

Energy Internet Platform Business Development Theory and Maturity Analysis From the Perspective of Empowerment

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ABSTRACT

The energy internet features extensibility, close connection, and value spillover effect. Platform-based businesses play an important role as a carrier of energy internet for external sharing and empowerment. Based on external empowerment, value network, and VCUA environmental theory, a "triple helix" model for the development of the energy internet platform business is constructed, and the mechanism of action between the environmental foundation, empowerment capabilities, and key elements, as well as the business development interrelationships at different stages are illustrated in this paper. Platform-based business development is typically divided into three stages, namely, exchange links, integrated perception, and ecological guidance. In order to accurately determine the degree and direction of business development, a platform-based business development maturity analysis model is proposed, to analyze the four dimensions of platform resource management, platform market expansion, platform ecological construction, and platform benefit output. Finally, a case study on green smart logistics platform is analyzed.

Keywords: *Business model, Platform, Maturity, Triple helix.*

1. CONNOTATION OF PLATFORM-BASED ENTERPRISES AND PLATFORM-BASED BUSINESSES

A platform-based enterprise refers to an enterprise that features bilateral market (bilateral platform) for matching transactions or information interaction and generating profits. Specifically, based on the bilateral market (bilateral platform), platform-based enterprises provide interactive scenarios and environments for information and resource exchange, transaction matching, etc. to both supply and demand parties, so as to achieve the purpose of matching their needs, reducing transaction costs, and sharing value. The development of the platform owner is dependent on the platform, and a corresponding platform development strategy is executed to construct a platform-based ecosystem and maximize the network effect, in order to obtain more users [1].

Platform-based enterprises carry out various businesses through platforms and realize their overall development through the platform. In the early stages of development, such enterprises may not possess all the

characteristics of a platform-based enterprise, instead they use mature businesses for platform-based development, gradually improve the platform strategy, and then form part of the platform-based business. Therefore, a platform-based business strategically creates a business ecological environment shared by multiple groups, enables participants to fully realize their capacity enhancement, business growth, and value realization, and applies the network effect to promote value sharing between platform enterprises and platform participants.

The main characteristics of platform-based services are as follows: Firstly, there are bilateral markets with many participants, which forms certain network externalities. Only when there are many participants and bilateral markets have been formed, can the purpose of platform interaction be fulfilled with greater efficiency. At the same time, the externality of the platform network makes the development of the platform more dependent on the participation of the parties in the bilateral market, forcing platform companies to increase their openness from the outside to the inside, and form a system of coordinated development with the bilateral

participants of the platform. Secondly, the participants interact and match products, information, resources, and transactions while following certain rules. Participants of the platform are all assigned with various interactive purposes. Through the connection and interaction function of the platform and certain "rules of the game", the supply and demand parties can achieve precise demand matching, thereby reducing transaction costs and improving efficiency. Lastly, not all products and information belong to the platform owner, and the main role of the platform owner is that of a platform construction manager. The platform owner mainly acts as the platform construction, management, and service party. Generally, the platform owner does not directly provide products and information, but uses its inherent technology and resource advantages to allow the service functions of empowering entities, matching transactions, and enabling interactions, for which it extracts commissions and platform management costs. Some companies integrate platform-based business with self-produced or self-operated business models (such as JD) to carry out platform operations.

2. TYPICAL CHARACTERISTICS OF ENERGY INTERNET PLATFORMS

Unimpeded system: Energy internet platforms take the power industry as the hub, integrate other basic energy industries, digital industries, and service industries, build an energy internet value platform, realize the deep coupling of energy flow, information flow, and value flow, and realize the integration and interconnection of energy industry and non-energy industry.

Diversified industries: The energy internet industry chain is extensive, covering strategic emerging industries such as energy-saving and environmental protection industries, new energy industries, new-generation IT industries, and high-end equipment manufacturing industries, and is closely related to agriculture, transportation, and construction.

Significant scale: The energy internet industry has a huge market scale, covering energy production, conversion, transmission, storage, and consumption. It plays a crucial role in the transformation and upgrade of several traditional industries and the development of emerging industries.

Open sharing: The energy internet platform possesses natural ecological characteristics that can effectively promote the open sharing of assets, information, and businesses, and absorb more social resources and capital to jointly build, govern, and share the energy internet industry ecosystem and achieve business innovation and mutual benefit.

3. PLATFORM-BASED BUSINESS DEVELOPMENT THEORY FROM THE PERSPECTIVE OF EMPOWERMENT

3.1. Analysis of Three Supporting Theories for Platform Business Development

External empowerment theory. External empowerment refers to the way in which a business entity achieves business growth through the extension of the service model under the premise of realizing iterative optimization of its own capabilities, and then fulfills the needs of its self-operated business. The key to achieve return of value through empowerment lies in whether the company possesses empowerment ability [2-6].

Value network theory. Value network refers to the network of value creation, exchange, and transfer formed between different market entities, different industries, different times, and different locations. The focus of value creation in the network has shifted from improving the efficiency of the supply chain to network collaboration. Different actors in the value network need to innovate more actively and interact and cooperate with other relevant entities to develop value co-creation.

VCUA environmental theory. Focus on describing the mechanism of environmental volatility, uncertainty, complexity, and ambiguity on empowerment capabilities and key business elements [7].

The development of platform-based services generally goes through three typical development stages, namely, exchange of links, integrated perception, and ecological guidance. In the value network under the complex network economic environment, platform-based business development needs to primarily improve its own external empowerment capabilities, and accordingly, positively improve the key elements of the business, thereby enhancing the development foundation, affecting the external environment, and realizing value return.

3.2. "Triple Helix" Model of Platform-Based Business Development

Based on external empowerment, value network, and VCUA environmental theories, a platform-based business development "triple helix" model is constructed to explain the mechanism of environmental foundation, empowerment capabilities, and key elements, as well as the interrelationship of different stages in business development. The schematic diagram of the model is shown in Figure 1.

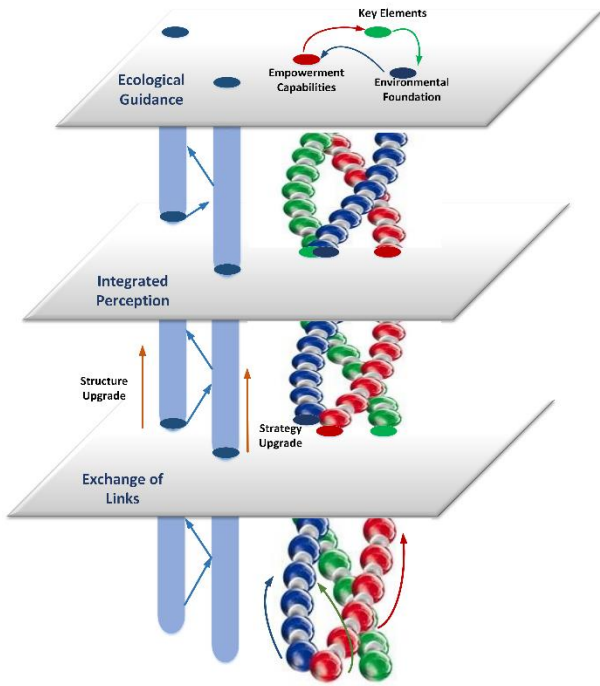


Figure 1 "Triple Helix" model of platform-based business development

First, the environmental foundation, empowerment capabilities, and key elements interact and promote each other, spiraling upward. The positive changes in environmental elements promote the improvement of business empowerment capabilities and the key elements of business restructuring. The restructuring of key elements in turn builds a good environmental foundation for business development. For example, the quality and coverage of data, promote the improvement

Table 1. Capabilities, elements and environments corresponding to different development stages of platform-based businesses

	Exchange link	Integrated perception	Ecological guidance
Empowerment	Connection ability matching ability tool ability module ability exchange ability communication ability	Perception ability concentration ability network interoperability resource acquisition ability integration ability	Analysis and mining capabilities decision support capabilities derivative development capabilities open sharing capabilities core leadership capabilities governance control capabilities incubation, and cultivation capabilities
Key elements	Interaction accountability mechanism structure design user scale growth organizational structure	Collaboration, Process optimization business model innovation connection method, connection efficiency resource allocation, collaborative rule user scale growth, operating income competition cooperation strategy organization architecture coverage area expansion	Integration, business model innovation resource allocation method interaction, increase in operating income network ecological performance organizational structure reform
Environment	Data, infrastructure, technology, policy mechanism, funding, influence		

of business empowerment capabilities, thereby driving the reorganization of key elements, and upgrading data quality, scale, and value.

Second, multiple factors work together to achieve a leap in platform-based business. The development of platform-based business has jumped to a higher stage under the joint promotion of environmental foundation, empowerment capabilities, and key elements. There are two types of growth during such a leap, namely, structural growth and strategic growth. Structural growth is an important basis for promoting strategic growth, which is a prerequisite for achieving a leap in platform-based business.

Third, the development direction and focus of platform-based business at different stages vary. The empowerment capabilities, key elements, and environmental foundation (the degree of environmental development changes) at different stages of the business vary [8-9], as shown in Table 1.

4. MATURITY ANALYSIS OF EACH STAGE OF PLATFORM-BASED BUSINESS DEVELOPMENT

To accurately determine the degree of development of each business and explore its direction, a platform-based business development maturity analysis model is proposed, which is used to analyze the four dimensions of platform resource management, platform market expansion, platform benefit output, and platform ecological construction [10].

Platform resource management: It is a prerequisite for the platform to survive and deepen the application to determine the basic capabilities of the platform business. It primarily includes equipment management, application management, data management, and interface management.

Platform market expansion: Identify the development of platform business in the market and reflect its position in the market, including market space, user scale, coverage area, and market share.

Platform benefit output: Determine the operating status of the platform business, whether it can effectively play its value, and reflect its sustainable development capabilities, including operating income, business profit, and overall ecosystem revenue.

Platform ecological construction: Determine whether the ecosystem around the platform business is established perfectly, reflecting its internal and external development level; primarily includes governance rules, standard systems, and ecosystem valuation.

Integrating the three stages of platform-based business, the above-mentioned dimensions should have differences in focus and degree of advancement at different development stages. See the table below for details

5. ANALYSIS OF CASE STUDY ON GREEN SMART LOGISTICS PLATFORM

Green smart logistics is a comprehensive new business format that takes urban distribution logistics as an entry point, and integrates online and offline methods to build a platform for intelligent matching of “pile, vehicle, and cargo”, providing new energy logistics vehicle charging, matching transactions, capacity sharing, and logistics parks integration. The green smart logistics business is a combination of two seemingly parallel and non-interactive traditional industries of logistics and power. With energy internet as the catalyst, green smart logistics has achieved cross-border + integration, enabled the urban logistics and distribution industry, and solved the conflicts between the logistics blowout incurred by the growth of new retail and the urban traffic pressure and pollution emission control.

According to the maturity analysis of platform-based business development, the following assessments are made in four aspects, namely platform resource management, platform market expansion, platform efficiency and output, and platform ecological construction:

Table 2. Key points of analysis for the development maturity of platform-based business at various stages

Dimension	Index	Exchange link stage	Integrated perception stage	Ecological guidance stage
Platform resource management	Equipment management	Number of connected devices	Device perception accuracy	Percentage of external equipment
	Application management	Application management	Industry software deployment	Complete application market
	Data management	Data collection summary	Data integration	Data mining value add
	Interface management	Basic interconnection interface	Realize flexible access	Customized interface
Platform market expansion	Business scale	Number of registered merchants	Number of external merchants	Number of active merchants
	User scale	Number of registered users	Number of interactive users	Number of active users
	Covered area	Number of online products	Industry coverage	Number of valid products
	Market development	Market growth rate	Segment market share	Extend market share
Platform benefit output	Operating income	Continuous and stable income	Scale business income	Supporting income
	Business profit	—	Basic profit level	Sustained scale profit
	Ecosystem revenue	—	—	Boosted income
Platform ecological construction	Governance rules	Operating rules	Standard governance	Collaborative governance
	Standard system	—	Basic standard system	Improve the standard system
	Ecosystem valuation	—	—	High ecological valuation

Platform resource management. Build a system matching platform, integrate resources like transportation capacity, electric piles, and bulk cargo, promote resource optimization and sharing, and boost pile-car-cargo linkage. Based on the correlation and accumulation of logistics capacity data and charging data, platform resource management promotes the matching of vehicles and goods, while laying the foundation for the digital and intelligent logistics business. It further promotes the industry standards and process standardization of urban distribution and logistics, and provides driver training services to continuously standardize the business. As of November 2019, Green Smart Logistics has completed the deployment of “22+12” integrated logistics service stations around Chengdu and Zhengzhou, initially forming a network effect and full-service coverage.

Platform market expansion. Promote the cultivation and development of the incremental market in related industries, expedite and accelerate the incremental urban new energy logistics market, and expand the market size based on energy internet's ability to generate new business formats. The comprehensive energy service market in the subdivisions of urban comprehensive logistics parks has great development potential. As of 2018, there were 1,638 logistics parks either in operation, under construction, or planned, nationwide, of which, 78% were comprehensive service and business service parks. According to research estimates, the comprehensive energy market space of the domestic logistics park in 2020 is about RMB 35 billion. Based on the average annual growth rate of the domestic urban distribution logistics market size of 13%, the comprehensive energy market space of the logistics park in 2025 is about RMB 64.5 billion. Considering the logistics park energy storage, and distributed photovoltaics, etc., the integrated energy service market space of the logistics park in the future will reach a scale of RMB 100 billion.

Platform efficiency and output. Solve key financing issues for the development of related industries based on the reliable credibility and financing capabilities of the grid platform. The green smart logistics platform can provide small and medium-sized enterprises (SMEs) with reliable new energy vehicle financing and leasing channels, effectively reducing the problem of high vehicle input costs for smaller companies. The platform brings positive value to the multi-parties of the new energy logistics ecology through the joint development of people-vehicles-pile-cargo-parks. The energy supply needs of logistics parks and logistics enterprises are met offline based on charging piles, energy storage, distributed photovoltaics, etc.; whereas the matching of supply and demand and transactions between goods and vehicles are completed online, reducing driver waiting time and improving logistics efficiency. Since the operation of the first station in May 2019, the number of

registered users of the green smart logistics platform has reached 4.77 million kWh, with 5,975 registered users, and the average daily service number of a single station has exceeded 300.

Platform ecological construction. The smart logistics platform faces a rich customer base, which can meet the needs of different stakeholders such as parks, logistics companies, shippers, drivers, and charging pile companies. In terms of supporting public governance, it is able to solve the pain points of urban energy transition, urban distribution, and logistics chaos, and can become an indispensable part of urban public infrastructure, reducing the number of transportation routes, vehicle trips, the land areas occupied by freight stations and related logistics facilities in urban areas, and increase the loading rate, so as to solve the chaotic problem of urban logistics operations and reduce environmental pollution. The green smart platform optimizes the urban environment by helping green transportation capacity to reduce CO2 emissions by about 3 million tons per year, realizes intensive operation in the unified warehouse model and doubles the utilization rate of stations, and improves the vehicle loading rate and increases the utilization rate of bicycles through shared distribution by 30%. It helps small and medium-sized logistics companies improve their cargo delivery capabilities and reduce the cost of the logistics industry chain by 25%, promotes the rapid popularization of new energy capacity and has replaced more than 10,000 fuel vehicles.

In summary, the green smart logistics platform is in the transitional stage from the exchange link to the integrated perception. It is necessary to further strengthen the connection capabilities between people and things, people and people, people and information, dynamic resource allocation capabilities, and information processing capabilities to segment users and promote resource enrichment and refinement.

6. CONCLUSIONS

The key to the development of the energy internet platform business is to integrate internal resources. Platform-based new businesses involve information, technology, finance, energy, and other links. Hence, such businesses need to establish a resource coordination department to promote their development. Platform-based businesses need to keep the platform open, pool more resources, communicate, co-build and share benefits to attract more users. The more platform partners there are, the more valuable the platform will be. Platform-based businesses need to promote open sharing of platform resources to the outside world and create new business models backed up by their brand reputation.

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