Intermediary Governance Mechanism of Collaborative Innovation in Green Building Industry, University and Research

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Abstract. Green technology is the dominant technology. The collaborative innovation of green building, industry, university and research must attach great importance to the industrialization of green technology in the upstream industry, which is of great significance to the economic development under the new normal. The research content and methods based on market orientation and production-use cooperation are still limited to framework and experience research. The research on bilateral collaborative innovation cooperation mode and contract governance of upstream and downstream enterprises that touched on the core issues of “production, study and research” has not been carried out in depth. Taking the collaborative innovation of production, research and research in green building as the research module, this study conducts in-depth research on the lack of design intermediary innovation in the technology supply side (green technology production enterprise) and technology demand side (green construction project owner). This paper proposes a bilateral collaborative innovation network structure with industry-university-research and engineering innovation functions.

1. Introduction
Green buildings are complex products, and building standards lag behind green technology innovation is a prominent feature of green buildings [1]. In the collaborative innovation cooperation of green building “production, study and research”, it is urgent to carry out governance research on the problem of insufficient innovation ability and innovation motivation of design contractors in the context of non-standard conversion interfaces. This paper takes green technology to the bilateral collaborative innovation network of green building transformation interface as an intermediary to further improve the intermediary innovation ability and motivation with designers as the main body; to solve the innovation ability and innovation dynamic mechanism of bilateral innovation network from the perspective of modular division of labor, deepen Research on the collaborative innovation mechanism of “production, study and research”. Based on the vertical collaborative innovation perspective of the project, this paper proposes a bilateral collaborative innovation network framework with industry-university research and research functions under the non-standard conversion interface. It reveals the influence of the intermediary problem of the “production-use” interaction process in the collaborative innovation framework of “production, study and research” on the intermediary innovation behavior. On the green building transformation interface, the problem of interface innovation capability of design intermediary
is solved by constructing a bilateral collaborative innovation network of “production, study and research”.

2. Green Technology - Interface Design Innovation Issues for Architectural Projects

2.1. The influence of construction party's value cognition on the income of green technology industry, university and research institute
The uncertainty of market returns is the fundamental reason for the imperfect introduction mechanism of production, study and research combined with innovation results. Based on the perspective of competitive strategy and customer value theory, the upstream green technology, industry, university and research technology innovation revenue depends on the new product in the downstream construction market end customer. Therefore, the project construction party's acceptance level and value perception of new products are the deep influencing factors of the conversion rate of technological achievements and market returns.

2.2. Innovative blocking effect of interface design on the path of green technology industrialization
Green building is a complex product system. The subsystem formed by green technology must integrate its other systems to reflect its green value through the overall performance of the integrated system. Therefore, engineering design serves as a link between green building performance and customer perception of green technology value. The interface or intermediary, its secondary innovation and integrated innovation shortcoming will inevitably have a serious negative impact on the cost and performance of green technology, hinder the sustainable acceptance of the construction market, and form an interface breakpoint for the green technology industrialization path.

3. Innovative ability defects and cooperation between industry, university and research institutes under the independent intermediary

3.1. The core innovation resources of engineering designers as independent intermediaries
In the construction project, the designer acts as the professional technical agent of the construction party and independently exercises the technology selection right and product recommendation right. The professional division of labor and qualifications will inevitably lead the designer to be the main body of the Green Technology-Building Interface Design (GBID). The unique "double-dual-dimensional" pressure [2] of the project will lead to the lack of innovative intrinsic motivation of the designers, resulting in the deterioration of the innovation resources of the employee-centered core, and ultimately the secondary innovation and integrated innovation will not match its core value resources, weakening its GBID innovation capabilities.

3.2. Engineering design and trade cooperation as an independent intermediary
The lack of dynamic mechanisms in the market, engineering design standards and the risk of innovation risks caused by legal responsibilities and project contract pressures have led the design team to adopt an evasive attitude towards the use of green new products. On the one hand, it is necessary to solve the problem of the designer's own innovation dynamic mechanism. On the other hand, it is necessary to use the cooperation of industry, university and research to stimulate the creative motivation of the design team, repair its core innovation resources, and weaken the contradiction between the secondary innovation and the integration innovation and the core innovation resources.
4. The defect management mechanism of designers' innovation ability under the form of joint intermediary

4.1. Joint Intermediary Bilateral Collaboration Architecture and Modular Division of Labor

In the process of collaborative innovation of green technology-construction projects, the engineering design industry is not only the communication mediator of the value information of upstream scientific and technological achievements and the demand information of downstream owners, but also undertakes the tasks of green technology products, secondary development of technology and system integration. Therefore, it is necessary to construct a green technology-building interface design (GBID) bilateral synergy, as shown in Figure 1.

According to the modularization idea, firstly, the designer should formulate the functional standards of the module products according to the needs of secondary development and system integration. The owner purchases the green building module products from the upstream enterprises through bidding; secondly, the downstream government departments provide the information platform and the designers Intermediary, to pass the second innovative rule information to the upstream green technology production and research team. Finally, the upstream green technology production and research team uses the standard, simple, and loosely coupled features of the modular technology interface to reduce the acceptance cost of downstream green technology knowledge and make the transfer of green new technology knowledge more convenient.

![Figure 1. Joint Agent's Bilateral Collaboration Architecture](image)

4.2. The Empirical Results of Joint Intermediary Governance Designers' Innovation Capability Defects

Synergistic factors. Employee innovation, organizational support, product modularity or direct, or indirectly affect the designer's willingness to adopt green technology through perceived usefulness, perceived ease of use, and perceived risk[3]; therefore, green suppliers should actively promote the innovation of designers' employees. And enhance its innovative organizational support; through the modular means of green technology to enhance the convenience of the designer to obtain resources from other innovative entities outside its own organization.

5. Innovative dynamic defect management mechanism of designers under the form of joint intermediary

5.1. Push synergy mechanism

According to the TAM model and the theory of collaborative innovation, under the form of joint intermediary, the green supply chain-led bilateral industry-university-research synergy can strengthen
the designer's second innovation in GBID through the push-based synergy mechanism driven by the upstream green technology industry-university-research team. Cooperate with power and integrated innovation to play the role of power.

5.2. Fair perception mechanism
Compared with the DBB model, the fair perception that the designer obtains in the EPC mode can significantly enhance the designer's willingness to cooperate with suppliers and builders for collaborative innovation. Therefore, under the form of joint intermediary, the construction of green building projects can adjust the designer's willingness to innovate on GBID through the choice of design transaction mode, control the designer's innovative behavior against GBID, and pull green technology products into the construction project from the end of the industrial chain.

5.3. Joint intermediary governance model led by the project builder
The integrated project delivery model (IPD) enables team-wide integration of all stakeholders in the project, and delivers project work that effectively responds to innovations in the building industry through high-level collaboration [4]. IPD can solve the problem of insufficient innovation in the output and income of the green building integrated R&D investment, insufficient control authority in the implementation process, and the innovation inertia of the design contractor and other participants in the DB or CMC contract mode, See Table 1 for details.

| Model   | output gain incentive | control boundary | innovation behavior |
|---------|-----------------------|------------------|---------------------|
| DB mode | insufficient incentive | not clear        | less                |
| CMC mode| insufficient incentive | not clear        | less                |
| IPD mode| effective incentive   | clear            | more                |

6. Conclusion
As an intermediary connecting green technology value and performance, engineering design has seriously affected the acceptance of green technology by project builders and owners, and continued to cooperate in production, education and research. The construction of the “green technology-construction project” interface with network characteristics and the collaborative bilateral synergy will help solve the problem of enterprise design integration and collaborative innovation in the industrial connection. The upstream and green technology production and research team with the strongest innovation power as the collaborative innovation leading and responsibility center of the interface synergy can solve the problem of downstream collaborative innovation efficiency and help to realize the innovation of interface synergy of green scientific and technological achievements transformation and industrialization. Aims. Green technology R&D and transformation enterprises can adopt the push collaborative innovation model. Advocate the choice of the EPC model, in which designers are more likely to be more aware of their distribution, procedures, and interactions, making it easier to foster a willingness to cooperate and innovate when faced with the challenge of collaborative innovation. The owner can adopt IPD's collaborative innovation model, and through the owner-led professional team, provide the possibility of diversified project participants to fully cooperate with green building design innovation.

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