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RESEARCH ON THE DYNAMIC BSORM IMPACT PATHWAYS OF SENSE OF POWER IN CO-DESIGN

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ABSTRACT
Given the inherent characteristics and current state of co-design, the issue of power imbalance has become increasingly evident. This paper elucidates the impact pathways within co-design through qualitative research methods, and explores the potential role of the sense of power in addressing power imbalances. By examining four design workshops from Ant Group's "Lifestyle Research for Chinese Young People," this study identifies five key factors contributing to variations in individual sense of power: social status, knowledge level, resource control, self-positioning, and contextual background. Additionally, it outlines the dynamic BSORM paths that emerge from the interaction of different power perceptions within the collaborative process. The study further analyzes how fluctuations in sense of power at the individual, interpersonal, and organizational levels affect the overall outcomes of co-design. This research offers valuable insights for future quantitative studies on power dynamics in co-design, establishing a comprehensive framework for understanding the modifiable aspects of sense of power in this context.

Keywords: Sense of power, Co-design, Design workshop, Impact pathways

1 RESEARCH BACKGROUND

1.1 The problem of power imbalance in co-design is becoming apparent

Co-design refers to a process where participants from different disciplines, who are impacted by design decisions, share their knowledge relevant to the design content to become part of the decision-making process [1]. Typically, co-design activities are organized by one or more initiators with extensive design experience, guiding various stakeholders to collaborate.

Research suggests that the relationship between initiators and stakeholders in co-design involves the granting and receiving of power. However, both existing studies and practices have identified gradually emerging power issues in this context. First, the initiator holds and controls the majority of power, yet research indicates that this power is often excessive and its boundaries are poorly defined, especially in design decision-making [2]. Additionally, initiators tend to be constrained by existing power structures; for example, knowing stakeholders' social identities or knowledge levels in advance can limit the initiator's actions within the established power framework. Furthermore, initiators engage with individuals from multiple knowledge domains, making power delegation prone to misalignment or mismanagement. A more fundamental issue is the lack of design education and practice that addresses power dynamics, resulting in insufficient recognition of the importance of power [3].

Secondly, the majority of stakeholders are non-design professionals and lack the ability to translate their knowledge into design-specific knowledge, making them vulnerable to power marginalization, which diminishes their confidence and willingness to participate [4]. Furthermore, the temporary nature of co-design, coupled with unfamiliar interpersonal relationships between stakeholders, often leads to an imbalanced and unstable power structure, creating barriers and conflicts during the process of knowledge integration [5]. Additionally, stakeholders frequently have a lack of clarity regarding their roles in co-design, making it difficult for them to quickly adapt to the dynamic design process, which often results in them assuming a passive, bystander role [6].

1.2 Sense of power may become a breakthrough in solving the power imbalance

The initial power studies primarily focused on the macro-level aspects of sociology and political science and leaned towards qualitative research. Viewing power as a psychological cognitive variable has only emerged in the past 20-odd years, alongside the rise of social cognition research paradigms [7]. In the context of co-design, power can be understood as the ability of actors to influence outcomes, which is in line with the definition of power in psychology. Specifically, power in psychology is not actual power, but a sense of power. Sense of power can mediate the influence of all objective power. Sense of power cannot represent an individual's social status or actual power level [8], but it can affect the actual effect of power. At the same time, sense of power can turn power into a controllable psychological variable, which is both a relatively static and stable personal trait [9] and a situational variable [10]. In other words, even if individuals do not actually hold power, they may still develop a sense of power, and under the same conditions, the degree of power perception varies among different individuals; But when exposed to different situations, individuals may also experience subjective feelings of "great power" or "little power" due to environmental stimuli [11].

Based on this, it can be inferred that different stakeholders in co-design may possess varying initial sense of power due to personal characteristics within the given context. This initial power perception influences their ability to participate in co-design activities and ultimately affects the outcomes of the design process. For example, high-power individuals are more sincere in expressing suggestions [12] and tend to actively participate in competitive social interactions [13], while low-power individuals consider others' feelings more when making decisions and have more empathy [14]. It is evident that low and high power perceptions possess different practical advantages, necessitating regulation based on various tasks. Therefore, power perception enables the possibility of power regulation.

2 A FRAMEWORK OF IMPACT PATHWAYS FOR SENSE OF POWER IN CO-DESIGN

Co-design generally has a temporary nature, and the stakeholders involved have different initial sense of power, which reflects personal traits in this context. The 'self-construction hypothesis' proposed by Lee suggests that individuals in different states of power adopt different self-construction approaches. He found in the experiment that participants with high sense of power were more inclined to adopt independent self-construction methods, while participants with low sense of power tended to utilize more dependent self-construction methods [15], [16], [17]. Therefore, due to varying levels of power perception, individuals utilize different types of self-construction approaches, which can lead to differences in individual sense of power in co-design. The interaction of various environmental factors in co-design can also affect the self-construction effects of individuals with high or low sense of power. When entering a co-design scenario, the sense of power triggers situational attributes. As the organizational model and activities of the co-design evolve, this sense of power may shift. For instance, individuals with a consistently high sense of power may maintain this elevated level, influencing others' power perceptions and potentially causing a decline or instability in others' sense of power. Existing research shows that individuals with high power are less likely to empathize, often displaying disregard for others' feelings and giving less consideration to alternative perspectives [14], [18]. Additionally, the agentic-communal model suggests that individuals with a high sense of power focus more on self-expression, self-enhancement, and self-protection. In contrast, those with a low sense of power are more concerned with their relationships with others and are more likely to consider others' feelings when making decisions [19]. Consequently, shifts in stakeholders' sense of power influence their attitudes and behaviors in co-design, while the design process itself dynamically evolves in response to these varied behaviors, further impacting others' sense of power. This feedback loop ultimately affects the overall effectiveness of the co-design.

Based on the above, as illustrated in Figure 1, when stakeholders with different initial sense of power enter the relevant context of collaborative design, interactions and collisions occur between them due to the organizational model or activity content of collaborative design. This leads to changes in their sense of power, which in turn affects stakeholders' performance in collaborative design, creating a cyclical influence that ultimately impacts the outputs of collaborative design.

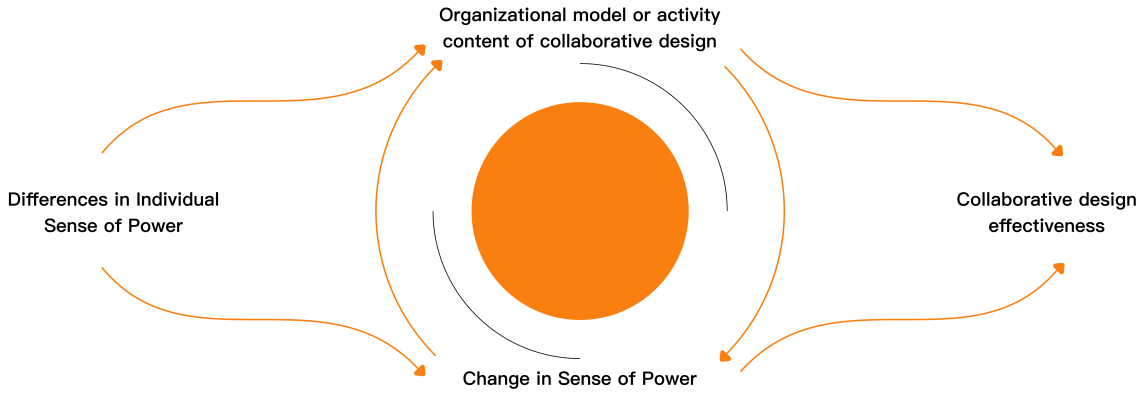

Figure 1. Diagram of The Framework of Impact Pathways for Sense of Power in Co-Design

3 ANALYZING THE INFLUENCE MECHANISM OF SENSE OF POWER USING DESIGN WORKSHOP AS AN EXAMPLE

Design workshops are one of the primary organizational formats for co-design. To clarify the impact pathways of the sense of power in co-design, this study focuses on the "Lifestyle Research for Chinese Young People" project. The project, organized by Ant Group, Tongji University, Guangdong University of Technology, and other institutions, was conducted from February to October 2024. Several design workshops were held at different stages of the project. This study focuses on four design workshops, where linguistic recordings and behavioral observations of participants are conducted. Through cross-validation and reflection on participants' language and behavior, the study identifies the representational meanings of their actions and speech. Subsequently, the information gathered from the workshops is integrated and analyzed to extract key features. Participants exhibiting prominent characteristics are selected for in-depth interviews, which further validate and refine these features. Finally, expert discussions are held to establish the final impact pathways. Table 1 provides details of the four workshops：

Table 1. Details of the Design Workshops

Design Workshops	Workshop Theme	Participants	Workshop Objectives	Workshop Organization Method
W1: Practical Workshop Location: Guangzhou, China	Co-creation Workshop for the Lifestyle Experiment Toolkit	Design experts, novice designers, and target users from various fields (including youth from first- and second-tier cities as well as youth from third- and fourth-tier county-level cities)	Based on the established framework for analyzing fundamental lifestyle patterns, we consolidate the life journeys of target users from various domains and utilize design-related methods to derive the form and components of the toolkit	The facilitator manages the process while design experts ensure information quality, guiding stakeholders in articulating their life contexts and offering suggestions for toolkit design
W2: Consensus-based Workshop Location: Shanghai, China	Lifestyle Characteristics and User Profiles of Chinese Young People	Representatives from four different universities in China, including design students, design instructors, and design experts	Conduct a common analysis of the information gathered from the four locations to distill the lifestyle characteristics and representative user profiles of Chinese youth	Design experts and representatives from various universities established the methods and criteria for information synthesis, guiding students from different regions to employ design thinking for feature extraction
W3: Training Workshop Location:	Training on Lifestyle System Research	Students from different grades and design majors in universities	Conduct teaching training on the newly developed innovative lifestyle system research	Students are randomly grouped and paired with teaching assistants for training in foundational knowledge

Tianjin, China; Xi'an, China	Methods	(including user research, industrial design, etc.), as well as design experts	method to validate the teaching effectiveness and feasibility of the new approach	and research methods
W4: Integrative Workshop Location: Shanghai, China	Exploring Potential Development Directions for Alipay Based on Young People's Lifestyles	Design experts, designers, representatives from Ant Group's product development team, and design students	Based on the lifestyle characteristics of Chinese young people, integrate their living needs with the service segments of Alipay to propose potential development directions for the platform	The designers present the concluding report, followed by R&D representatives who speak in a designated order to discuss their viewpoints, outline the necessary resources for development, and explore the feasibility of the proposed developments

3.1 The problem of power imbalance in co-design is becoming apparent

Generally, individuals tend to have a relatively fixed sense of power, which may fluctuate in different contexts. Through the observation and analysis of four workshops, it can be concluded that there are five reasons that contribute to individuals experiencing either a higher or lower sense of power in co-design:

3.1.1 Social status

In co-design, individuals with higher social status are characterized by greater familiarity within the temporarily assembled team and higher recognition from other stakeholders. This recognition enables them to receive more interpersonal support throughout various stages of co-design, particularly during decision-making. Consequently, individuals with higher social status tend to exhibit a stronger sense of power. The participants in W2 were largely recruited by or through design experts, and both design students and teachers demonstrated strong identification with these experts. Prior to W2, the design experts had already formed expectations or directions regarding the lifestyle characteristics and user profiles of young people distilled from the workshop. This made it easier for them to position themselves as facilitators or leaders, thus reinforcing their sense of power. Other participants, especially the design students, acted more as executors, responsible primarily for documentation and information verification. As a result, during verbal exchanges, design experts were frequently asked whether "a particular characteristic was accurately expressed" or prompted with affirming questions such as "I believe this characteristic is more appropriate, don't you think?" Spatially, design experts also tended to occupy central positions, as illustrated in Figure 2.

Figure 2. W2 Scenario Diagram

3.1.2 Knowledge level

In co-design, when social status is relatively equal, knowledge levels can influence an individual's sense of power. This is particularly evident when designers collaborate with non-designers. Designers, operating in their area of expertise, tend to display greater confidence and self-efficacy, while non-designers, lacking the ability to translate design concepts, often find themselves in situations where they only address minor, non-design-related questions. For instance, in W1, non-design participants, who were target users from various fields, rarely engaged in discussions during the concrete expression of life narratives. They only responded passively when asked specific questions, such as whether they exhibited certain behaviors or if a particular design element aligned with their understanding. Additionally, during the design of lifestyle experiment toolkits, while all parties participated equally,

the suggestions from non-designers were less frequently adopted, as illustrated in Figure 3. Therefore, the level of design knowledge an individual possesses to some extent determines their ability to contribute to co-design. When their capabilities are not utilized or their input is not actively considered, their sense of power diminishes, and conversely, it increases when their contributions are acknowledged.

Figure 3. W1 Scenario Diagram

3.1.3 Resource control

In co-design, resource control refers to an individual's possession of various resources that can facilitate the implementation of design solutions, including human resources, land resources, and market resources. The output of these resources ultimately determines the value and feasibility of the design outcomes, leading individuals who control more resources to exhibit greater decision-making authority during the design payment phase. Even if they are not designers, these individuals can influence resource allocation based on their own interests or may possess stronger capabilities in project execution compared to designers. In other words, despite potentially having lower levels of design knowledge, the resources they control can afford them a significant sense of power in critical design stages. In W4, the speaking order was led by the R&D manager, followed by design experts, and finally the designers. The R&D manager and design experts, possessing Alipay's market and talent resources, exhibited a greater sense of power in decision-making regarding design direction. In contrast, designers, as the implementers of these resources, displayed more passive behavior, operating within the constraints of the available resources, which resulted in a lower sense of power.

3.1.4 Self-positioning

In co-design, self-positioning refers to how individuals perceive their own design roles, which encompasses their sense of control or autonomy over the design project, as well as their psychological state during the collaborative process. This self-positioning can predispose individuals to experience a heightened sense of power. For instance, in W2, design students from the same school exhibited varying degrees of control over the project based on their level of involvement. Students involved in the framework demonstrated a stronger sense of design responsibility and were more willing to engage with design experts regarding user details, reflecting a higher sense of power. Similarly, in W3, both design students and teaching assistants, although all design students, displayed differences in their sense of power due to their distinct roles in the co-design process. For example, the facilitator indicated that both design and non-design students needed to follow the teaching assistant's guidance when practicing lifestyle research methods. Consequently, students naturally sought advice from the teaching assistant and rarely questioned the instructions, exhibiting compliant behavior.

3.1.5 Contextual background

In co-design, cultural background refers to an individual's broader cultural context, separate from the design workshop itself, encompassing their work, educational, and social backgrounds. Individuals develop ingrained perceptions within their established contextual systems, and these perceptions influence their sense of power through comparisons with others. For example, in W3, students with more knowledge about lifestyle-related information would typically possess a higher sense of power. However, due to the higher recognition of other students' educational backgrounds, their willingness to express opinions was affected. They might use phrases like "I'm not sure" or "maybe," or even restrain their behavior to avoid communication, thus experiencing a lower sense of power.

3.2 BSORM: The dynamic changes of sense of power in co-design process

During the four design workshops, this study analyzed the participants' sense of power by examining their language, behavior, and interactions. The following are the types of changes in sense of power that may occur during the design workshop process, which can be understood by referring to Figure 4:

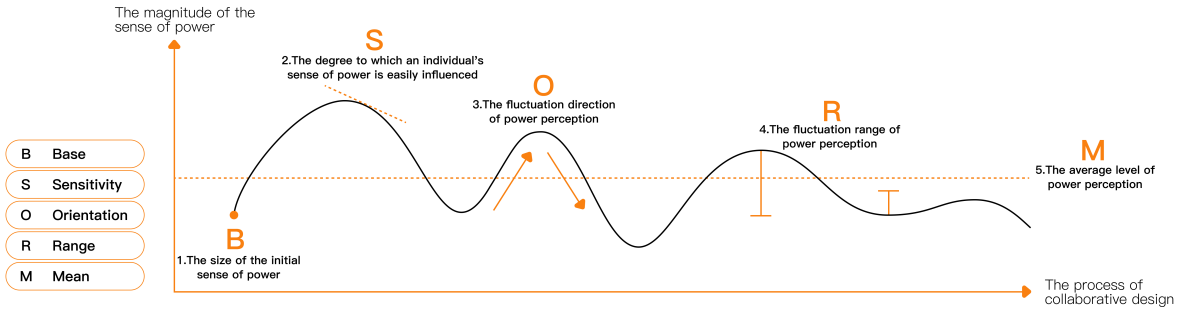

Figure 4. Types of Changes in Sense of Power Diagram

3.2.1 Base:The size of the initial sense of power

Before the formal commencement of each workshop, the facilitator typically introduces the identities of the participants. Each participant independently constructs the power structure of the workshop and assigns themselves a tentative position, thereby forming an initial sense of power. This initial sense remains stable until influencing factors emerge, leading to behaviors inconsistent with their sense of power, at this point, their sense of power begins to fluctuate.

3.2.2 Sensitivity:The degree to which an individual's sense of power is easily influenced

The extent to which an individual's sense of power is susceptible to influence is more closely related to personal traits. For instance, in W2, if both students' remarks are simultaneously challenged by the design expert, the more confident student is likely to give more affirmative responses, while the less confident student may tend to remain silent or interrupt, even if their internal responses to the issue are fundamentally similar. Therefore, in a co-design environment, even if individuals start with a similar sense of power, their susceptibility to influence differs, resulting in variations in their expressions during the co-design process.

3.2.3 Orientation：The fluctuation direction of power perception

An increase or decrease in an individual's sense of power can influence participants' performances, which is related to the stimuli provided by various contextual factors during the co-design process. For example, in W3, if an individual's viewpoint receives group affirmation, their sense of power will rise at that moment, leading them to repeat the viewpoint and seek further validation. Conversely, if an individual's remarks are ignored or refuted, their sense of power may decline, resulting in a tendency to cease speaking. Therefore, in co-design, different stimuli can potentially affect the direction of fluctuations in an individual's sense of power.

3.2.4 Range：The fluctuation range of power perception

The magnitude of fluctuations in an individual's sense of power represents the frequency or number of stimuli the individual experiences in co-design. When an individual receives continuous positive stimuli, the increase in their sense of power will be greater and last longer. Before the occurrence of negative stimuli, this can lead to observable behavioral differences at different stages. Therefore, during the co-design process, the sense of power will exert different influences on participants' behaviors at different stages, a phenomenon that occurs frequently in W1.

3.2.5 Mean：The average level of power perception

Even though various uncontrollable factors in co-design can cause fluctuations in an individual's sense of power, overall, participants with a higher average sense of power tend to exhibit differences in behavior compared to those with a lower average sense of power. For instance, participants with a higher average sense of power may show a decrease in their sense of power at certain points. However, their overall speaking style and frequency of participation in decision-making still differ from those with a

lower average sense of power. For example, in W4, design experts and designers illustrate these contrasting behaviors.

3.3 The Influence of sense of power on individual performance in co-design

From the previous analysis, it can be seen that in co-design, individuals' sense of power will fluctuate, thereby affecting their ability to participate in co-design. Co-design is an activity about knowledge, so fluctuations in sense of power will affect the knowledge-related effectiveness of co-design. This article analyzes the performance differences of participants within and between groups during multi-line tasks in a workshop and clarifies the impact of sense of power on individual performance from three aspects: personal, interpersonal, and organizational.

3.3.1 Personal level

During the entire co-design process, individuals have two types of knowledge roles, namely knowledge providers and knowledge receivers. As knowledge providers, individuals contribute knowledge, and fluctuations in their sense of power can affect their attitudes, willingness, and behavior toward knowledge contribution. Specifically, individuals with a high sense of power demonstrate a higher sense of design efficacy and confidence in their knowledge output, while those with a low sense of power perceive their importance in co-design with the encouragement and recognition of others, thereby enhancing their desire to express themselves.

When acting as a knowledge recipient, individuals tend to adopt knowledge, and fluctuations in their sense of power can affect their attitudes, willingness, and behavior toward knowledge adoption. Specifically, individuals with a high sense of power may exhibit more prosocial behavior and be more open to the adoption of knowledge in certain situations, but they may also develop a rejection of external information due to the instability of their high-state sense of power; Low power individuals have higher empathy, are more tolerant of emotional information, and rely on external information for their own knowledge supplementation, thus exhibiting higher knowledge adoption.

3.3.2 Interpersonal level

Individuals engage in knowledge sharing through the output and input of knowledge among various parties in the co-design process, emphasizing the mode of knowledge interaction between individuals. The fluctuation of individual power will affect the motivation for knowledge sharing, and thus influence the attitudes and behaviors for knowledge sharing. Specifically, individuals with a high sense of power have a higher level of communication confidence in the process of knowledge interaction, especially in the decision-making stage, and therefore demonstrate a higher frequency of speaking and positive expression. However, individuals with a low sense of power may exhibit more spontaneous knowledge-sharing behaviors due to their high task dependency, or to avoid conflicts, they may split group tasks and avoid knowledge-sharing.

3.3.3 Organizational level

Whether it is knowledge adoption and contribution at the individual level or knowledge sharing at the interpersonal level, all of these factors ultimately influence knowledge conversion at the organizational level. The emphasis here is on the degree to which various forms of knowledge are transformed into design knowledge. Comparative analysis reveals that significant disparities in the sense of power within the same group can lead to polarization among participants, resulting in a clear division between a core discussion group and a peripheral group. In such cases, design knowledge occupies the highest domain, while opportunities for converting other types of knowledge diminish. Alternatively, frequent fluctuations in the sense of power can cause participants to remain in an unstable state, even leading to self-doubt, which destabilizes the overall collaborative model and results in fragmented or non-convergent knowledge conversion.

4 THE IMPACT PATHWAYS AND KEY FACTORS OF SENSE OF POWER IN CO-DESIGN

In summary, the impact mechanisms and key factors of the sense of power in co-design are illustrated in Figure 5. Individual differences in participants' sense of power stem from factors such as social status, knowledge level, resource control, self-positioning, and contextual background. These factors are interdependent; they may interact and vary in levels and combinations within individuals. Such inherent

characteristics influence both the initial sense of power experienced during co-design and its susceptibility to external influences. Additionally, within co-design, different organizational models and activity types continuously stimulate individuals' sense of power, leading to fluctuations of varying directions and magnitudes, which subsequently affect individual performance. This dynamic also influences the organizational methods and components of co-design. Overall differences and performance among individuals can be analyzed based on the average sense of power. Finally, the dynamic fluctuations of sense of power, trigger a chain reaction affecting knowledge contribution and adoption at the individual level, knowledge sharing at the interpersonal level, and ultimately knowledge conversion at the organizational level, thus influencing the overall effectiveness of co-design.

This study, from a theoretical perspective, employs qualitative research to analyze and deduce the degrees of influence and impact pathways among various factors in co-design. Subsequent quantitative research could further explore and validate these findings, offering clearer directions for studying the mechanisms and significance of the sense of power in co-design. Moreover, it introduces a new perspective for addressing power-related challenges in co-design contexts. From a practical perspective, assuming the manipulability of the sense of power, quantitative validation could help identify methods of manipulation, regulation scope, and related mechanisms in co-design scenarios. These findings could support the establishment of standardized organizational principles and guidelines, enhance education on power dynamics, and formalize training for co-design practices. Ultimately, such efforts aim to improve the overall effectiveness of co-design processes.

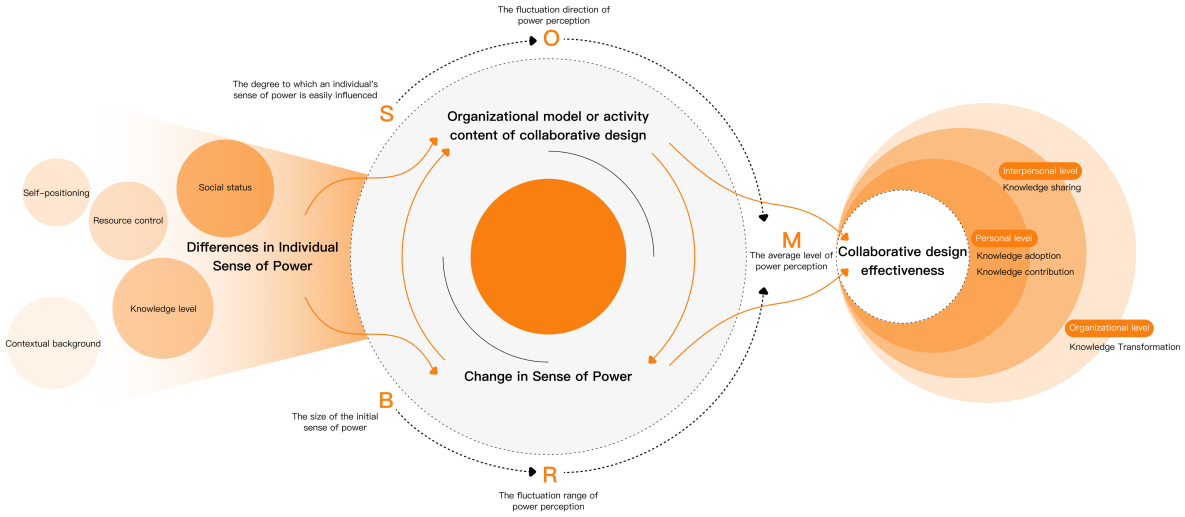

Figure 5. Diagram of the impact pathways and Key Factors of Sense of Power in co-design

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