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Abstract: This study explores how to promote effective collaboration between design and non-design professionals and how such collaboration contributes to meaning-making in innovation. Drawing on a project-based educational program involving interdisciplinary graduate teams, the research analyses reflective journals and visualizes changes in team collaboration and meaning-making. In addition, co-occurrence network analysis was conducted to capture qualitative shifts across the four phases. Findings reveal that the creation of psychological safety, use of visualization, and the development of ownership are crucial for deep collaboration and the evolution of shared meaning. Visual outputs served as catalysts for concretizing abstract ideas and aligning perspectives. The study contributes to the theory of innovation management by empirically demonstrating the temporal process of meaning formation and provides practical insights for structuring innovation teams.

Keywords: design professional, innovation management, design-driven innovation, collaboration, meaning-making, organizational capability

1 Introduction

In recent years, there has been increasing recognition of the competitive advantage that can be achieved by integrating design into the innovation process, and growing interest in how this can be practically implemented. Brown (2009) positions design thinking not merely as a product development methodology, but as a human-centered approach that emphasizes team collaboration and the integration of diverse perspectives across the stages of observation, empathy, ideation, prototyping, and testing. Additionally, the importance of business transformation through "Design-Driven Innovation" has been highlighted, where the concept of Design Discourse—a network of interpreters including designers—is key to innovation (Verganti, 2009). Effective innovation using design thus requires collaboration among diverse professionals, including designers.

However, the intuitive and creative characteristics typical of design professionals differ significantly from the logical and analytical traits of professionals in R&D,

marketing, and other non-design domains. Consequently, how to effectively promote collaboration between these two groups in real business settings remains a subject of trial and error. Moreover, how such collaboration influences the meaning-making of innovation has not been sufficiently elucidated. As a result, while interest in incorporating design professionals into innovation processes continues to grow, widespread adoption remains limited.

This study addresses this issue by exploring effective modes of collaboration between design and non-design professionals, and how such collaboration impacts the construction of meaning in innovation.

2 Literature Review

Martin (2009) argues that generating organizational capability for new value through design thinking requires a balance between analytical thinking, which prioritizes reproducible results based on data, and intuitive thinking, which embraces ambiguity and creative outcomes. Kelley & Littman (2005), based on case studies from IDEO, categorize innovation-related roles into three groups and ten types, including learning (The Anthropologist, The Experimenter, The Cross-Pollinator), organizing (The Hurdler, The Collaborator, The Director), and building (The Experience Architect, The Set Designer, The Caregiver, The Storyteller). However, the study does not sufficiently discuss effective collaboration among such diverse roles.

Verganti (2008) defines Design-Driven Innovation, in which knowledge is acquired through Design Discourse—a network of diverse interpreters. He further classifies in-house Design-Driven Laboratories (DDLs) into three types—linguistic (socio-cultural and design capabilities), hybrid (multidisciplinary), and technological (technological and marketing capabilities)—each with different modes of communication (Verganti, 2009).

Research on the impact of design on organizational capability and culture has also progressed. Beckman & Barry (2007) conceptualize the innovation process as a learning process and suggest that role distribution based on learning styles (e.g., leaders, artists) can be effective, in addition to function-based team structures (e.g., engineering, marketing). Elsbach & Stigliani (2018) review empirical studies and clarify that using design thinking tools facilitates experiential learning processes and fosters organizational cultures around user-centered, collaborative, risk-taking, and learning. Landoni et al. (2016) identify five capabilities—holistic view, meaning-making, applying new technologies, visualizing and materializing, and managing the design process—as essential for enhancing design-driven innovation and diversifying creative and technical resources.

While these studies have advanced understanding of how to incorporate design into innovation processes and shown the benefits of interdisciplinary collaboration, specific requirements for facilitating collaboration between intuitive/creative design professionals and logical/analytical non-design professionals in practice remain underexplored. Moreover, little is known about how such interdisciplinary collaboration contributes to meaning-making in innovation.

3 Research Question & Research Design

This study aims to clarify the conditions that facilitate effective collaboration between design and non-design professionals in innovation processes, and how such collaboration affects meaning-making in innovation. The empirical setting is a project-based educational program jointly operated by a design school and a business school at the authors' university. In this program, 12 graduate students from business backgrounds and 9 from design backgrounds formed five teams. Over approximately four months, they engaged in envisioning future societal designs and developing unique business concepts, which were presented to external experts at the final session. Throughout the course, participants voluntarily kept weekly reflective journals (free format) documenting their own and their team's "growth" and "challenges." These texts were analyzed by categorizing descriptions into "collaboration" and "meaning-making" and examining their temporal characteristics across four phases: (1) early, (2) interim presentation, (3) maturity, and (4) final presentation.

In addition, co-occurrence network analysis using bi-grams (n-gram) was conducted to capture qualitative shifts in "learning from the program" across the four stages. Preprocessing involved stop-word removal and stemming, followed by part-of-speech filtering to extract nouns, verbs, and adjectives. The analysis was conducted using the RMeCab package in R version 4.3.1.

4 Findings

Collaboration:

(1) During the early phase, as the team had only recently begun working together, communication tended to be reserved. As a result, attention was paid to creating psychological safety during discussions. Team members gradually came to understand each other's concerns and values, and there was a noticeable respect for diverse perspectives. In addition, mutual support among members was frequently observed.

(2) Interim presentation phase, a LEGO® Serious Play® workshop was conducted to share individual perspectives and inner thoughts through their creations. This contributed to deepening mutual understanding among team members, fostering an atmosphere of open dialogue within the team, and laying the foundation for deeper discussions and proactive engagement.

(3) Maturity phase for the final presentation, design background students began producing visual outputs such as illustrations and videos to convey the team's proposed concept. These visual materials facilitated and enhanced communication during internal discussions and external interviews, thereby promoting collaboration.

(4) Final presentation phase, both individual self-esteem and mutual understanding within the team had significantly improved. This led to strong commitment and momentum toward the final outcomes.

Meaning-making:

(1) In the early phase, the team lacked sufficient information and expertise regarding

the selected theme. Additionally, the absence of adequate psychological safety resulted in superficial and generalized discussions. However, this situation in turn prompted the realization that having a unique perspective to their team was crucial.

(2) Interim presentation phase, team members shared the task of reviewing academic literature and reference materials related to the theme. Moreover, user interviews yielded a significant increase in new knowledge and insights. Particularly, the LEGO® workshop enabled the team to deepen their understanding and share recognition of the theme, which accelerated the selection and prioritization of relevant information for their proposal.

(3) Maturity phase, the production of hand-drawn visual images and prototypes mainly by design students enriched intra-team communication. Discussions became more constructive and aimed at resolving ambiguities. The team also boldly redefined their target users and the theme, and they began to place value not only on logical reasoning but also on emotional and affective aspects.

(4) Final presentation phase, the resolution of the prototypes improved significantly, and team members developed a strong sense of ownership toward the user experience, referred to as an "overwhelming sense of user empathy." This contributed to a tangible sense of growth at both the individual and team levels.

Co-occurrence network analysis:

Additionally, co-occurrence network analysis of learning diaries, showed in Appendix, revealed key word clusters in each phase as follows.

(1) In early phase, clusters such as "SOS–pain–truth," "interview–request," "explore–deep," and "perspective–new" suggested initial struggles with depth and shared vision.

(2) In interim presentation phase, clusters such as "feedback–get–insight," "develop–decide–find," "team–task–feel," and "align–perspective" indicated alignment and early solution ideation.

(3) In maturity phase, terms like "hearing–user–prototype," "image–come up," "ourselves–think–good," and "pain–serious–importance" emerged, suggesting a deeper understanding of user challenges through prototype shaped by team's collective vision.

(4) In final presentation phase, high-frequency co-occurrences of "team" along with phrases like "task–feel–member–all–growth" and "growth" along with phrases like "myself–cohesion." Furthermore, "uplift–affirmation–self" and "empathy–support" indicated reflecting the growth of self-awareness, emotional affirmation, and team cohesion.

5   Discussion

This study suggests that in collaborations between design and non-design professionals, it is not sufficient to merely divide tasks; rather, it is essential to establish spaces where participants can share their underlying values and problem awareness. Activities such as LEGO® Serious Play®, which enable the verbalization and visualization of emotions and tacit knowledge, were found to deepen mutual understanding and foster psychological safety (Edmondson, 1999) within teams.

Moreover, visual outputs created by design professionals functioned as catalysts that clarified ambiguous ideas and promoted shared understanding, thereby enriching the process of meaning-making. These practices of visualization effectively bridged the emotional and rational dimensions of dialogue, playing a significant role in aligning different perspectives among team members.

As time progressed, a noteworthy transformation was observed: individual members began to reframe the team's challenges as personal matters, leading to a redefinition of innovation—not merely as an external outcome, but as an intrinsically motivated value rooted in a sense of ownership. This finding echoes Verganti's notion of "interpretative networks" in meaning-driven innovation, providing empirical support for the inseparability of collaboration and meaning creation. In short, effective collaboration between design and non-design professionals depends not only on clear formal roles, but more crucially on the quality of dialogue grounded in mutual trust and empathy.

6   Contribution & Limitation

Theoretically, this study contributes to the literature by revealing how collaboration among professionals with different expertise fosters and deepens the construction of meaning in innovation processes, in a practice-based and temporal manner. Specifically, it demonstrates how the sequential development of psychological safety, the mediating role of visualization by design professionals, and the emergence of a sense of ownership collectively transform the quality of meaning over time. This process provides empirical reinforcement for the theory of Design-Driven Innovation. Additionally, by employing co-occurrence network analysis—a quantitative method—to visualize shifts in latent meaning structures embedded in open-ended text responses, this research offers an integrative approach that bridges qualitative and quantitative inquiry.

Practically, the insights gained from this study can be used to design collaborative innovation processes that foster meaningful outcomes by leveraging the diverse expertise of interdisciplinary teams, including design professionals.

However, the study also has several limitations. First, the participants were graduate students enrolled in an educational program, which may not fully reflect the constraints and dynamics present in actual corporate settings. Future research should examine similar dynamics within real-world project teams to evaluate the generalizability of the findings.

Second, the study relied on self-reported written data, lacking complementary behavioral data obtained through methods such as observation or interviews. This remains a key area for future methodological enrichment. Furthermore, the study opens avenues for further investigation into how individual attributes—such as personality traits or professional experience—may influence the quality of collaboration.

Acknowledgement

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Areas for feedback & development

Area:

Design Thinking, Innovation Management, Collaboration

Specific points for feedback:

We welcome suggestions on future research design, particularly regarding the development of quantitative research approaches to obtain more robust evidence in the areas of innovation management, design thinking, and meaning-making in innovation.

Also, if there are any other prior studies we should refer to, we would greatly appreciate your suggestions.
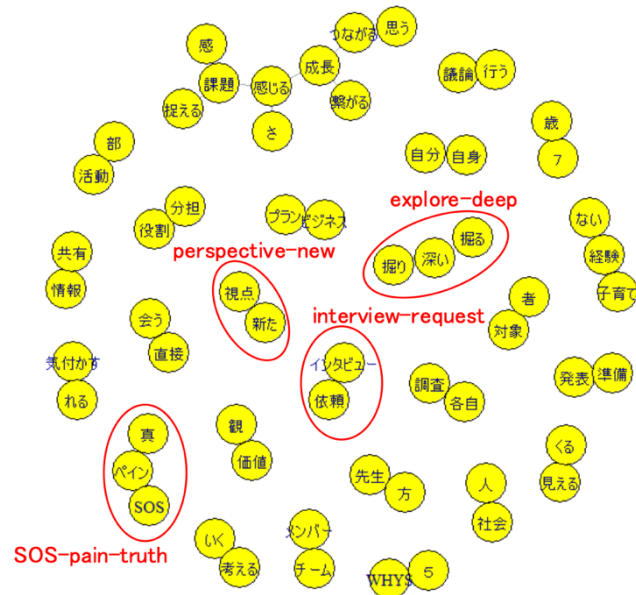
Appendix
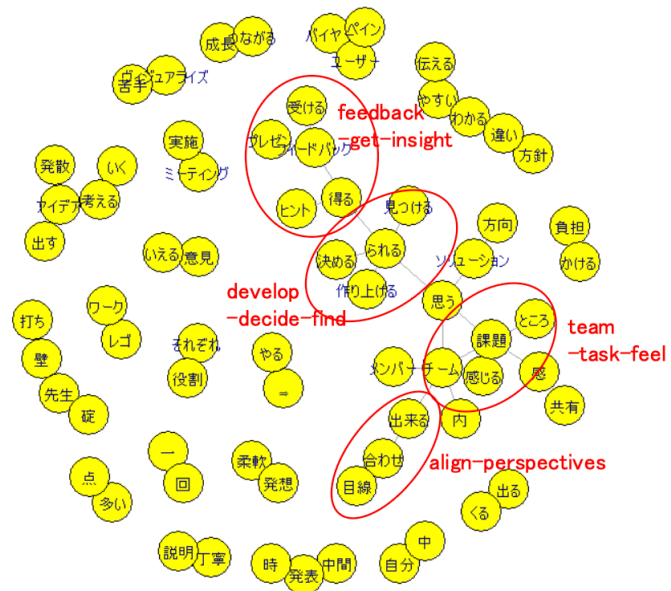

Fig.1 Co-occurrence network in early phase

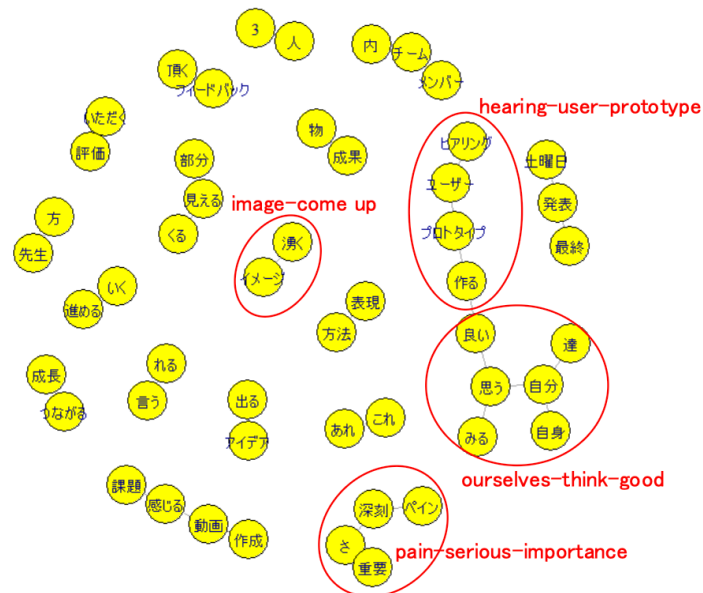Fig.2 Co-occurrence network in interim presentation phase
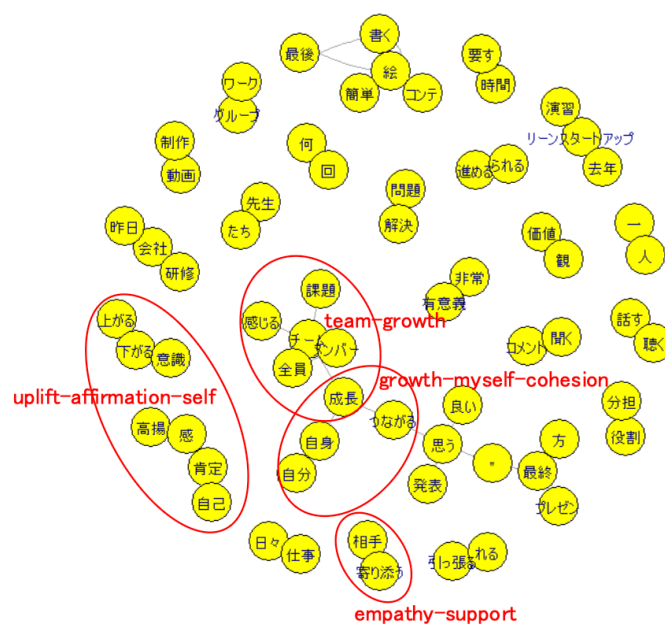
Fig.3 Co-occurrence network in maturity phase

Fig.4 Co-occurrence network in final presentation phase