's Service-Oriented Transformation

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**Abstract:** Ensuring fairness and equity in value distribution is crucial for the sustainability of platform ecosystems. However, existing approaches to distributing benefits among cooperative entities often find it difficult to accurately assess each stakeholder's contributions. This paper tackles this challenge through a case study of the Haier COSMOPlat IIoT platform. By analyzing its value creation and value distribution processes, the research uncovers how platform enterprises can overcome existing limitations by quantifying and revealing intangible customer relationships alongside financial metrics. This revised value-sharing mechanism encourages a shift from "post-event value-sharing" to "mid-event adjustment", promoting a fair and equitable profit distribution framework that motivates stakeholders toward sustainable value co-creation.

**Keywords:** platform ecosystems; win–win value-added table; value-sharing mechanism; service-oriented transformation

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## 1. Introduction

Based on the Brundtland Report published by the United Nations, sustainability is typically upheld by three pillars: economy, society, and environment [1,2]. As a fundamental unit of the economy, corporate sustainability (CS) can be defined as meeting the needs of both the enterprise's direct and indirect stakeholders (such as shareholders, employees, users, etc.) while not compromising its ability to meet the needs of future generations of stakeholders [3,4]. Manufacturing enterprises leveraging the industrial Internet of Things (IIoT) platforms to achieve servitization transformation can generate excess profit conducive to economic sustainability [5,6]. However, there remains a dearth of literature addressing the allocation of this excess profit among stakeholders, which hinders the sustainable operation of the platform ecosystem. In light of this gap, our study endeavors to introduce a value-sharing mechanism beneficial for the sustainable development of the platform ecosystem within the context of manufacturing enterprise servitization transformation.

The Internet era has facilitated the dissemination of user-demand information, elevating the significance of information resources in value creation to unprecedented levels. As a consequence, the value chain is no longer product-centric [7] but rather customer-centric [8], with customer relationships becoming important resources for platform ecosystems. As the network value of a platform ecosystem is proportional to the square of the number of users because users can form relationship links [9], the presence of these customer relationships often leads to the overall value created by the platform ecosystem being higher than the sum of the values created by individual stakeholders. In other words, the total profit of the platform ecosystem is the excess profit after subtracting the general profit obtained by each stakeholder through independent or integrated means. Expanding on the economic rent concept [10], this excess profit stemming from customer relationships is termed relationship rent [11].

The customer relationships on e-commerce platforms mainly rely on the marketing efforts of platform enterprises (such as Amazon and Alibaba), with relationship rent naturally enjoyed solely by these platform enterprises. In contrast, during the manufacturing servitization transformation, the platform enterprises first attract resource providers to join and then, together with these resource providers, attract consumers to purchase products and services. For example, in the collaboration between the large-scale manufacturing enterprise Haier and fresh food suppliers, users purchasing Haier refrigerators can order vegetables and fruits by clicking on the display screen installed on it. In this context, customer relationships are attributed not only to the manufacturing enterprises that join the platforms but also benefit from fresh food suppliers who attract users and users who provide improvement suggestions. However, as customer relationships do not have a physical form, how to quantify and allocate relationship rent becomes a critical issue in maintaining the stability of the platform ecosystem.

Currently, studies on platform ecosystems mainly focus on e-commerce platforms built on the theory of two-sided markets [11–13], with only a few studies addressing IIoT platform ecosystems. Nevertheless, the latter emphasizes business model innovation of platforms [5,14,15] without delving into the value-sharing mechanisms between platform enterprises and other stakeholders. Previous studies have proposed using the Shapley value to address the issue of profit distribution in platform ecosystems [16,17]. This method is based on the premise of knowing the profits that different stakeholders' combinations can generate, but it is often difficult to implement in practice. Moreover, the Shapley value model overlooks consumers' value creation functions and does not include users in the category of beneficiaries of profit sharing. Therefore, this method is not applicable in platform ecosystems where users are involved in the operation.

In light of the literature gap in the measurement of customer relationship rent, this study conducted a case study on the service-oriented transformation of Haier, a traditional manufacturing enterprise. We focused on Haier's process of building the IIoT platform to attract resource providers and users for value creation and value sharing, aiming to investigate the following research questions (RQs):

RQ1: Against the backdrop of IIoT, what are the key elements of organization reform for manufacturing enterprises undergoing service-oriented transformation?

RQ2: As the leader of an IIoT platform, what are the management methods for the platform enterprise to engage stakeholders in co-creating value for the sustainable development of the platform ecosystem?

RQ3: For the IIoT platforms, non-financial information represented by customer relationships holds high value. How can platform enterprises feasibly disclose these intangible assets in sustainability reports to establish a value-sharing mechanism tailored to the platform ecosystem's characteristics?

The research contributions are primarily reflected in the following three aspects: Firstly, this paper extracts an actionable, sustainable value-sharing mechanism for the IIoT platform ecosystem. The crucial form for the servitization transformation of manufacturing enterprises is building digital platforms. However, existing research on IIoT platform ecosystems primarily focuses on management concepts, business models, and related areas [18,19], with the academic community yet to propose a suitable benefit distribution method for platform ecosystems. From Vroom's "Valence-Instrumentality-Expectancy Theory" [20], it is noted that mobilizing individual enthusiasm requires considering the relationship between performance, effort, and rewards. Using Haier Group, a large-scale manufacturing enterprise, as a case study, this paper analyzes how it combines financial information with non-financial information, such as user numbers and activity levels, to evaluate the value created by different stakeholders on the platform. It was found that Haier's COSMOPlat uses a win–win value-added table to quantify and distribute the overall value of the platform ecosystem. This can stimulate platform stakeholders' enthusiasm to create value and supplement academic research gaps with practical experience.

Secondly, sustainable methods for driving the service-oriented transformation of manufacturing enterprises are proposed. Generally, large-scale manufacturing enterprises provide necessary resources to small and medium-sized enterprises (SMEs) by establishing manufacturing platform ecosystems. For example, the aerospace engine manufacturer Rolls-Royce has created an open maintenance network that integrates social multi-subject maintenance resources, offering product maintenance services such as Lessor Care, Total Care, and Select Care [21]. According to Metcalfe's Law, the network value of a platform ecosystem is proportional to the square of the number of users [9]. Therefore, the value created by the manufacturing platform ecosystem comes not only from large-scale manufacturing enterprises, namely platform enterprises but also from providers and users who join the platform. In this process, if the profit distribution needs of the latter two are not met, the transformation of large manufacturing enterprises into service-oriented ones will be difficult to sustain [22,23]. However, few studies propose organizational management methods that enhance the alignment of employees' and users' personal value systems with organizational sustainability goals. This paper proposes a value-sharing mechanism that considers the interests of all parties, which is beneficial for promoting the service-oriented transformation process of the manufacturing industry.

Thirdly, the application scope of stakeholder theory was expanded. Since the concept of stakeholders was introduced into the field of management by Ansoff in 1965, related research has covered individual perspectives, relational perspectives, and network perspectives [24]. However, research from an individual perspective has always been predominant, focusing mainly on the residual rights within the enterprise. This paper proposes that entities such as providers, users, and employees, as stakeholders in the value co-creation of platform ecosystems, should have the right to share in the IIoT platform ecosystem's network rents. This can expand the applicability of stakeholder theory from within the enterprise organization to the collaborative organization of the IIoT platform ecosystems.

## 2. Literature Review and Theoretical Framework

### *2.1. IIoT Platforms and Service-Oriented Transformation of Manufacturing Enterprises*

The Internet of Things (IoT) was first introduced by Ashton in 1999 while working on a radio-frequency identification (RFID) infrastructure project at the Auto-ID Labs of the Massachusetts Institute of Technology [25]. Subsequently, the International Telecommunication Union (ITU) provided a more general definition of IoT as a global infrastructure for the information society that facilitates advanced services by interconnecting physical and virtual objects using existing and evolving interoperable information and communication technologies [26]. Since Germany introduced the concept of the fourth industrial revolution (Industry 4.0) in 2011, the industrial aspects of IoT have gained increasing attention [27]. In the literature, simple definitions of the Industrial Internet of Things (IIoT) have emerged, such as "the use of Internet of Things (IoT) technologies in manufacturing" [28]. Initially, scholars focused on the two essential features of IIoT: the capacity to make ordinary objects intelligent and the connectivity of these objects. For instance, Conway [29] described the IIoT vision as one where smart connected assets (the things) operate as part of a larger system or systems of systems that comprise the smart manufacturing enterprise. Boyes et al. [30] further expanded on this, defining IIoT as a system comprising networked smart objects, cyber-physical assets, and edge computing platforms, which enable real-time and intelligent access and exchange of process, product, and service information within the industrial environment to optimize overall production value.

From a practical perspective, as large manufacturing enterprises introduce Industrial Internet of Things (IIoT) platforms such as GE Predix and Siemens MindSphere to the market, academic research is increasingly focusing on the business models of IIoT platforms beyond their technical features. In terms of organizational goals, IIoT platforms aim to connect different services by using IoT technology to create cross-organizational Industry 4.0 business ecosystems that generate network effects [31]. The operational characteristics of IIoT platforms, which provide resource connection services, have led existing literature to view them as a means of transforming or reshaping business networks. For example, Pardo et al. [18] argued that the Actors-Resources-Activities (ARA) model from traditional business network literature is not applicable to IIoT platforms because these platforms establish electronic ties for data exchange between suppliers and demanders, serving not only as a communication method but also as a new way of coordinating resources for production and distribution. They view IIoT platforms as a system of systems (SoS). Falkenreck and Wagner [32] suggested that real-time data sharing between manufacturers and customers on IIoT platforms may disrupt trust, which is traditionally maintained through social relationships, rendering the Commitment–Trust Theory less applicable. Although the validity of these traditional theories under the IIoT platform model is still debatable, the organizational and operational characteristics of IIoT platforms identified in the literature indicate that leveraging Industry 4.0 technology to reestablish and maintain relationships between manufacturers and between manufacturers and customers is crucial for transforming existing business models.

Accordingly, some studies explore the opportunities that IIoT platforms bring to the servitization transformation of manufacturing enterprises. For instance, Zhou et al. [33] considered IIoT platforms essential for industrial enterprises to facilitate digital servitization and proposed a feasible multi-criteria decision-making framework for selecting IIoT platforms. Liu et al. [34] found, through survey data from Chinese manufacturing enterprises, that implementing IIoT platforms can enhance market perception and resource management capabilities, positively impacting their servitization strategies. Pei et al. [5] provided empirical evidence on how IIoT platforms reshape the aftermarket service landscape by exploring the competitive and cooperative relationships between IIoT platform enterprises and maintenance, repair, and operations firms (MROs). They found that if manufacturing enterprises choose to establish and open their IIoT platforms to attract MROs rather than compete with them, both parties can achieve a win–win equilibrium, with manufacturing enterprises gaining royalty revenue and MROs profiting more by accessing the platform.

In summary, IIoT platforms, based on Industry 4.0 technology, are reshaping business networks and creating innovative business models. Specifically, the connectivity provided by IIoT platforms has significantly impacted the servitization transformation of manufacturing enterprises. However, the existing literature may have focused more on the value creation through extensive and deep connections enabled by IIoT platforms while neglecting the assessment of the relationship value established between manufacturers and customers and the fair distribution of these relationships rent among all stakeholders. This oversight could hinder the sustainable operation of IIoT platforms.

### *2.2. Value Creation and Value Sharing of Platform Ecosystem*

Porter [7] identified the supply chain as the "value chain" or "economic chain", asserting that an enterprise's position within it dictates its bargaining power and influences its value enhancement. As value creation activities become increasingly complex, the limitations of value creation logic based on the value chain become apparent. Nalebuff et al. [35] found that there is not only competitive behavior emphasized by the concept of the value chain among enterprises; in fact, there is a widespread phenomenon of value co-creation through cooperative behavior among both upstream and downstream enterprises, as well as competing enterprises. They propose the viewpoint that enterprises create value through a value net based on coopetition relationships. Normann and Ramirez [8] argued that in addition to suppliers, customer enterprises, and competitors, stakeholders such as users, employees, and government form a community of value creation. The concept of the value net is extended to a customer-centric value constellation. The introduction of the value net and value constellation expands the logic of enterprise value creation from a vertically integrated value chain to a vertically and horizontally intertwined value chain network. Rayport and Sviokla [36], from the perspective of the sources of enterprise value creation, further propose the concept of a virtual value chain, suggesting that virtual resources such as information can enable enterprises to achieve value enhancement. With the advent of the Internet era, due to the conditions created by the Internet for the dissemination of user demand information, the role of data resources in the value creation process has reached unprecedented heights. This gives rise to the value creation system—the platform ecosystem—to reduce transaction costs arising from information asymmetry between the supply side and the demand side.

The value creation logic of platform ecosystems has shifted from vertically integrated or user-centric radiating network models to a bidirectional driving mode between users and platform enterprises. Platform enterprises integrate resources to meet user demands to create value, leading to a Matthew effect where the aggregation of users on the platform attracts more users, thereby enhancing the overall competitiveness of the platform ecosystem and enabling value addition for the platform enterprise. Due to reduced transaction costs and increased transaction benefits, the overall value created by platform ecosystems often exceeds the sum of values created by individual stakeholders. The total profit of the platform ecosystem minus the general profits obtained by each stakeholder through independent means leaves the excess profit, which is termed relationship rent [10]. However, there is scarce research on how to quantify and distribute the excess profits generated by platform ecosystems.

An extensive body of research has established that equitable and reasonable value-sharing mechanisms play a critical role in driving sustainable development across nations, cities, communities, and businesses [37–45]. At the national level, Medaglia and Perron-Welch [37] argued that the concept of benefit-sharing is an emerging principle in international sustainable development law, encompassing frameworks such as the Convention on Biological Diversity, the International Treaty on Plant Genetic Resources for Food and Agriculture, and the Law of the Sea. At the urban level, Shi and Shang [38] and Zhou et al. [39] emphasized that prioritizing benefit-sharing between enterprises and local villagers is essential for promoting the transformation and sustainable development of rural areas during the urbanization process. Regarding communities, the development of equitable benefit-sharing schemes between hydropower companies and local communities has become a central theme in a growing number of sustainability studies [40–42]. On the corporate front, since Porter and Kramer's [43] concept of shared value creation proposed a pioneering approach to integrating sustainability into corporate activities, the potential to enhance the wealth of all stakeholders has been increasingly recognized as a key element of corporate sustainable development. For instance, Xie et al. [44] proposed a dynamic value-sharing mechanism based on human capital contribution aimed at leveraging an incentive system that combines fairness in distribution with dynamism to attract and retain talent for stable and sustainable value creation. Arduini et al. [45] suggested that non-financial reporting should reflect knowledge management efficiency, thereby generating a sustained positive impact on corporate culture and reputation.

In the context of economic ecosystems, value sharing is also integrated into the theoretical framework of sustainable development. For example, Matthyssens et al. [46] and Yu et al. [47] argued that cost-driven behaviors that erode supplier profits during cooperation are short-sighted and detrimental to the sustainable benefit of the entire supply chain. Yoo et al. [48] further emphasized the superiority of benefit-sharing schemes between customers and suppliers in reducing waste and energy consumption. Additionally, Kauffman et al. [49] discussed the advantages of equitable value sharing within business networks by utilizing multiple case studies from the tourism and hospitality industries as information technology transforms e-commerce activities. Nevertheless, existing research on value sharing lacks applicability to practical business operations. The Shapley value method, commonly used to address cooperative game theory problems, has been widely applied in studies concerning profit allocation within cooperative organizations such as industrial clusters or strategic alliances [50]. It is undeniable that, compared with these cooperative organizations, platform ecosystems exhibit characteristics of flexibility and dynamism [51]. The uncertainty inherent in platform ecosystems leads to difficulties in accurately assessing expected benefits. Consequently, the Shapley value method, which uses marginal contributions of stakeholders as the basis for profit distribution, faces challenges in evaluating their actual contributions. More importantly, the Shapley value method overlooks the value created by users and employees within the platform ecosystem. Unlike other collaborative organizations, users in a platform ecosystem have a two-way synergistic relationship with the platform enterprise. Ignoring users in the process of benefit distribution may decrease their enthusiasm for interacting with the platform enterprise or weaken the network effect of attracting other users to join the platform. The excess profit of the platform ecosystem comes from relationship resources [22], while platform enterprise employees play an important role in handling and matching user demand information and supplier supply information. Neglecting incentives for employees will reduce their motivation to contribute their value to the overall system value creation.

Therefore, existing research on platform ecosystem value-sharing mechanisms only considers the relationship between platform enterprises and suppliers without considering the roles of users and employees from the perspective of internal governance. This may not only lead to uneven distribution of benefits but also make it difficult to incentivize the sustainable operation of the platform ecosystem.

### *2.3. Stakeholder Theory and the Research Perspective*

The term "stakeholders" was first introduced into the management field by the American scholar Ansoff in 1965 [24]. However, there is still no consensus in academia regarding the concept of stakeholders. Scholars represented by Freeman [52] proposed from the perspective of the relationship between stakeholders and firms that stakeholders are individuals who can influence the realization of business objectives or are affected by the process of achieving business objectives. On the other hand, Clarkson [53] emphasized specific investments, arguing that stakeholders invest in capital and labor and thus assume risks in the company. Although scholars have differing views on the concept of stakeholders, proponents of stakeholder theory, such as Blair [54], unanimously believe that a firm's contributions come not only from shareholders but also from stakeholders, including employees, customers, suppliers, and others. Mitchell et al. [55] further emphasize the value of human capital owners, stating that in the knowledge economy era, both the innovative ability of employees and the stable relationships formed through long-term collaboration between companies and suppliers or users have gradually become intangible, core competitive advantages that are difficult for competitors to imitate. As a result, the position of physical capital owners is weakening while that of human capital owners is becoming increasingly important. Considering the undeniable role that human capital owners play in the value creation process of a company, scholars question the viewpoint of neoclassical economics that advocates maximizing shareholder value as the company's goal. Blair [54] argues that stakeholders, such as employees, suppliers, users, etc., not only make specialized investments in the company but also bear some residual risk after shareholders exit the company. Therefore, they should have the right to claim the surplus value of the company, leading to the proposition of maximizing stakeholder value as the company's goal.

However, the current discussion on whether employees, suppliers, users, and other entities should be included in the category of stakeholders is limited to the sharing of residual equity within companies. This leaves a research gap for this paper to extend stakeholder theory to the allocation of relationship rent within the platform ecosystems. The concept of platform ecosystems originates from natural ecosystems. Moore [56] argues that the mutually beneficial characteristics of various groups in natural ecosystems also exist in the business domain. Platform enterprises play a role in connecting two or more complementary demand groups, driving cooperation among stakeholders in the platform ecosystem through the construction of transaction venues and multilateral cooperation mechanisms for mutual benefit [57,58]. In other words, the essence of a platform ecosystem is a multilateral market involving multiple stakeholder groups [59]. Furthermore, the object of value allocation in platform ecosystems is the excess profit after deducting the solo profit of stakeholders from the total profit. Therefore, there is a similarity between the allocation of excess profit in platform ecosystems and the allocation of residual equity in companies.

In light of this, the paper attempts to draw on the core ideas of stakeholder theory, based on how leading manufacturing enterprises drive the process of value co-creation with SMEs through building platform ecosystems. It aims to balance the fair distribution of benefits with internal governance within the system while exploring an operational platform ecosystem value-sharing mechanism.

## 3. Research Methods

### *3.1. Method Selection*

In alignment with the research question, a longitudinal single-case study approach was employed with the data analysis process adhering to the grounded theory methods [60]. The rationale for this selection is based on two aspects. For one reason, for complex process-oriented research questions, the single-case study method can dissect intricate evolutionary processes and multi-agent interaction relationships, explaining the reasons and logic driving this value-sharing mechanism [60]. This paper aims to uncover the interest relationship between platform enterprises and their stakeholders while summarizing theoretically valuable and actionable mechanisms for value sharing within platform ecosystems. These ecosystems are characterized by mutual growth, mutual benefit, and continuous evolution. By utilizing a single-case study method, we gather data from multiple sources to illustrate the platform's sustainable development process through effective value-sharing mechanisms. This multidimensional approach assists in extracting meaningful patterns from the data.

For another reason, the single-case study method can explore emerging phenomena in management practices through theoretical constructs [61]. As an emerging phenomenon facilitated by the Internet of Things (IoT) technology, the manufacturing platform ecosystem has a limited number of samples, making empirical research challenging. In this context, inductive research based on practical data is particularly useful for developing theoretical insights, as conducting an in-depth single-case analysis can provide valuable insights for other enterprises [62]. Thus, this paper adopts a single-case-based approach to deeply investigate the complex relationships of the stakeholders and the complex process of sharing value in the IIoT platform [60,63].

It should be noted that although longitudinal single-case studies focus on how relevant events change over time, aiding in the understanding of patterns and mechanisms of emerging phenomena, the inductive conclusions drawn from a single-case study may still be exploratory and incomplete [61]. The generalizability of these conclusions awaits validation through more robust theoretical models.

### *3.2. Case Selection*

Based on the principles of typicality and accessibility in case selection [64], this paper chose Haier, a large-scale manufacturing enterprise in China, as the case study sample.

According to the typicality principle, we selected Haier, which is building the Industrial Internet platform named COSMOPlat, as the case study object. The selected case study object has typicality and instructiveness that can be used for theoretical exploration [60,64]. As for the platform type, as an important carrier of the Internet extending from the consumer side to the production side, the industrial Internet platform is a manufacturing platform ecosystem with IoT as the core technology. Against the background of China's supply-side reform, it plays an important role in driving the digital transformation of the manufacturing industry. As for the platform enterprise, as the only IoT ecological brand selected in the BrandZ$^{TM}$ Top 100 Most Valuable Brands, Haier's COSMOPlat IIoT platform has been selected for the list of industrial Internet platforms across industries and sectors released by the Ministry of Industry and Information Technology of China. Therefore, conducting in-depth longitudinal case studies with a typical industrial Internet platform like Haier's COSMOPlat has good appropriateness [65].

In terms of accessibility principle, Haier also meets the selection criteria for the case study. The research team conducted long-term tracking and research on Haier, accumulating abundant first-hand materials through on-site investigations and interviews. Simultaneously, there was a pile of archival documents and public literature available for us to reference and analyze. Based on this, we further focused and refined the research questions through in-depth interviews, introducing a stakeholder perspective to explore the value-sharing mechanisms of the platform ecosystem. The in-depth interviews obtained in this process, along with a large amount of archival documents and public literature, provide support for this research.

### *3.3. Data Collection and Analysis*

#### 3.3.1. Data Collection

The study utilized a combination of semi-structured interviews and secondary data to collect data. The data collection process includes three stages: the stage of recognizing and focusing on practical phenomena, the stage of secondary data collection, and the stage of semi-structured interviews.

① Recognizing and focusing on practical phenomena

In June 2020, Zhang Ruimin, Chairman and CEO of Haier Group, and Zhou Yunjie, President of Haier Group, attended a special report meeting on IIoT in Shandong Province, China. They delivered a speech titled "Concepts and Management Models of IIoT Development: Haier Group's Exploration and Practice". This live broadcast was our first introduction to Haier Group's strategy of empowering small and medium-sized enterprises through the development of an IIoT platform, thereby accelerating the transformation and upgrading of the manufacturing industry. We transcribed the recording of this event and included it in our dataset.

② Secondary data collection

After recognizing the emergence of IIoT platforms, from July 2020 to December 2020, we read and accumulated secondary data such as news, research reports, literature, and other resources. The purpose of this step was to gain a preliminary understanding of IIoT platforms and clarify the theme of our on-site investigation. Based on these secondary materials, we realized that in its service-oriented transformation with the COSMOPlat IIoT platform, Haier had abolished the decades-old hierarchical system and replaced it with a structure of "platforms" and "micro-enterprises" that interact with users. This also included the creation of the "Employees gather and disperse by orders" organizational model, aligning employee value with user value.

③ Semi-structured interviews

To explore whether Haier's organizational model transformation provided the premise and foundation for developing its IIoT platform, we contacted Haier Group and conducted on-site investigations from March to December 2021. We reached out to Haier and conducted multiple in-person interviews with relevant personnel from the COSMOPlat departments, the Win-Win Value Added Table Research Institute, and the Financial Sharing Center, as well as representatives from the chain groups. As mentioned earlier, through the IIoT-themed speech by Haier Group's leadership and secondary data collection, we recognized that Haier's implementation of the IIoT platform for service transformation was not merely a technological innovation but also an organizational and management model transformation. In this process, the relationships between the group and employees, employees and users, and users and suppliers changed. Specifically, employees were no longer mere recipients of fixed salaries from Haier; under the "Employees gather and disperse by orders" model, they became linked to the profits of the IIoT platform and shared the associated risks. Likewise, users and suppliers evolved from recipients or providers of goods to essential contributors who attract additional client relationships to the platform. Stakeholder theory posits that stakeholders are individuals or groups who have invested in and taken on associated risks in an enterprise and whose actions can impact or be impacted by the enterprise's goal attainment [54]. Therefore, we speculated that Haier may have considered employees, users, and suppliers as stakeholders in its IIoT platform strategy. Exploring how Haier addresses conflicts of interest among these stakeholders in the value co-creation process could present an innovative and worthwhile research question. Given the appropriate and robust theoretical framework provided by stakeholder theory, our semi-structured interviews were structured around three key themes derived from this theory: IIoT platform business models, cooperation processes among stakeholders, and profit distribution mechanisms.

Based on these three interview topics, materials from Haier executives were coded as A, COSMOPlat operation managers and employees were coded as B1, B2, and B3, the leaders and employees of the Win-Win Value Added Table Research Institute were coded as C1, C2, the leader and member of Haier Chain Group were coded as D1 and D2, the minister and one consultant of the Haier Financial Sharing Center were coded as E1 and E2, and secondary data were coded as F. The collected data are presented in Table 1.

**Table 1.** Data collection methods.

| Interview Topic | Information Source | Interview Details | Code |
|---|---|---|---|
| Business model | Haier executives | Watch the live broadcast of the Industrial Internet Special Report Conference. The Chairman and CEO of Haier, as well as the President of Haier, attended and delivered a special report on "The Development Concept and Management Model of Industrial Internet—Exploration and Practice of Haier". | A |
| | COSMOPlat departments | Interview with one minister and two staff, a total of eight person-times, 10 h. | B1<br>B2<br>B3 |
| Value sharing mechanism | Win-Win Value Added Table Research Institute | ① Interview with two researchers, a total of 6 person-times, 12 h;<br>② Haier's internal materials, such as "win-win value-added table manual", "chain group intelligent contract ecological map", etc. | C1<br>C2 |
| Stakeholder value co-creation process | Chain Group | Interview with one leader and one member, a total of two person-times, 6 h. | D1<br>D2 |
| | Haier Financial Sharing Center | Interview with one minister and one consultant, a total of three person-times, 9 h. | E1<br>E2 |
| Supplement and corroborate interview data | Internal data and external public information | ① Internal company materials, such as the Win-Win Value Added Table Handbook and the Chain Group Smart Contract Ecological Chart;<br>② News updates published on official channels, such as the COSMOPlat official account and the company's homepage;<br>③ Information publicly available through other channels, such as media reports and industry reports;<br>④ Haier's financial report for the first quarter of 2022. | F |

Source: Compiled by the authors.

The following primary interview questions (IQs) were delineated:

- For Haier's COSMOPlat departments' minister and staff (B1~B3):

IQ1: The development vision of the IIoT platform.
IQ2: The ecosystem strategy of the IIoT platform.
IQ3: The business model of the IIoT platform.

- For Win-Win Value Added Table Research Institute's researchers (C1, C2):
  IQ1: How does Haier adjust the organizational structure during the transformation process?
  IQ2: How does the Win-Win Value Added Table drive stakeholders to sustainably participate in value co-creation on the IIoT platform?
- For the Chain Groups (D1, D2):
  IQ1: What is the formation and operation mechanism of chain groups?
  IQ2: How do chain group members attract resource providers to serve users?
  IQ3: What is the compensation incentive mechanism for chain groups?
- For Haier Financial Sharing Center's minister and consultant (E1, E2):
  IQ1: As an important support platform for Haier's IIoT strategy, what are the services provided by the Haier Financial Sharing Center?
  IQ2: How does Haier implement the "Employees gather and disperse by orders" model to integrate the interests of employees and users?
  IQ3: How to evaluate the value created by different stakeholders on the IIoT platform?
  IQ4: How to reasonably distribute the overall value of the IIoT platform among stakeholders?

To ensure the validity and reliability of the research data, we undertook three main actions during the data collection process: First, we focused on collecting primary data while incorporating secondary data throughout the entire research process to enable cross-verification from multiple sources. After each semi-structured interview, the research team promptly transcribed the recordings, resulting in approximately 40,000 words of interview material. For any gaps in the interview data, we supplemented and reviewed internal documents from Haier, including the "Win-Win Value-Added Table Manual" and the "Chain Group Intelligent Contract Ecological Map". This process provided both real-time and retrospective data, allowing the research team and interviewees to jointly review and summarize the empowerment strategies and processes.

Second, during the ongoing research, the interval between interviews did not exceed three months. This short timeframe supports the coherence and stability of the interviewees' memories, enabling the research team to conduct follow-up interviews and avoid issues of retrospective interpretation and impression management.

Third, we employed the triangulation model to compare data from different sources and selected data supported by multiple sources for analysis [66]. To avoid subjective bias, we compared responses from different interviewees, as well as responses against other archival data. Based on these comparisons, the research members collaboratively screened and wrote the case descriptions, distilling the value-sharing mechanisms of the case subjects. Moreover, we held internal meetings to discuss individual conclusions, and any discrepancies were debated and analyzed based on the research data until a consensus was reached.

#### 3.3.2. Data Analysis

In light of strategy recommendations of process research, this paper used narrative strategy and event sequence methods for initial analysis [67,68] and utilized the procedural grounded theory coding method for data analysis and coding [69]. The analysis results are presented using structured diagrams, as shown in Figure 1.

The data analysis and coding process adhered to three principles: (1) first-order coding retained the original language of the interviewees to vividly present the actions of the case subject; (2) second-order coding formed themes to reveal the logic behind the actions from a theoretical perspective; and (3), second-order codes were abstracted into aggregate dimensions to identify the connections behind the themes.

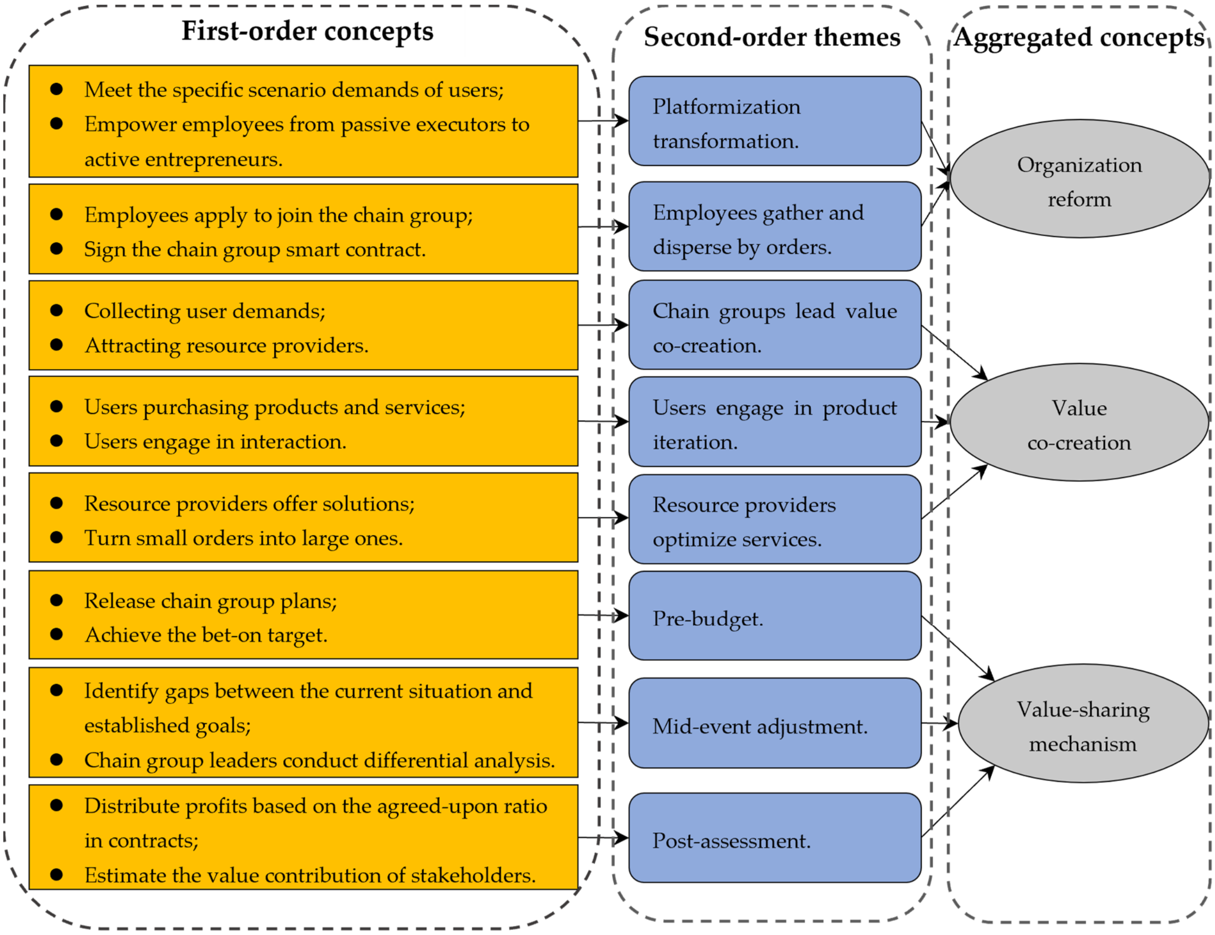


**Figure 1.** Data structure.

Following these principles, the data structuring process in this study comprised three stages. The first step was to distill first-order concepts while faithfully retaining the language of the participants. The research team compiled materials collected at different stages into Microsoft Excel 2019 sheets according to the prior research and interview sequence. The content was then summarized by extracting the central sentences as first-order codes. For example, based on the statement in the original data, "*there is a distinction between users and customers; customers are anonymous and cannot provide preferences, while users can provide product demands and participate in product design. Even without purchasing, as long as they evaluate the product or interact with us, they are considered users* (C1)". The concept of "Meet the specific scenario demands of users" was derived as a first-order concept. Similarly, 16 first-order concepts were obtained, including "Employees apply to join the chain group" and "Sign the chain group smart contract".

The second step abstracted and summarized first-order concepts with similar characteristics into second-order themes from a theoretical perspective. According to stakeholder theory, second-order codes represent organizational and management strategies related to value co-creation and value sharing among stakeholders on the IIoT platform, using gerunds to indicate specific constructs. For example, the two first-order concepts, "Employees apply to join the chain group" and "Sign the chain group smart contract", were distilled into the second-order theme "Employees gather and disperse by orders". Similarly, a total of eight s-order themes were obtained, including "Platformization transformation" and "Users engage in product iteration", etc.

The third step involved abstracting second-order codes that express the same theme into aggregate dimensions and establishing an event chain. Based on stakeholders' event experiences in value co-creation and value sharing on the IIoT platform, the research team integrated second-order themes into theoretical dimensions. For instance, “Platformization transformation” and “Employees gather and disperse by orders” were aggregated into “Organization reform”, and so on. In total, three aggregated concepts were obtained: “Organization reform”, “Value co-creation”, and “Value-sharing mechanism”. Logical connections were sought at the aggregate dimension level to construct a complete interest chain and distill a value-sharing mechanism applicable to the IIoT platform.

## 4. Findings

### 4.1. Organizational Reform

#### 4.1.1. Platformization Transformation

Haier Group is a Chinese manufacturing giant, consistently listed among the “The World’s 500 Most Influential Brands” for 20 consecutive years by the World Brand Lab, ranking among the top three Chinese brands and maintaining its position in the Fortune Global 500 list for years. With the advent of the knowledge economy era, the center of the value chain has shifted from products to users. Haier recognized the importance of meeting personalized user needs. Thus, in 2012, Haier began implementing its network strategy. The aim was to transform closed organizations into open IIoT platforms and achieve service-oriented transformation.

Haier completely restructured its organizational structure during this transformation, breaking away from the traditional pyramid-like hierarchical structure and replacing it with a network structure consisting of platform hosts, micro-enterprise owners, and makers. Specifically, it empowers employees from passive executors to active entrepreneurs, whom Haier refers to as “makers”. These makers directly serve user needs, and if their introducing resources can meet user demands, they can establish micro-enterprises. This disruptive transformation is known as Haier’s IIoT platformization transformation.

#### 4.1.2. Employees Gather and Disperse by Orders

In order to effectively utilize resources across industries and domains to respond rapidly to personalized user needs, Haier developed a new employee organizational model based on the aggregation and dispersal of orders. Within Haier’s IIoT platform transformation, some micro-enterprises realized that the resources available to themselves were limited, making it difficult to meet the complex needs of users. Consequently, micro-enterprises that provide specific services for users spontaneously formed communities within the micro-enterprise ecosystem, termed “ecosystem micro-communities”, abbreviated as “chain groups”.

The chain groups are the fundamental unit for Haier as an IIoT platform enterprise to link resources from all parties to meet user demands. It transforms the scenario where each micro-enterprise within Haier acted independently, forging them together based on the platform’s goal of satisfying user needs. The chain groups lie in a dynamic partnership mechanism, where the roles of Haier employees shift from passive executors to autonomous entrepreneurs.

Employees who identify user scenario demands can initiate a chain group plan. Micro-enterprises or employees intending to join the chain group can submit applications. After both parties reach a cooperative intention through mutual selection, they sign a smart contract. This is a multi-party betting contract based on blockchain technology, stipulating the common goals of the chain group and the tasks of each party. The sharing value of the chain group comes from users. If the services provided by the chain group result in added value for users, the chain group can obtain corresponding profit sharing according to the agreement of the smart contract. Then, the chain group can continue to meet the needs of other users, achieving sustainable development and growth. Otherwise, the chain group may face dissolution due to difficulties in bearing the risks and losses. This salary mechanism drives employees at all nodes, such as research and development, production, sales, and after-sales within the chain group, to cooperate closely and to attract resource providers to realize the value of users.

### *4.2. Value Co-Creation*

#### 4.2.1. Chain Groups Lead Value Co-Creation

During its transformation towards an IIoT platform, Haier discovered that in the IoT era, users' demands have evolved from single products to integrated smart lifestyle solutions. For instance, users need more than just a refrigerator; they desire access to fresh ingredients. Obviously, as a household appliance manufacturer, Haier's resources are limited and cannot fully meet users' needs beyond appliances. Therefore, Haier's chain groups extensively attracted resource providers from other industries, transforming its household appliances into "smart devices" that can be ordered online. Here is an example: Haier's smart refrigerators can alert users about expiring food items, assisting them in managing ingredients. Users can then order fresh fruits, vegetables, and milk through the refrigerator's smart screen and also choose providers for various kitchen supplies such as cooking oil, salt, vinegar, and others.

Around user needs, the process led by Haier's chain groups in value co-creation with resource providers can be abstracted in Figure 2. Initially, Haier interacts with users through household appliances as the medium to gather and aggregate user needs, then engages in centralized procurement with third-party suppliers. Subsequently, products from various industry suppliers are integrated by Haier into a comprehensive set of solutions, catering to users' needs for smart and healthy living. Lastly, Haier collects user feedback and evaluations to share with resource providers, collectively facilitating continuous optimization of solutions and enhancing service quality.

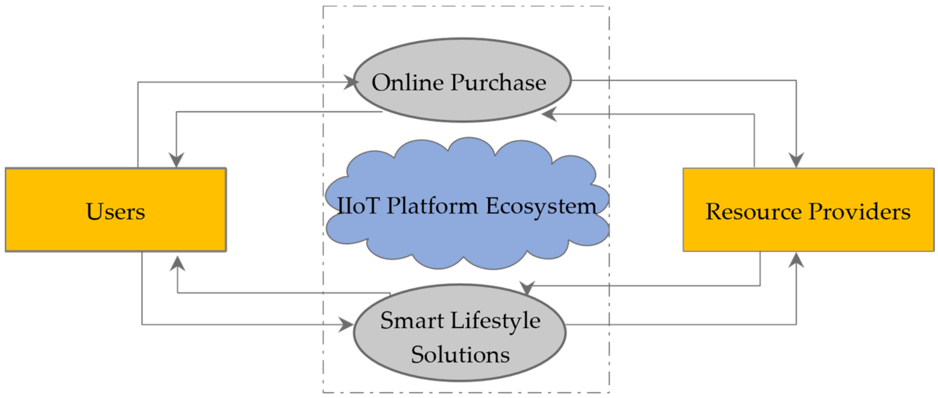


**Figure 2.** Value Creation Process of Haier's IIoT Platform Ecosystem.

In fact, due to Haier's chain group-led organizational model, which promotes value co-creation with users and resource providers, the Haier COSMOPlat IIoT platform can now meet user demands that extend beyond the household appliance industry. The COSMOPlat IIoT platform's contribution to the transformation and upgrading of the Zichuan ceramic tile industry serves as a fitting example. In its interactions with ceramic tile companies, Haier's ceramic tile chain group discovered that these enterprises had high-specification anti-static requirements for environments like precision laboratories and data rooms. However, they struggled to find suitable anti-static research and development resources. To address this, Haier's ceramic tile chain group found providers with anti-static R&D resources available on the IIoT platform, enabling the creation of high-specification anti-static laboratories. This not only allowed the resource providers to rapidly commercialize their anti-static technology but also facilitated the local ceramic tile enterprises in upgrading to high-end differentiated products. This transformation supported their shift from traditional production and sales models to large-scale customization. As a result, the COSMOPlat IIoT platform's interventions in the Zichuan ceramic tile industrial park led to a 15% reduction in collective procurement costs, a 20% decrease in inventory levels, a 27% savings in energy consumption, a 20% increase in efficiency, and a 7.5% reduction in average manufacturing costs.

#### 4.2.2. Users Engage in Product Iteration

Users benefit from smart living solutions, and their usage records and product evaluations become valuable data resources, assisting platform enterprises and resource providers in improving service quality and attracting more users. Regarding this, researchers from the Haier Win-Win Value Creation Institute specifically delineated the difference between Haier's "users" and the conventional "customers" referred to in management studies. "Customers", they emphasized, are characterized by transactional behaviors associated with product exchanges, typically involving sporadic and one-time transactions with enterprises. On the other hand, "users" are defined by interactive relationships; even in the absence of purchase behavior, as long as there is engagement or product feedback, they are considered users. Another significant distinction lies in anonymity: customers remain anonymous and often do not provide detailed preferences, whereas users are capable of offering product demands and participating in product design processes.

As feedback from users on the Haier IIoT platform contributes to product upgrades, the involvement of users in the product interaction process also constitutes their engagement in the value co-creation process of the IIoT platform system.

#### 4.2.3. Resource Providers Optimize Services

As a household appliance manufacturer, Haier provided an IIoT platform for users and resource providers to establish transactional relationships. Resource providers offer fresh ingredients, kitchenware, and other products that meet users' needs for a healthy lifestyle. Haier's centralized procurement helps in turning small orders into large ones, aiding suppliers in expanding their market reach and achieving zero inventory. The more suppliers of kitchenware and other products attracted to the platform, the better the user experience provided. This, in turn, can attract more users to customize Haier household appliances. Hence, the competitive value of Haier's IIoT platform, the commodity value of resource providers, and the experiential value of users are enhanced through mutual participation. Together, they form a user-centric "User-Refrigerator-Fresh Food Supplier" ecosystem.

Apart from refrigerators, Haier is transforming different types of household appliances into "smart devices" that can create ecosystems. For example, they are creating a "Clothing Network" ecosystem revolving around washing machines, integrating clothing, washing and care products, and other resource providers. Catering to users' "wearing" needs, it offers a seamless experience covering the entire process of washing, caring, storing, matching, and purchasing clothes. Centered around gas stoves, integrating restaurants, cleaning agents, and other resource providers to form the "Food Network", catering to users' "eating" needs, it creates a one-stop gourmet experience for buying, storing, eating, cooking, and washing in different scenarios.

### *4.3. Value-Sharing Mechanism*

#### 4.3.1. Overview of Win–Win Value-Added Table

The win–win value-added table is a management tool derived from the demand for external cooperation resources introduced by Haier for the chain group based on a decade of practical experience with its salary model. The reason is that in the IoT era, user demands are no longer for singular products but for specific scenarios. This necessitates collaboration between enterprises and external providers with complementary resources to collectively meet the specific scenario demands of users. In the interview, researchers at the Haier Win-Win Value Added Table Research Institute stated, "*Enterprises within the ecosystem should be in a symbiotic state rather than competing with each other. However, the traditional financial statements cannot reflect the symbiotic and mutually beneficial relationship between enterprises, nor can be used for profit sharing*". This is because the three traditional financial statements—the balance sheet, income statement, and cash flow statement—reflect income minus costs and expenses equals profit and cannot reflect the number of users, the number of resource providers, and the profit sharing that stakeholders should gain. Taking the Haier smart refrigerator as an example, when the refrigerator was just an appliance, financial staff could use traditional financial statements to calculate the incomes and profits of the refrigerator to measure the value the product created for the company. However, when the refrigerator transformed into a smart device, becoming a gateway for kitchen supplies, the value created by the refrigerator should also include the number of users and the profits of the resource providers. That is, the value created by the ecosystem of "users-refrigerators-fresh food suppliers". Therefore, traditional financial statements are suitable for one-time transactions between buyers and sellers, but they cannot serve the multilateral transactions that continue to occur with user interactions. The win–win value-added table arises from the demand for multilateral transactions where users and resource providers coexist.

The win–win value-added table is not a substitute for traditional financial statements but a supplement to address the deficiencies of traditional statements and provide important insights for business management, clarifying the value contribution of stakeholders within the platform. This clarity aids in collectively sustaining the operation of the industrial Internet platform ecosystem. Specifically, the win–win value-added table evaluates the entire IIoT platform ecosystem from six aspects: users, resource providers, total value, revenue, costs, and marginal revenue. Its composition and meanings of indicators are shown in Table 2.

**Table 2.** The composition of the Haier win–win value-added table and the meaning of each index.

| Index | Item | | | Definition |
|---|---|---|---|---|
| User resources | Trading users | | | Users who have traded on the platform. |
| | Interactive users | | | Users who continue to participate in the interaction after purchasing a product or service on the platform. |
| | Lifetime users | | | The platform evolves through continuous iteration, enriching the community ecosystem and ultimately cultivating lifelong users. |
| | Single-user value contribution | | | (Ecosystem profit + Value-added sharing)/Amount of users, measuring the value contribution generated by a single user on the platform. |
| Resource Provider | Interactive Resource Provider | | | All resource providers on the platform. |
| | Active Resource Provider | | | Resource providers can participate in co-creation. |
| The total value of ecological platform | Profit | Traditional profit | | Traditional revenue—Traditional costs |
| | | Ecosystem profit | | Ecosystem revenue—Ecosystem costs |
| | Value-added sharing | Chain group Sharing | | The sharing value obtained from chain group co-creation. |
| | | Supporting Platform | | The supporting platforms that help chain groups achieve value creation. |
| | | Stakeholders in Co-creation | Resource Provider Sharing | The sharing value obtained by resource providers (suppliers or brand partners, etc.) on the platform. |
| | | | User Sharing | The sharing value obtained by users participating in product and service development. |
| | | | Capital Sharing | [Shareable Profit + (End-of-Period Valuation − Beginning-of-Period Valuation)] × Equity Ratio, measuring the sharing value of socialized capital parties. |

**Table 2.** *Cont.*

| Index | Item | Definition |
|---|---|---|
| Revenue | Traditional revenue | Focusing on the continuous iteration of user interaction and experience, revenue generated through businesses such as selling appliances and providing services. |
| | Ecosystem revenue | Focusing on the goal of creating an IoT ecological brand, revenue generated through co-creating value by micro-enterprises and partners. |
| | Single-user revenue | Revenue/Number of users = (Traditional Revenue + Ecosystem Revenue)/Number of users |
| Cost | Traditional cost | Focusing on the continuous iteration of user interaction and experience, as well as costs incurred through businesses such as selling appliances and providing services. |
| | Ecosystem cost | Costs incurred during the continuous iteration and upgrading process of the community interaction platform, including resource costs and service costs. |
| | Marginal cost | (Traditional cost + Ecosystem cost)/Number of users |
| Marginal revenue | | Single-user revenue—Marginal cost |

Source: Haier internal materials.

In the IoT era, meeting users' personalized needs is the source of value for businesses. Whether users are willing to participate in IIoT platform interactions directly determines the survival of the entire ecosystem. The "user resources" indicator in the win–win value-added table divides users into three types based on their level of involvement: transaction users, interaction users, and lifetime users. Among them, transaction users refer to those who engage in a single buying or selling transaction, while lifetime users refer to those who engage in continuous interaction throughout the entire lifecycle. The user resources indicator reflects the user stickiness of the platform by measuring the number of users at each level and the value contribution generated by each user. High-quality user resources need to attract equally high-quality resource providers to better meet user needs. The "resource providers" indicator categorizes providers into interactive resource providers and active resource providers based on their level of participation. The former measures the total number of resource providers in the IIoT platform ecosystem, while the latter measures resource providers actively meeting specific user needs. This indicator reflects the co-creation capability of the ecosystem through the number and activity level of resource providers.

The "profits" created by the IIoT platform enterprise of the ecosystem and the "value-added sharing" among chain groups, resource providers, investors, and other relevant stakeholders collectively constitute the "total value of the platform". This indicator is used to reflect the total value of the IIoT platform ecosystem achieved through co-creation. "Profits" include not only traditional profits obtained from hardware sales but also ecosystem profits generated through collaboration among chain groups and relevant parties. "Value-added sharing" reflects the profits shared by stakeholders, including the supporting platform, chain groups, users, resource providers, and capital providers, according to pre-agreed proportions. It should be noted that in this item, "chain group sharing" refers to the performance incentives shared with employees according to the smart contracts signed when the chain group is created. "Supporting platform" and "co-creation stakeholders" refer to the profits allocated to stakeholders, including the interactive platform, users, and other stakeholders, according to the proportions agreed upon in the legal agreements.

The "revenue" of IIoT platform ecosystems is not only the "traditional revenue" obtained from main business activities such as selling hardware products and providing services but also includes the "ecosystem revenue" generated through collaboration with external resource providers to meet user scenario demands on the platform. In the "User-Refrigerator-Fresh food supplier" ecosystem, Haier's revenue from selling refrigerators constitutes hardware revenue, while the revenue obtained from providing a sales channel for kitchenware resource providers to sell ingredients is considered ecosystem revenue. Similar to "revenue", the win–win value-added table categorizes "costs" into "traditional costs" incurred from selling hardware products and providing services and "ecosystem costs" related to the scenario operations cost invested in iteration and upgrades of the interaction platform. The "marginal profit" is defined as the profit generated per transaction user, represented by the difference between the "single-user value contribution" formed by each transaction user and the "marginal cost" incurred in attracting and serving each transaction user, reflecting the attractiveness of the IIoT platform ecosystem. As the IIoT platform attracts more user resources, marginal costs decrease while marginal profits increase.

#### 4.3.2. Utilization of Win–Win Value-Added Table

The win–win value-added table not only provides a basis for profit distribution among IIoT platform enterprises, employees, users, and providers but also serves as a management tool driving chain groups to proactively engage in behaviors that promote organizational sustainability. This paper analyzed both roles of the win–win value-added table within COSMOPlat IIoT platforms from three dimensions: "before events, during events, and after events", as depicted in Figure 3.

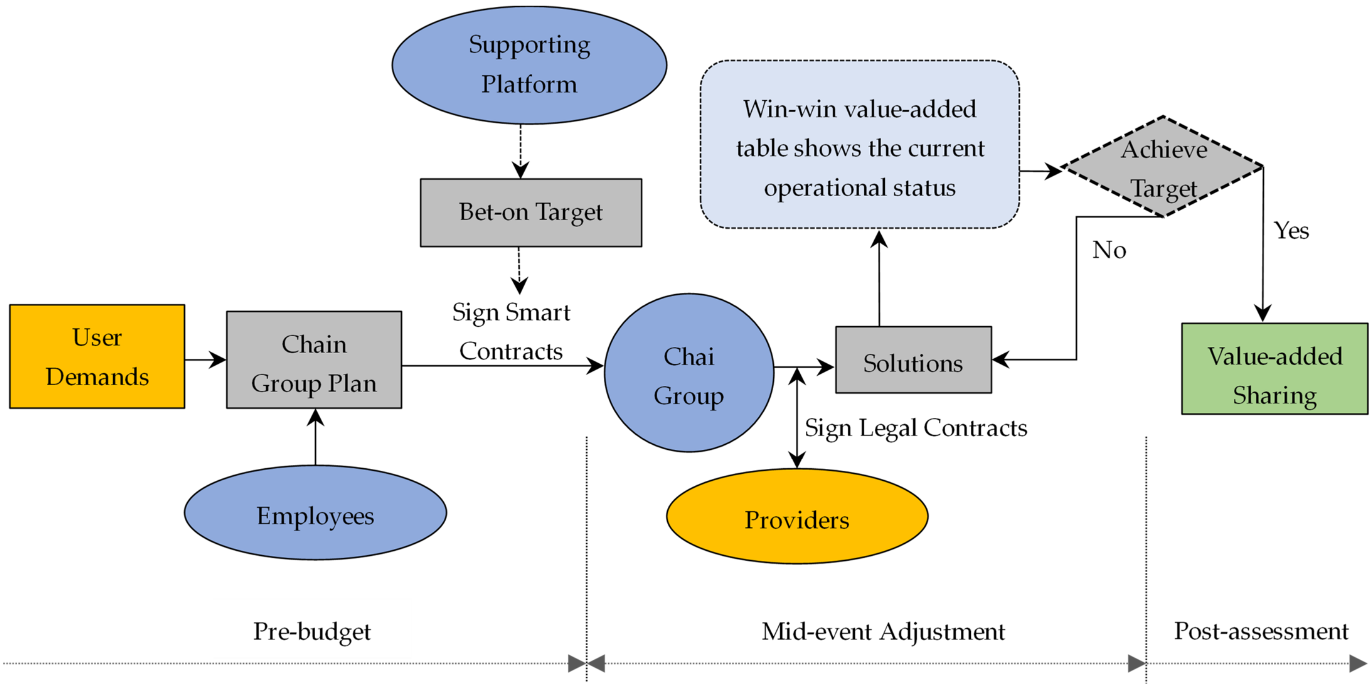


**Figure 3.** The process of value creation and value sharing in Haier's COSMOPlat IIoT platform ecosystem.

① Pre-budget

Haier uses chain groups as the basic organizational unit to participate in the value co-creation of the IIoT platform ecosystem. This offers the advantage of flexible operations. However, due to the unpredictable market environment that chain groups must rapidly respond to, annual comprehensive budgeting struggles to accurately estimate their income formation, resource requirements, and cost expenditure. Under the "Employees gather and disperse by orders" organizational model, Haier decomposes comprehensive budget targets into smart contracts of chain groups. Specifically, some employees initiate a chain group plan based on user demands. Once other interested employees join, a chain group is established by signing a chain group smart contract. In contracts, the support platform combines factors such as market environment and competitiveness to set bet-on targets for the chain group. The win–win value-added table displays the completion status of the chain group's betting targets, which is used to assess salary incentives for employees within the chain group. Overall, chain group smart contracts and win–win value-added tables serve as tools for budget management of chain group operations on an order-by-order basis.

② Mid-event adjustment

The win–win value-added table not only presents the financial information on Haier's products and services but also reports crucial non-financial information, such as user resources and resource providers, that are vital to the operation of the ecosystem. It serves as a management tool for Haier, a platform enterprise, to conduct internal management. The disclosure of the total value of the platform enables chain group leaders to grasp the current operation status of the entire community. This facilitates the timely identification of gaps between the current situation and established goals across dimensions such as user numbers, resource provider quantities, and engagement levels, thereby enabling precise gap analysis. Specifically, based on the bet-on targets signed by the chain group leader, we conducted differential analysis from the perspective of user resources according to the six subjects of the win–win value-added table. For projects that have not met the standards, we analyzed the reasons through reverse deduction and promptly adjusted and optimized strategies that are currently unsuitable. Specifically, the chain group leader conducted a differential analysis based on the six items of the win–win value-added table, combining the bet-on targets signed in the chain group smart contract. For items that failed to meet standards, reverse analysis could be conducted to identify the reasons, and then chain group leaders could promptly adjust and optimize strategies.

③ Post-assessment

The win–win value-added table separates traditional revenue (or costs) and ecological revenue (or costs), allowing the chain group leaders on the COSMOPlat IIoT platform to compare the cost-benefit ratio of hardware investment and ecological investment. This enables them to allocate limited capital and human resources to projects with higher returns, improving the efficiency of internal capital market allocation [70].

In summary, the win–win value-added table not only provides decision-making information for internal management but also serves as a basis for value contribution assessment and disclosure to stakeholders, facilitating fair benefit distribution among them. Specifically, user resources and resource provider subjects reflect the level at which the chain groups on the COSMOPlat IIoT platform attract users and resource providers and interact with them continuously. The total value of the IIoT platform ecosystem provides a detailed disclosure of profits and value-added sharing not only enables members of the chain group to grasp the information on returns from hardware and ecological investments but also allows stakeholders such as users, resource providers, and investors to perceive the overall value of the ecosystem and their own contributions' value. Among these, the chain group sharing subject that embodies Haier's user-paid salary mechanism binds the benefits of chain group employees with those of users, incentivizing employees to continuously discover new value growth points based on user demands.

In this case, the chain groups on the Haier COSMOPlat IIoT platform enter into legal contracts with collaborating users and suppliers, establishing agreements on their respective responsibilities and benefit distributions. They also utilize a win–win value-added table to evaluate stakeholders' value contributions, achieving a mechanism where fair and equitable benefit sharing drives the entire IIoT platform ecosystem's operation. Therefore, we consider that the quantification, disclosure, and distribution of relationship rent through the win–win value-added table are crucial for stakeholders in the IIoT platform ecosystem to engage in value co-creation. In summary, emphasizing the importance of relationship rent can enable stakeholders on IIoT platforms to collectively adhere to platform norms and reach mutual consensus for mutual benefit.

## 5. Discussion

Through case analysis of the value creation process and value sharing mechanism of the COSMOPlat IIoT platform developed by Haier, it can be seen that stakeholders such as employees, users, and resource providers are all the main stakeholders in value co-creation. Accurately assessing the overall value created by the ecosystem and accurately allocating the value contribution of each stakeholder is key to driving the value creation process through a value-sharing mechanism. It is essential to ensure that the benefits of the ecosystem exceed the opportunity cost of resources invested by stakeholders, thus necessitating the existence and sustainability of the ecosystem. Only when all relevant parties receive returns commensurate with their contributions can the stable relationships within the ecosystem be maintained. To ensure the above two key points, Haier innovatively proposed the win–win value-added table, which quantifies the overall value of the ecosystem in the form of financial statements and demonstrates the distribution of profits among stakeholders. This provides a breakthrough in addressing the problem of the Shapley value method, as proposed in existing research, which struggles to assess the actual value contribution of stakeholders. Additionally, the win–win value-added table includes employees and users in the scope of value-sharing, aligning the beneficiaries of value-sharing rights with those involved in the value-creation process.

This study believes that Haier regards the win–win value-added table as a tool for value sharing among stakeholders and provides practical insights for exploring the value-sharing mechanism of platform ecosystems under the IoT model. However, to achieve value-sharing effects that balance rational profit allocation and internal management within the platform, there are still areas for improvement.

### *5.1. The Necessity of Using Win–Win Value-Added Table for Platform Ecosystem Value Sharing*

Globally, as an increasing number of enterprises integrate sustainability into their core business operations, disclosing sustainability reports containing non-financial information has become a trend [71]. Even though there has been a longstanding debate over whether financial reports should be directed toward all stakeholders or specific categories of stakeholders [72], recent studies emphasize that the core of sustainability reports should be to engage stakeholders [72,73]. The Financial Accounting Standards Board (FASB) categorizes users of accounting information into two main groups based on their economic relationship with the enterprise: those with direct relationships and those with indirect relationships. The former includes shareholders, creditors, employees, users, suppliers, and other stakeholders directly associated with the enterprise, while the latter refers to stakeholders providing consulting services to the direct stakeholders. The information needs of indirect stakeholders are contingent upon the interests of direct stakeholders. Thus, financial reporting should prioritize the information needs of direct stakeholders as the fundamental objective.

Porter's theory of industry choice [7] posits that the competitive advantage of traditional enterprises stems from strategic choices, as enterprises tend to enhance their bargaining power relative to upstream and downstream players to seize more profit within the value chain, achieving "shareholder value maximization". This is a zero-sum game mentality. Under the value creation logic based on the value chain, it is necessary to utilize the income statement to reflect the interests of shareholders, who are direct stakeholders. However, the value creation logic of COSMOPlat is leveraging employees' motivation to research resources for user demands, thereby achieving overall value enhancement and subsequently gaining increased value for the stakeholders. Stakeholders on the platform, including employees, users, and resource providers, enter the ecosystem through contracts such as chain smart contracts or legal contracts, becoming direct stakeholders in the ecosystem. The signing of contracts binds the profits and risks of each stakeholder together, and shareholder value becomes a manifestation of the value of stakeholders within the ecosystem. For the stakeholders, the overall value of the platform and the distribution of value- added need to be clearly defined in accounting information. However, traditional financial statements focus on the benefits of shareholders, whether it is the net assets of the balance sheet or the net income in the income statement; both are based on shareholders as the equity subject. Taking the income statement as an example, net profit only reflects the value created for the shareholders, while the expenses deducted to calculate net profit, such as wages, interest, taxes, etc., are the value created for stakeholders such as employees, creditors, governments, etc. Therefore, the income statement cannot reflect the value created collectively by stakeholders within the ecosystem. From the perspective of value-added distribution, the income statement only reflects the distribution of shareholders, and the other two traditional financial statements also fail to reflect how value-added is distributed among other stakeholders.

In addition, to enhance the disclosure mechanism of corporate information, the FASB suggests incorporating management commentary on intangible business resources and relationships into the scope of financial reporting disclosures. This provides decision-useful information to financial report users, such as investors, regarding the competitive advantages of the enterprise's business model and its ability to create value.

Therefore, considering the shortcomings of the traditional financial statements in capturing the value creation and sharing process within platform ecosystems, as well as FASB 's requirements for improving accounting information disclosure, this paper argues that the following three features of a win–win value table make it suitable for development as a tool for value sharing in IIoT platforms.

Firstly, the win–win value-added table takes stakeholders as the reporting subject. Organizations have turned to sustainability reporting as a means to demonstrate accountability to their stakeholders [71]. Herremans et al. [72], through their investigation, summarized sustainability report characteristics that facilitate stakeholders in executing engagement strategies. However, there has been insufficient research on how to leverage financial reporting to enhance stakeholder engagement. Moroney and Trotman [73] argued that enterprises should ensure the reliability of sustainability reports to meet the interests of investors and other stakeholders. Traditional financial statements cannot reflect the contributions of stakeholders, such as employees and users, to the platform ecosystems. The research findings of this study indicate that the win–win value-added table not only covers information such as revenue and profit of the core platform enterprises but also includes information about stakeholders. The "total value of the platform" item reflects the value collectively created by stakeholders in the ecosystem, while the "value-added sharing" item reflects the profit distribution among stakeholders. The win–win value-added table not only reflects the operating status of core enterprises but also reflects the overall value of the ecosystem and the value sharing among stakeholders such as users and resource providers. It demonstrates the role of network nodes, reflecting the collaborative and win–win business goals between platform enterprises and stakeholders such as employees, users, and resource providers in the ecosystem.

Secondly, the win–win value-added table pays more attention to management factors, emphasizing the disclosure of non-financial information represented by customer relationship rent, and provides a more comprehensive assessment of the value-creation capability of platform enterprises and the ecosystem as a whole. Ensuring fairness in the distribution of profits is a significant social concern associated with the pursuit of accounting equity. The concept of value added, along with the information provided in the value-added table, is a representation of how effectively the enterprise is managed in consideration of all stakeholders [74,75]. However, due to the disclosed information cannot be verified by reconciling it with financial statements, there have been doubts raised regarding the usefulness of value-added information disclosed in current sustainability reports. For instance, Haller et al. investigated the value-added information published in sustainability reports and found that the value-added information disclosed by companies currently lacks clarity, comparability, and comprehensibility [74]. For platform ecosystems, financial incentives are more closely tied to their sustainability [76], as users and resource providers have become one of the main driving factors for the development of the ecosystem. Customer relationship rent, related to the quantity and quality of users and resource providers, is essential non-financial information for evaluating platform enterprises and even the entire IIoT platform ecosystem. The chain group is a basic unit that Haier, as a platform enterprise, provides products and services to users. For chain group leaders, the win–win value-added table's representation of the information of users and resource providers can provide a clear view of the driving factors, enabling them to adjust solutions timely and keep the sustainability of this platform ecosystem. For investors, the win–win value-added table includes intangible business resources and customer relationships, such as the quantity and quality of users and suppliers, in the disclosure scope of financial reports of the platform ecosystem, providing them with useful information for decision-making about its value creation capability.

Lastly, hardware and software revenues and costs are measured separately. In the traditional business model, manufacturing enterprises predominantly depend on the sale of hardware products. On the contrary, in the IoT era, selling hardware products constitutes only a fraction of enterprise revenue streams. The existing literature has become increasingly aware of the influence of the digital on traditional reports [77], but there is little research exploring the method for assessing ecosystem excess profits beyond hardware. As a manufacturing platform enterprise, Haier's revenue sources include hardware revenue generated from business operations such as selling appliances and providing services, as well as ecosystem revenue generated from chain groups and partners meeting user scenario needs on the platform. Traditional financial statements combine these two types of revenue, making it difficult for readers to clearly distinguish the sources of revenue. However, during the enterprise's ecological transformation, managers need to compare the financial return on investment of traditional and ecological businesses to balance the resource investment. The win–win value-added table provides financial data for the separate listing of traditional revenue (or ecological costs) and ecological revenue (or traditional costs), assisting managers in calculating the proportion of ecological revenue (or ecological costs) and facilitating timely strategic adjustments for the platform ecosystem.

In addition to the theoretical significance outlined above, the application of the win–win value-added table also has managerial implications. The commitment of management's commitment to shareholders is central to business ethics, but due to the complexity and instability of platform ecosystems in terms of business and profits, traditional valuation models are not conducive to assessing distributional fairness between stakeholders. This study finds that Haier, in its pursuit of business model innovation, uses the win–win value-added table as both a financial report and a management tool. Beyond shareholder value, it evaluates the value-creation capabilities of employees, users, and resource providers. This is complemented by improvements in production processes, employee incentives, and a realignment of responsibilities and accountabilities. As a result, these actions reshape relationships with internal and external stakeholders, thereby signaling stable firm performance to their stakeholders and fully activating organizational vitality. This suggests that manufacturing enterprises undergoing a service-oriented transformation with IIoT platforms should prioritize balancing stakeholder interests as the first step. They should also utilize innovative management tools as a guarantee for implementing business model innovation.

### 5.2. Further Elaboration on Using Win–Win Value-Added Tables in Practice

Previous studies have defined the excess profit remaining after deducting the individual profits of each stakeholder from the total profit of the platform ecosystem as relationship rent [11,12], using it to evaluate the value-creation ability of the platform ecosystem. Haier's win–win value-added table separately presents the ecological profits of Haier as a platform enterprise and the value sharing among stakeholders. It quantifies the concept of relationship rent in financial data and agrees with internal employees through the signing of smart contracts and with external partners through legal contracts on the resources to be provided by each party and the distribution ratio of excess profits. This approach solves the problem of the traditional profit allocation principle being unable to divide resource ownership and establish a consensus on the value of relationship rent. However, because cooperative contracts such as chain group smart contracts and legal contracts are signed before stakeholders participate in the value creation process, the profit distribution proportions stipulated in contracts may not align with their actual value contributions. This paper suggests exploring the discrepancy between the actual value and the target value in the "value-added sharing" project of win–win value-added tables, providing a visual basis for distributing benefits to stakeholders.

Furthermore, regarding the reporting entity, first, the win–win value-added table does not involve creditors. In traditional financial statements, interest to be shared by creditors could either be capitalized into the fixed asset cost in the balance sheet or be included in the financial expenses in the income statement along with exchange gains and losses, financing costs, and other items not related to the creditor, thus failing to reflect the value sharing of them. Secondly, the win–win value-added table only lists the performance-based compensation achieved by employees within the chain group through smart contracts without listing their basic wages. In traditional financial statements, employee wages could be included in the cost of related assets or operating expenses. Therefore, neither the win–win value-added table nor the traditional financial statements can accurately reflect the value sharing of employees.

## 6. Conclusions

Due to the difficulty in accurately assessing the actual contributions of platform ecosystem stakeholders, the existing literature on organization value sharing, such as the Shapley value method, has limitations in addressing actual problems. It also fails to consider the contributions of employees and users in the value-creation process. This paper, by studying the value-sharing mechanism of Haier COSMOPlat IIoT platform, discovered that Haier uses smart contracts with internal employees and legal contracts with external partners to define the distribution ratio of relationship rent and quantifies it in financial terms using a win–win value-added table.

This method of quantifying and disclosing intangible business resources in financial terms can address the common problem of assessing the actual contributions of stakeholders in existing platform ecosystem benefit distribution methods. It can also change the existing literature's "post-event value-sharing" mindset, allowing platform enterprises to achieve value creation through "mid-event adjustment" while balancing the profit distribution and internal management in the platform ecosystem, ultimately driving value creation through a fair and reasonable value-sharing mechanism. Therefore, the win–win value-added table enables stakeholders in the platform ecosystem to clarify the overall value of the system and the value each party creates, thereby balancing the benefits of all parties and generating the driving force for the sustainable operation of manufacturing platform ecosystems.

The study offers three key theoretical contributions: Firstly, it introduces a practical and sustainable value-sharing mechanism for the IIoT platform ecosystem, addressing the existing literature gap in this area. Secondly, it proposes sustainable approaches to drive the service-oriented transformation of manufacturing enterprises, which contributes to the advancement of sustainable reporting practices. Lastly, it extends the application scope of stakeholder theory from individual enterprises to IIoT platform ecosystems, thereby broadening the applicability of stakeholder theory.

The limitation of the case study suggests directions for future research. This paper focuses on the value-creation process and value-sharing mechanisms of IIoT platforms. Although it is found that the win–win value-added table provides a tool for value sharing among stakeholders in the platform ecosystem, the value creation and sharing model of the COSMOPlat may be based on the platform transformation of Haier. This is because Haier achieved strategic transformation during the network strategy, and the "Employees gather and disperse by orders" organizational model provided the prerequisite to meet user needs through chain groups. Therefore, future research could compare the value-sharing mechanisms of the COSMOPlat IIoT platform to other manufacturing platform ecosystems and summarize value-sharing mechanisms suitable for different organizational models.

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