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Article

Formation of Interdependence among Individuals in the Initial Phase of Intercompany Collaboration: The Role of Leaders and Members of AI Consortiums in Japan

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Abstract: Japanese firms are accelerating their engagement in horizontal collaboration through unprecedented inter-firm combinations that allow organizations to respond flexibly and quickly to changes in the external environment. However, existing research has not sufficiently examined trust formation and individual interaction processes in the initial stages of such inter-organizational collaboration. This study examines a newly established value-creation consortium led by the private sector that uses state-of-the-art artificial intelligence (AI) technology to solve social issues. We interviewed consortium members in different positions; the steps for coding and theorization (SCAT) were used to analyze individuals' interactions in the initial stage of forming inter-organizational collaboration. The results showed that the members' willingness to collaborate increased due to the leader exhibiting trustworthy behavior. Furthermore, uncertainty caused by AI's technological specificity led to insecurity, creating role ambiguity and role conflicts, which leaders and members overcame to form interdependent relationships among individuals. The indication of such a process is a new finding, the practical implications of which are discussed.

Keywords: inter-organizational collaboration; AI consortium; trust propensity; willingness to collaborate; trust; role conflict; interdependence

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1. Introduction

Horizontal collaboration among firms has recently accelerated in Japan, occurring in unprecedented combinations that allow firms to flexibly and quickly adapt to changes in the external environment. Under these circumstances, several consortium activities have been actively conducted. A consortium is a community formed by multiple companies and organizations for a common purpose; consortium activities are increasingly forming new values, achieving various results.

For inter-organizational collaboration to succeed, trust must be fostered among organizations, starting from interpersonal trust before developing into inter-organizational trust (Kawasaki 2019). In the initial stages of inter-organizational cooperation, individuals with assumed roles associated with the expectations of their respective organizations encounter each other and exchange information, forming interpersonal trust. Research on inter-organizational trust through interactions among individuals (the starting point of inter-organizational cooperation) is essential to succeed in the search for inter-organizational cooperation.

The current research on trust formation factors in inter-organizational cooperation includes case studies in various cooperative organizational units; however, all successful case studies analyzed the results and achievements based on deep relationships built over time after inter-organizational cooperation (e.g., Lambright et al. 2010; Kawasaki 2019). Similarly, current research on trust-building factors in the initial stage of inter-organizational

cooperation only analyzed successful cases back to organizational formation (e.g., Renzulli et al. 2000; Bachmann and Inkpen 2011; Osaki 2019). The extant literature has largely overlooked the trust-building process from the initial stage of inter-organizational cooperation (before the relationship between organizations was established) to establishing a deep relationship and the details of the interactions between individuals leading to that point.

Therefore, this study focuses on consortium activities, which have recently attracted attention in sociology and business administration. We analyze cases of value-creating consortiums that form new standards, focusing on organizations formed shortly after the consortium establishment. We take this approach because the details of interactions among individuals in the initial stage of inter-organizational collaboration cannot be confirmed by retrospectively examining successful cases. Furthermore, many consortia for social implementation based on cutting-edge technologies have been launched; therefore, current studies focus on consortia based on cutting-edge artificial intelligence (AI) technologies. In particular, new technologies such as AI have little experience or history in social implementation. By their very nature, new technologies carry significant uncertainty regarding their feasibility and applicability. In this situation, we elaborate on the consortium participants' roles based on their respective positions and actions to overcome such uncertainty. Current research has largely overlooked interactions among individuals in an organization newly established as a consortium.

Based on the above, we explore the success factors in horizontal collaboration among firms that have never previously collaborated, taking the perspective of the trust-building process of inter-organizational collaboration. This study contributes to developing businesses that create new value through horizontal collaboration among firms in response to rapidly changing social needs.

2. Literature Review

2.1. The Role of Consortia

Consortiums are diverse in type and form, depending on the leading entity and the consortium's purpose. Consortia types can be broadly classified into public and private. Public consortia are mainly led by the national government, local governments, or commissioned entities, with public and private sectors working together to solve social issues. Private companies lead private consortiums, which involve collaboration between companies and multiple organizations (such as universities and other research institutes, companies in different industries, small and medium-sized companies and ventures, and national and local governments). Their diverse objectives include standardization and technological innovation through current research and development (R&D). In recent years, consortia have evolved from public to private networks (Hawkins 1999).

Consortium activities were developed in the United States in the 1980s, and consortia have recently been used for various purposes in Japan. Among private consortia in Japan, those in the information and communication technology (ICT) industry have been active for several reasons. First, a single company cannot set industry standards alone; increasing international competitiveness and obtaining a de facto standard can influence the profitability of each participating company. Second, technological innovation is extremely rapid, and one company alone cannot keep up with the pace of innovation (Yamada 2004). Even large firms with abundant management resources require considerable time and funds to achieve industry standardization and technological innovation. Therefore, cooperative areas among competing firms, such as DVD Forum and Wi-Fi Alliance, have gradually formed in the market. Consortia in the ICT industry includes groups focusing on industry standards, joint ordering and purchasing, R&D, social issues and regional solutions, and industry-government-academia collaboration for solving social and regional issues (e.g., Odagiri et al. 1997). Various other initiatives do not fit these frameworks. One primary goal of forming a consortium is to create a business ecosystem, which is a collaborative relationship to solve social and customer issues. Especially in recent years, ecosystems formed through digital ICT platforms have been increasing (Nakazawa and

Takagi 2021). Becoming a leader in a business ecosystem means gaining access to significant business opportunities.

Recently, countries have actively worked to increase their international competitiveness in AI. In countries worldwide, strengthening their AI R&D capabilities is an important element of national policy. To this end, countries promote various support measures to encourage collaboration among industry, academia, and public research institutions by establishing AI research institutes, networks, and collaborative platforms. Such promotional efforts encourage AI research, enabling private companies and research institutions to conduct innovative AI research and link it to business opportunities (Galindo et al. 2021).

This study focuses on Japan, where the AI Technology Consortium (National Institute of Advanced Industrial Science and Technology; AIST) promotes the development and diffusion of AI technology through collaboration among AI-related companies and organizations. Furthermore, the AI Social Implementation Promotion Committee (Information-technology Promotion Agency; IPA) conducts surveys and studies to promote the social implementation of AI. Finally, consortiums of private companies aim to co-create value in data utilization, each active for various purposes. A wealth of literature focuses on the motivations for establishing organizations in this type of inter-organizational collaboration related to cutting-edge technology; however, the reasons for firms joining consortia and the internal processes in the early stages have not been studied (Teubner et al. 2021).

2.2. Trust Building in the Early Stages of Inter-Organizational Cooperation

The initial stages of inter-organizational cooperation have been discussed from various perspectives. For example, Renzulli et al. (2000) argue that the probability of an organization being established increases when a formal network organization (such as an industry-recognized promotion body or official certification body) is involved from the initial formation stage. Furthermore, Bachmann and Inkpen (2011) discuss mechanisms for building trust in the early stages of inter-organizational cooperation. They find that institutions are vital and that certification and legal regulation are most effective at this stage. These previous studies focused on the organizational design in the initial stage of inter-organizational cooperation, especially at the time of establishment. Furthermore, Osaki (2019) focuses on social capital in inter-organizational collaboration, discussing the initial stage of collaborative collaboration by administrative corporations, nonprofit organizations, and private companies to solve social issues related to public administration.

Previous studies on inter-organizational collaboration generally agree that trust formation is essential (Donati et al. 2020; Guo et al. 2021; Schilke and Lumineau 2023). Inter-organizational trust significantly impacts performance, but distrust leads to high costs. Therefore, effectively building inter-organizational trust is essential (Guo et al. 2021). The starting factors for trust formation among organizations include economic rationality, shared objectives, and ideals based on shared experiences, norms, and individual trust regarding reputation and information. Moreover, if organizations have had previous contact, they are equipped with proximate social identities, shared values, and communication frequency (Kawasaki 2019).

In a study focusing on trust-centered social exchange relationships between leaders and members within their organizations, Whitener et al. (1998) found that leaders' trust tendencies—(1) behavioral consistency, (2) behavioral integrity, (3) shared control, (4) communication, and (5) concern and care—influence members' behavior. That is, the social exchange between leadership and creative and autonomous modes of behavior by members develops through trust.

This situation is also true in inter-organizational networks, where trust between individuals within an organization positively affects individual involvement (Donati et al. 2020), i.e., individual social ties are positively related to inter-firm trust (Zaheer and Harris 2005). Thus, inter-organizational relationships are a process with dynamic interactions (Dekker 2004; Majchrzak et al. 2015), and relational contexts such as cooperation, communication, and commitment are crucial in strategic management (Klimas et al. 2023).

The above literature primarily focused on cooperation between government-led network organizations with political coercive power, individuals with some personal connection in the past, or individuals who do not have personal contacts but are near each other regarding industries or areas surrounding their related work. A public-type cooperative network for social issues or a community of local businesses for regional revitalization can be considered an aggregation of organizations with a common purpose. For example, a cooperative network of administrative, nonprofit, and for-profit organizations may provide public services that the government cannot provide alone or through the market (Nakashima 2020). Such a network is considered to have a common purpose; therefore, behavioral norms can be easily established for the participating stakeholders. Furthermore, such a network is believed to have an environment that facilitates forming trusting relationships with consensus building, i.e., this is an environment where both parties are located in the same or nearby industries and can easily share common objectives and values. In contrast, this study targets value-creating consortiums that aim to create new value through collaboration among companies that have never cooperated; thus, these previous studies are challenging to apply.

2.3. Trust in Technology

Information technology (IT) research has examined how humans can trust IT (Söllner et al. 2012). Furthermore, studies on the initial trust of individuals exposed to new IT have shown that a better understanding of IT increases predictability and trust; thus, understanding technology promotes trust (Madsen and Gregor 2000). Previous trust studies of IT systems based on trust theory comprise two main components: cognition-based trust and emotion-based trust. Furthermore, cognitive-based trust comprises understandability and technical competence perceived by the IT system (Madsen and Gregor 2000). Thus, trust in technology also involves human emotional aspects. Janson et al. (2013) conducted an initial survey of users' trust in new mobile applications, discussing the quality and reliability of the information presented on mobile application screens. Thus, like trust between individuals, trust in technology can be viewed and analyzed as a "trusting" person and a "trusted" technology.

This paper examines a consortium that aims to solve social problems through the social implementation of AI, which is not yet widely recognized. It is impossible to see the breakdown of the AI's behavior; however, the AI's output can be seen as tangible results, meaning that the output quality can increase human users' trust in AI. Regarding its potential to take over some tasks humans have performed—AI will likely have a more significant impact on human emotions than other technologies.

2.4. Roles in Inter-Organizational Relations

Roles are the expected behaviors of each person in an organization, and roles are important. If individuals' roles in an organization are ambiguous or conflict with one's values or the roles of others, the organization may not function adequately, potentially creating conflict among people and increasing overall stress (Ueda 2003). Many previous studies have focused on the role of boundary linkers in inter-organizational cooperation. A boundary linker is an entity that represents a firm and contacts an external organization to link them between different organizational boundaries. In inter-organizational collaboration, boundary connectors often suffer from role conflict and ambiguity (Dong et al. 2016). Role conflict is the conflict between one's will and expected role due to the simultaneous appearance of two or more incompatible expectations (Biddle 1986). Role ambiguity refers to insufficient salient information to perform a role effectively. According to Kundu et al. (2019), empirical research on the relationship between employee role clarity and intrinsic motivation in firms positively relates to employee-perceived role clarity and creative and autonomous behavior patterns. Role–conflict positively affects individual performance, while role ambiguity reduces individual performance (Coelho et al. 2011).

The results of these previous studies can be applied to the aforementioned multiple roles of each person in the consortium, an external organization, and the company itself. A complex combination of issues can arise regarding collaborative activities in cooperation with external organizations. These include issues that can be solved by the company's organizational capabilities and problems that cannot be realized without the aid of the external organization. Thus, the company cannot control various problems directly in a consortium organization. To fulfill each role in a consortium organization, individuals must first understand their roles, referred to as role perception. Furthermore, role expectations are the beliefs held by others in the organization about what role that party should play. The party's perception of their role and the expectations of the surrounding people toward that party mutually influence each other (Ueda 2003). Thus, the members must correctly understand each other's roles in the consortium organization and either demand that the parties play that role or that the parties act on their initiative.

Open innovation research on value creation explores the human dimension, focusing on human interactions since humans cause innovation (Majchrzak et al. 2023). In value-creation situations, each individual has several roles in sharing their knowledge and bringing people together; however, a single person cannot simultaneously fulfill the required roles, nor can they be forced to play a specific role. This situation suggests that each person should be able to choose the role they feel they should most likely fulfill. In contrast, this study discusses that the roles are unclear in the early stages of consortium activities, where new value is created using highly uncertain, cutting-edge technology. It would be instrumental to use the analysis in this paper to discuss roles in the case of cutting-edge technology consortia.

2.5. Research Question

Inter-organizational collaboration allows businesses to respond quickly and flexibly to changes in the external environment, making it crucial in business development. This chapter discusses inter-organizational collaboration through the formation of consortiums as a way to quickly realize networks among different firms. Inter-organizational collaboration starts from trust among individuals, which, on the side of the consortium organizer and the participants, is essential to the success or failure of the activity in the consortium's initial stage.

Many previous studies have examined inter-organizational trust; however, most analyzed inter-organizational cooperation among firms with pre-existing relationships or proximity, such as affiliated firms with long-term business experience or local industry activation organizations (Wakabayashi 2006; Saito 2017). Therefore, the trust formation process is where the relationship between firms has not been established, such as in a value-creating consortium where new value is created by a new combination of firms.

Therefore, this study explores the success factors of horizontal inter-organizational collaboration among firms that have never collaborated. Prior studies have indicated that inter-individual trust is essential in inter-organizational collaboration, and the factors that form inter-individual trust in its initial stages have gradually become clear (McAllister 1995; Bachmann and Inkpen 2011; Kawasaki 2019). However, these studies all focused on successful case studies that retrospectively analyzed the outcomes and achievements based on deep relationships after the formation of inter-organizational cooperation. Therefore, this study sets the following three research questions.

The first research question is, "How is the rational trust that leads to the commitment of participants formed?" Consortiums are often established to solve social issues and provide social value; however, the actual themes of the technologies and business models covered in the consortiums are diverse, and each participant has different objectives and aims. Under these circumstances, the interaction process between the consortium management and the participants must be confirmed. This approach is based on each participant's thinking to recognize their organization's rational economics of cooperation and form rational trust

in the consortium organization. The previous research method of tracing successful cases does not allow us to confirm the details of such interactions.

The second research question is, "How do participants trust new technologies when exposed to them?" Previous studies on trust in inter-organizational cooperation discussed the process of trust formation between organizations and between people at the same time (Kawasaki 2019); however, they have not addressed trust in technology at the same time. Alternatively, trust in technology has been discussed in isolation; however, no studies have analyzed trust from multiple perspectives, such as trust in research interests (technology and business models), organizations, and people. Furthermore, research on trust in technology has focused on the quality of functions and outputs, ignoring nontechnical interrelationships. These factors include the company's reputation that developed the technology, trust in the introducer, and expectations about the technology's potential. Inter-organizational collaboration on new technologies is expected to expand; therefore, trust factors in "technology" should be considered simultaneously with trust toward the organization and people.

The third research question is, "In the initial stage of inter-organizational collaboration where uncertainty is high, what role will each person play in overcoming the uncertainty?" Cutting-edge AI technology, the central theme of this consortium, has a strong tendency toward uncertainty due to its technological characteristics. This uncertainty will increase the need for coordination and control among the consortium's multiple organizations, and each individual will take action to resolve the uncertainty. We will review the details of the interactions in such actions.

3. Method

Research has investigated factors that contribute to the formation of trust between individuals in the initial stage, which is the starting point of inter-organizational trust (e.g., Renzulli et al. 2000; Bachmann and Inkpen 2011; Osaki 2019); however, analyzing the details of the interactions between individuals involved in the process up to that point remains insufficient. Therefore, this study focuses on consortium activities, which have recently attracted attention in sociology and business administration. We conduct a case study of a value-creating consortium that aims to create new value through inter-organizational cooperation among companies in unprecedented combinations.

Figure 1 presents the analytical framework. Kato et al. (2016) define three phases in their case study of an R&D consortium: entry opportunities, value creation, and value dissemination. We focus on the interactions among the consortium organization operators and participants between the entry opportunity and value creation phases. The entry opportunity phase is defined as the phase of value formation. This study excludes the entry opportunity phase because a consortium organization always conducts activities to enhance its credibility (institutional credibility, competence, reputational credibility, etc.) and promote itself to the outside world. Participants trust the organization based on this information (with a tendency toward higher trust in the initial stage) given its affinity with their organization's objectives; thus, they join the consortium. Therefore, we believe that institutional and personal trust in the organization can be created through organizational design, and such trust may already be formed. Furthermore, we exclude the value formation and dissemination phases because many previous studies conducted research based on successful cases of consortiums and other achievements and results.

Given the above, this study focuses on the process between the entry opportunity and value formation phases. We analyze the interactions among the individual leaders and participating members of the working groups formed within the consortium. Working groups for each theme are often established simultaneously when a consortium is established. A working group is a place of collaboration and co-creation where participants with the will to realize the objectives of each theme gather and create the desired products through each other's activities. Through frequent communication among working group participants,

solutions to each theme and issue are realized; therefore, the working group is considered the source of interaction between individuals and the source of value formation.

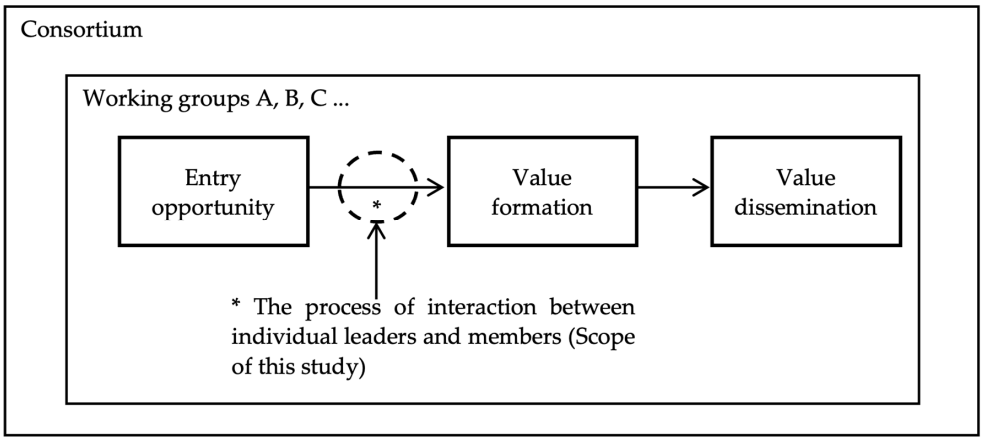

Figure 1. Analytical framework.

The research method is a qualitative case study to confirm the details of the interaction process among individuals. This study focuses on an Automated Negotiation SCM Consortium established in 2021, which has existed for about two years. The organizer was NEC Corporation (The Nippon Electric Company, Tokyo, Japan). This private-sector-led, value-creating consortium sees the optimization of supply chains in the manufacturing and logistics industries as a social issue, aiming to solve it using state-of-the-art AI technology. We chose this consortium for our research for several reasons. First, it is a horizontally cooperative consortium of private companies that have never collaborated. Therefore, we can confirm that trust is built from a state without pre-existing relationships. Second, this consortium organization has been recently established. Previous studies analyzed successful cases resulting from long-term activities; however, this approach does not allow us to confirm in detail the interactions among individuals in the initial stages of inter-organizational cooperation.

Semi-structured interviews were conducted with working group members. The constructs were structured using the steps for coding and theorization (SCAT) (Ohtani 2011), a method of analysis in which constructs are used to describe storylines, from which a procedure for describing theory is followed. This method is also effective for analyzing relatively small qualitative data. SCAT was chosen as the instrument of structured analysis because this study's subject is a single case in which the interactions between individuals are analyzed in detail. Table 1 presents the interviewees' respective purposes for participation and the reasons for their selection.

Table 1. Interviewees and reasons for selection.

	Interviewee	Purpose of Participation in the Consortium	Reason for Selection
Management member	Mr. M, Chairman of the Board of Directors	Establisher	He focused on strengthening the credibility of the organization.
	Mr. Y, Secretariat (Operation leader)	Substantive leader of the working group	He devoted himself to revitalizing working group activities.
Participant member	Mr. S, Member (Company P)	Introduction to the company and its suppliers	He developed initiative and a collaborative attitude.
	Mr. O, Member (Company S)	Introduction to own group and external sales	He had high expectations for the actions of other members.

(Interview period: December 2022 to May 2023).

4. Results and Discussion

4.1. Analysis Results

Figure 2 summarizes the analysis results, while Table 2 presents the details. Figure 2 shows that a collaborative will was developed between the leader and the participating members. This relationship was established due to the consistency, sincerity, concern, and high trustworthiness of the president and the leader on the management side of the consortium organization. Additional contributing factors include the change in awareness of the participating members due to their recognition of the consortium's economic rationality and legitimacy. Nonetheless, the project's central theme was social implementation using cutting-edge AI technology; therefore, the project's technological specificity placed uncertainty about the technology at the center of discussions between the steering leader and participating members. This situation created a role conflict for the leader to help the members overcome the uncertainty. Role ambiguity arose for each participating member because they were unclear about their own and each other's positions. The uncertainties could only be overcome by relying on others to promote the technical aspects and social implementation activities the company's organization could not conduct alone. Therefore, to overcome the uncertainty, the lead manager and participating members generated an interdependent relationship based on expectations concerning the other party's actions. After explaining the background of the AI consortium's establishment, the following describes the formation process of the interdependent relationship based on the will to collaborate among the participating members and the factors that led to this interdependence. Furthermore, based on the results of the research question analysis, we generated hypotheses regarding the formation of interdependencies in the early stages of the consortium.

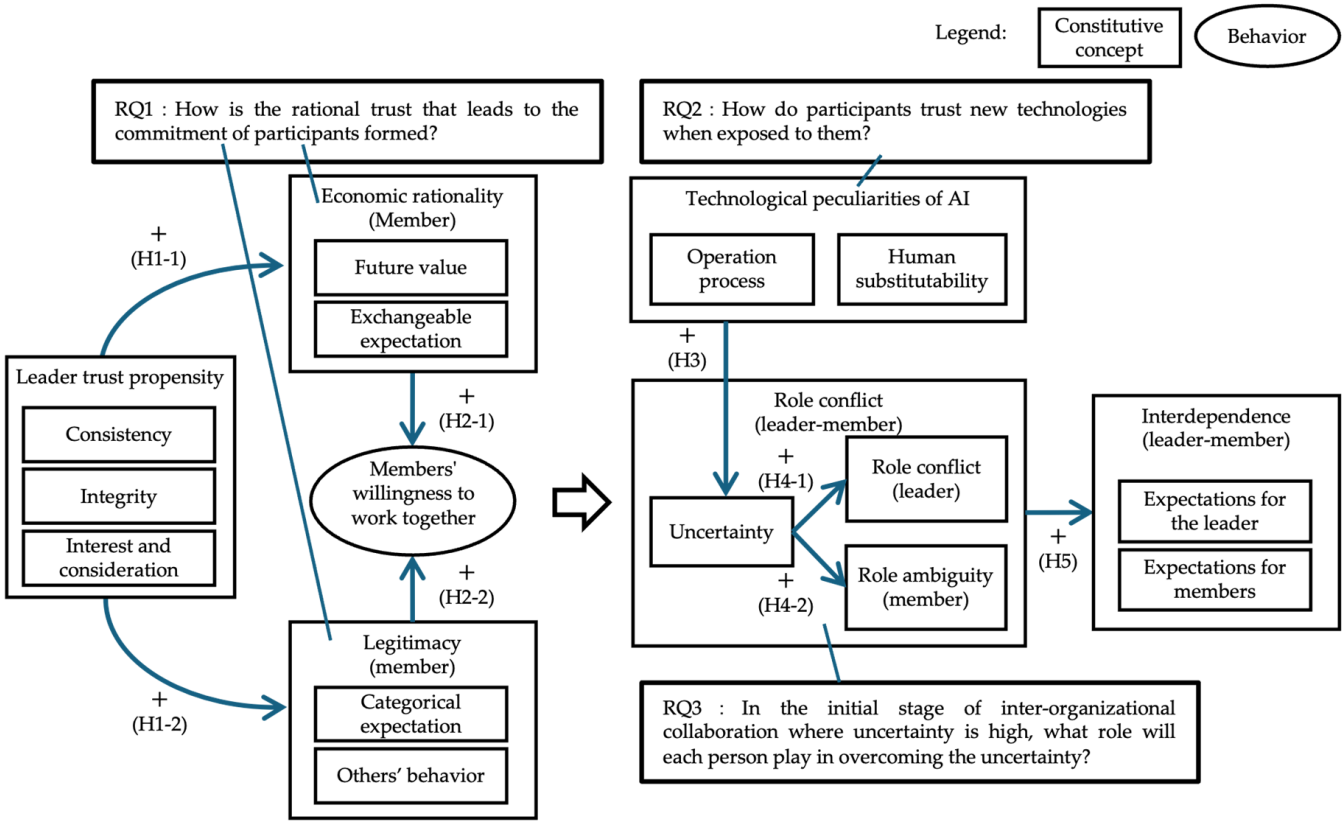

Figure 2. Processes leading to interdependence among individuals in the early stages of an AI consortium.

Table 2. Factors leading to interdependence in the early stages of an AI consortium.

Category	Subcategory	Description
Leader trust propensity	Consistency	The behavior of a leader who takes the initiative to achieve their original purpose
	Integrity	A leader who speaks the truth and keeps their promises
	Interest and consideration	A leader who takes an interest in and gives Individual consideration to each member
Economic rationality (Member)	Future Value	Anticipation of future value that will contribute to their organization
	Exchangeable expectations	Expectations of receiving special consideration by cooperating with the leader
Legitimacy (member)	Categorical expectations	Expectations of the roles they want others to perform based on information about the organization to which the other member belongs
	Other's behavior	Evaluate the legitimacy of your behavior through observation of other members' behavior
Technological peculiarities of AI	Operation process	Uncertainty about the process of AI output generation
	Human substitutability	Vague uncertainty about the ability of AI to replace human workers
Role conflict (leader-member)	Uncertainty	Uncertainty within the consortium organization due to the unique nature of the technology
	Role conflict (leader)	Conflicting or conflicting perceptions of roles
	Role ambiguity (member)	Lack of the tools and information necessary to carry out their roles
Interdependence (leader-member)	Expectations for the leader	Expectations about the actions of parties other than oneself who can implement solutions
	Expectations for members	

4.2. Background of AI Consortium Establishment

Mr. M, the chairperson of the board of directors, established The AI consortium to solve social issues by implementing cutting-edge AI technologies in private companies. Establishing the consortium promoted cooperation with international standardization organizations and industry associations and strongly appealed to the philosophy of solving social issues and advancing technology. As a result, the consortium increased its authority and gained support for its objectives and philosophy, attracting diverse member companies. Working groups were established in several fields following the social issues and objectives of companies participating in the consortium; thus, consortium activities were initiated.

4.3. Leader's Trustworthiness

Mr. Y, the management's secretariat, was the operational leader within the working group, facilitating the proceedings of the activities and making efforts to invigorate the discussions. He expected a lively exchange of opinions through proactive voices among the members, anticipating the networking effect of involving other outside companies by the participating members. The working group meetings consciously tried to create an atmosphere where it was easy to speak up.

Some members of the working groups were competitors; thus, they tended to avoid direct voices that could potentially disclose their organization's internal affairs in formal meetings. Thus, in-depth conversations were challenging when the members were all in one place; therefore, Mr. Y persistently explained the merits of the social implementation

of new AI technologies through dialogues with each member and during formal working group meetings.

Mr. Y and Mr. M also carefully shared information on the management of the consortium organization with each member. In this way, Mr. Y's behavior as a substantive management leader showed consistent actions to achieve the original purpose of the consortium. He was also aware of the differences in the degree of each member's understanding, thinking, and stance toward the consortium activities, confirming Mr. Y's interest and consideration.

In a study on trust-centered social exchange relationships between leaders and members within their organizations, Whitener et al. (1998) elucidated leaders' trust tendencies as (1) behavioral consistency, (2) behavioral integrity, (3) sharing and delegation of control, (4) communication (e.g., accuracy, explanations, and openness), and (5) demonstration of concern. These tendencies explain the influence of members' behavior, and similar trends were observed in the relationships within the consortium organizations. Thus, Mr. Y increased the credibility of the consortium organization by working with industry associations, subsequently acting in a highly trustworthy way as the operating leader. This situation positively affected the relationship between the leaders and members, fostering a willingness to collaborate among the members.

> *[Leader Y] We need to create one roadmap and develop this horizontally. (Omitted) I think we actually already have a grasp of the image. (Consistency)*
>
> *(Depending on the nature of each member's duties within the company) the expected effect will probably vary. (Interest and consideration)*
>
> *[Member O] I definitely trust that this other party (the consortium management) is going to do it. (Integrity)*

From the above, we derived the following hypotheses.

Hypothesis 1-1. *In the early stages of a consortium, members perceive the economic rationality of the consortium due to the leader's trust propensity*.

Hypothesis 1-2. *In the early stages of a consortium, members perceive the legitimacy of the consortium due to the leader's trust propensity*.

4.4. Willingness of Members to Work Together

Mr. M explained the consortium's purpose at its establishment, and individual dialogues with Mr. Y increased the trust of the participating members of the consortium organization. Some participating members recognized the economic rationale for involving their organizations, confirming no error in their recognition. They evaluated the legitimacy of their activities by directly asking about and observing other members participating in the consortium organization in the same position as themselves. This situation led to a desire for collaboration among some members, and they began to take action following their positions as members of the consortium organization.

Member S initially participated in the consortium to gather information under his organization's direction. Later, through repeated individual dialogues with the consortium organization's management, he recognized the future value, including a sense of expectation, which would benefit his organization. He thought that if his organization cooperated with the consortium, they would receive generous consideration from the consortium side immediately after its establishment. These expectations of the consortium members regarding an exchange relationship increased the will to devote time and effort to the consortium's activities. Furthermore, through dialogue with the other members, Member S confirmed the legitimacy of his activities in the consortium.

Member O participated in the working group; his organization had high expectations since the consortium was established. Although he trusted the other members participating in the consortium organization, he had doubts about the gap between his initial expectations

within his organization and the activities of the other members. He felt no compulsion to realize the social implementation the consortium aimed for since it is promoted mainly by consensus building among the working group members. The content, scope, and timing of social implementation depend significantly on the willingness of other members to collaborate; therefore, he evaluated the legitimacy of his activities in the consortium through dialogue with other members and repeatedly observed the level of their willingness to work and their behavior. Member O gathered facts about the other members' activities, reported how the consortium members thought and acted in response to his organization's high expectations, and tried to coordinate internally to deepen his understanding of the consortium's activities. While repeating such activities, his demand for the consortium management to encourage the other members to act and coordinate their actions increased. Furthermore, his expectations for the other members to act independently also increased.

[Member S] I think it would be very beneficial for us to participate in this project together. (Future value, exchangeable expectation)

[Member O] I had a direct conversation with other companies, asking them how they perceive conso-activities. (categorical expectation, others' behavior)

From the above, we derived the following hypotheses.

Hypothesis 2-1. *In the early stages of a consortium, members who perceive economic rationality will be highly willing to work together*.

Hypothesis 2-2. *In the early stages of a consortium, members who perceive legitimacy will be highly willing to work together*.

4.5. Uncertainty Associated with Technological Specificity

This study's analysis focuses on a value-creating consortium that sees the optimization of supply chains in the manufacturing and logistics industries as a social issue. This optimization is achieved using state-of-the-art AI technology; therefore, AI technology is always the center of content and discussions inside and outside the consortium.

Due to the technological specificity of cutting-edge AI (the central theme within the consortium organization), a tendency toward uncertainty was noticeable. The first uncertainty is the opaqueness of the AI process before output; AI's behavior cannot be visually captured, its reality is difficult to grasp, and a clear perception is impossible to obtain. The second uncertainty is a vague sense of insecurity about the ability of AI to replace humans. For example, AI will replace conventional human operations, such as automating a company's conventional operations. In this study's consortium, a computer screen for demonstrations was created from the organization's beginning to provide a more concrete image of the application; this demonstration was easy to understand even for non-specialists. Through these efforts, even individuals who had just joined the consortium had a strong sense of functional confidence in AI technology; however, unease remained concerning whether AI could be applied in actual situations and replace conventional operations.

Thus, uncertainty about the implementation of the project increased in the consortium, resulting in insecurity among consortium members, which has become a significant concern in the management of consortium organizations. A better understanding of new technology increased predictability and trust on the part of humans; however, this trust only applied to functionality and output quality (Madsen and Gregor 2000). Nonetheless, the consortium members in this study had functional trust in AI technology. Technological trust studies discussed only the functional quality aspect; conversely, uncertainty about AI's operating process is difficult to see until its output is generated. Vague apprehension about the human-replacement capability of AI is more influential on trust formation. The results show that uncertainty about AI's output generation process is more influential on trust formation.

Furthermore, since significant uncertainty was generated in the consortium's management, role conflicts arose among the leaders and members to overcome these conflicts.

> *[Member S] I didn't know at all how the AI would think and decide what to do. (Operation process)*
>
> *[Member O] I am sure that everyone will feel no sense of discomfort. It is comparable to working with humans or with AI. (Human Substitutability)*

From the above, we derived the following hypothesis.

Hypothesis 3. *The technological particularities of AI lead to a perception of project uncertainty among consortium members.*

4.6. Role Conflicts Associated with Uncertainty

The counter-functional aspect of organizational conflict has been emphasized, which hinders organizational effectiveness; however, the functional aspect of conflicts has also attracted attention (Ueda 2003). Conflicts are a natural occurrence in groups where people with different perspectives and objectives gather; healthy conflicts enhance the effectiveness of group decision-making.

The participants recognized several problems and solutions to the emerging uncertainties, which exceeded their roles. They began to demand actions from parties other than themselves who could implement the solutions. If such expectations cannot be met or the conditions for meeting them differ, the individual making the request becomes emotionally anxious and dissatisfied. Therefore, based on each person's willingness to collaborate (fostered in the initial stage), the participating members approached others to solve the problem. They aligned themselves with the intentions of their organization to find a solution since they had positions associated with their organization's expectations.

Kondo et al. (2020) and Oura (2021) confirm a role–conflict model between those in contact with external organizations in the buyer-seller relationship and a principal–servant relationship in sales transactions. In this case, both parties have a principal–servant relationship of buyer and seller. The external pressure for continuous transactions causes the weaker party in the power balance to overcome the role conflict, resulting in a concession. Conversely, the conditions differ substantially in this study, which targets horizontal collaboration utilizing a private consortium on an equal footing, with no strong or weak power relationship in the transaction. In the studies mentioned above, one person in a position to contact an external organization had both role ambiguity and role conflict, the strengths and weaknesses of which were not clarified. Conversely, depending on each person's position in the working group, the administrative leader in this study showed a strong tendency toward role conflict, and the participating members showed a strong tendency toward role ambiguity.

> *[Leader Y] If I were to do it, it would probably not be allowed in my position. I'm doing something totally unrelated to that. (Role conflict)*
>
> *[Member O] I think I have to do it, but there is nothing I can do. I don't know what to do. (Role ambiguity)*

From the above, we derived the following hypotheses.

Hypothesis 4-1. *Uncertainty in consortium projects causes role conflicts for leaders.*

Hypothesis 4-2. *Uncertainty in consortium projects causes role ambiguity for members.*

4.7. Interdependence

Significant operational uncertainties in the consortium organization between the steering leader and the participating members or among the participating members resulted in role-based conflicts based on the participants' respective positions. Recognizing the

numerous problems and solutions that exceeded the control of each role, individuals made demands with behavioral expectations of parties other than themselves who could implement the solutions. Whether they could take corresponding actions depended on the actions of others, the organizations they belonged to, and the actions surrounding them. It is impossible to control the actions of other companies and the environment surrounding them only through the actions of one individual or their organization. Based on the desire to cooperate fostered in the initial stage, each management leader and participating member approached others to solve problems and find clues for solutions by aligning their intentions with those of their organizations.

> *[Leader Y] Considering the application of the system, we have a meeting (with members) about once a week. I think we need to do something similar to this (with other members) to spread the idea. In this way, little by little, we have gradually developed a kind of modularization. (Expectations for members)*
>
> *[Member S] How much can be covered (by AI technology)? How far can it cover? I would like to confirm not only the development but also the actual operation in the future. (Expectations for the leader)*
>
> *[Member O] I think it would be good if you could talk more frankly with me. (Expectations for the leader and members)*

From the above, we derived the following hypothesis.

Hypothesis 5. *Role conflicts between leaders and members raise expectations for each other and form interdependence.*

The rest of this section presents inferences about the interdependence relationship. First, for problems the company's organization cannot solve, the company expects (and demands) others who can fulfill the expected role. For problems individuals recognize as their role to solve, they act to fulfill their obligation. For this purpose, a system and atmosphere must be created where the individual and the people around them can correctly recognize each person's role (Ueda 2003). When the leader and consortium members understand each person's role as an organization, a strong relationship of dependency with the other person may lead to behavioral and even execution aspects. This relationship is considered healthy and interdependent. Based on mutual understanding and recognition of each other's role expectations, behaviors that meet those expectations are expected to accumulate and establish a trusting relationship.

4.8. Supplementary Analysis

Because this study's sample of interviewees was small, supplemental analyses were conducted to confirm the reliability and validity of the findings. Specifically, we analyzed the success stories of another working group activity in ICT, in which approximately 20 companies participated. This approach can further validate the results obtained from the interviews described above.

In this working group in the ICT field, the roles of each member were unclear at the beginning of the activity. As the leader led the activity and showed this attitude to the members, the roles to be played by each member became apparent. As a result, the members could assign roles to each other and move to autonomous activities, thereby establishing commitment. Below are the actual actions taken by one leader and two members.

The leader, Mr. A, created an atmosphere that made it easy for each member to speak up at the start of the activity; however, since the participants were from competing companies, they avoided making in-depth statements. Therefore, Mr. A established a common theme that all members could generally understand, which helped them think about their own company's issues and recognize the economic rationale they believed would solve their company's problems. As a result, in-depth statements and lively discussions centered

on the common issues progressed, and gradually, common issues and objectives were clarified among the members.

Member B initially participated in the consortium to gather information, but through Mr. A's leadership, his trust in Mr. A deepened. Member B could also find values similar to his own in the place. This situation led him to perceive a sense of empathy for the working group and an economic rationality that would benefit his organization. As the activities progressed, his role within the group became increasingly evident, and other members nominated him as the team leader. He then felt fulfilled by the interdependent relationships among the members and had relational trust in them. As a result, common terms were created among the members, and active discussions were held within the group.

Member C joined the working group at the direction of the company. When he first joined the group, he did not know anyone and was the youngest member. His initial purpose was to gather information; however, he and the other members were close in their positions within their respective organizations, and they found a shared set of values. Member C also recognized the economic rationale for the benefit of his organization when he realized that the knowledge system he had gained from the project could also help his company. As a result, Member C volunteered to take on a role in the working group and built relationships with other members, which helped him develop a sense of ownership of the working group. He also developed a sense of trust in Mr. A's leadership, and by taking his role as a role model in creating an environment conducive to conversation, Member C further deepened his trust in the relationship with the other members.

This complementary case study is in the early stages of working group activities. In this case, individuals had institutional trust in the organization and cognitive trust in the technology handled. Then, many members in the place had trust in the leader and perceived the economic rationale of the benefit to their organization. From there, the discussion among the members was active, and they began to see the roles that each other played within the working group. This situation led to the development of commitment and autonomy among the members as the leaders assigned or offered roles, which is a successful example that ultimately led to relational trust.

The result might have differed if fewer members had rational trust in the company's merits. Furthermore, even if members with economic rationality exist, they may be bound by a closed, interdependent relationship with the leader. Each member's role would not arise in such a case, and interdependence among members would not be created.

Since this case study is an activity in the ICT field, it is not as technologically specific or uncertain as AI; however, the process identified here also applies to the results of this paper. Therefore, this study has a certain degree of applicability to other cases.

4.9. Summary

We examine a case of inter-organizational collaboration shortly after establishing a consortium, confirming the details of the interaction between individuals in the initial stage of inter-organizational collaboration.

First, establishing the consortium raised institutional and personal trust in the organization and its technology by vigorously strengthening cooperation with international standardization organizations and industry associations. As a result, various member companies gathered and began activities.

The chairperson and the steering leader on the consortium organization side ensured that the participating members shared their objectives and deepened their understanding of AI technology. They also showed interest in understanding the purpose of each member's participation in the working group, AI technology, and the merits of social implementation. They showed sincerity in carefully sharing the consortium organization's management situation to eliminate any uneasiness among members. These highly trustworthy actions positively affected the exchange relationship between the leader and the members, increasing the members' will to participate. Economic rationality and legitimacy encouraged the participating members to cooperate.

The consortium's theme was the social implementation of cutting-edge AI technology and the extremely high technological specificity of AI-generated uncertainty among participants, which was a significant concern. Leaders and participating members identified role conflicts between the two positions within the consortium and their organizations. They cooperated to find a solution consistent with their organizations' intentions, including problems that depended on the actions of other participating members, which they could not control solely through their actions or those of their organizations. In the process, healthy interdependent relationships were established by making demands with behavioral expectations of parties other than themselves who could implement the solutions.

5. Conclusions

5.1. Academic Contributions

Case studies have examined the factors that form trust in inter-organizational cooperation in various cooperative organizations. All were studies of successful cases based on business relationships established over a long period after the formation of inter-organizational cooperation (Wakabayashi 2006; Saito 2017). The same was true for trust-building factors in the initial stage of inter-organizational cooperation, where the results were mainly based on analyzing successful cases from the organizational formation (Kawasaki 2019).

This study differs significantly from the scope of previous research. First, we focus on a recently-established organization. Few studies have focused on interactions among individuals in organizations that have not been established. Previous research methods trace successful cases and cannot confirm the details of interactions between individuals in the early stages of inter-organizational collaboration. Second, this study's central theme is advanced AI technology, which is highly technology-specific. We elaborate on how the individuals in the consortium recognize their role conflicts, think and act to overcome them, and reach interdependence when facing uncertainties arising from the technological uniqueness of AI.

The first research question was, "How is the rational trust that leads to the commitment of participants formed?" The chairperson and steering leader tried to explain the shared objectives of the consortium organization and their understanding of AI technology to each participating member. They showed interest in and consideration for the cognitive aspects of the benefits of AI implementation for each member who accepted the explanation. These trustworthy actions of the chairperson and administrative leader positively impacted the exchange relationship between leaders and members, leading to a desire and willingness to collaborate among members and between leaders and members. Economic rationality and legitimacy were identified as factors forming the members' willingness and will to cooperate.

The second research question was, "How do participants trust new technologies when exposed to them?" Cutting-edge AI is characterized by an extremely high degree of technological specificity. The members' functional trust in AI technology was strong initially; however, some members' discussions deepened within the working group. From the beginning of the consortium organization, a mixture of functional trust existed in the technology. As the discussion deepened, a sense of uncertainty and unease about AI technology surfaced regarding the operating process for AI and its ability to replace humans. These technological peculiarities led to operational uncertainties in the consortium organization. Furthermore, this became a significant concern in the consortium organization, where uncertainty was more critical to the consortium members than their functional trust in the technology.

The third research question was, "In the initial stage of inter-organizational collaboration where uncertainty is high, what role will each person play in overcoming the uncertainty?" Significant operational uncertainties arose between the steering leader and the participating members or among the participating members. Role conflicts were identified as each person's position to overcome these uncertainties. Individuals recognized several problems and solutions beyond the control of each person's role alone, making

demands with behavioral expectations on parties other than themselves to implement the solutions. The ability to take corresponding actions depended on the actions of others and the actions of their organizations. It is nearly impossible for an individual or their organization to control the behavior of other companies and the environment surrounding them. Therefore, we worked with others to solve problems based on each person's willingness to cooperate (fostered in the initial stage) and sought clues to solve problems by aligning with the intentions of the company's organization. Prior research focuses on the role–conflict model perceived by individuals in contact with external organizations in the buyer-seller relationship that have a principal-seller relationship in sales transactions (Kondo et al. 2020; Oura 2021). In previous studies, the weaker power balance in the principal-seller relationship in a transaction had role ambiguity and role conflict alone; however, in this study, the tendency differed by position, with leaders showing a stronger tendency toward role conflict and members showing a stronger tendency toward role ambiguity.

The above three points are unique findings of this research on AI consortiums in the start-up phase. In particular, forming interdependent relationships among individuals through role conflicts caused by technological uncertainty is a new finding.

5.2. Practical Implications

This study's practical significance is to derive the formation process and factors of inter-organizational trust in the initial stage of consortium establishment, which are required for a successful consortium among private companies. We selected a newly established consortium organization, focusing on the interactions among the participating parties. This study targets trust in cutting-edge AI technology with a high degree of technical difficulty, in addition to the trust in organizations and people in previous studies. We also included technology as a partner trusted by individuals since AI involves uncertainty due to its extremely high technological specificity. Technology is also a factor in forming trust among individuals in consortiums with advanced technology as the theme. Previous studies on inter-organizational trust formation factors have been unable to explain interactions in more complex situations.

Each person's role as an organization is naturally ambiguous immediately after participation in the consortium; however, it is necessary to make such roles clear and mutually consistent in deepening collaborative activities. At the same time, it is necessary to create a system and atmosphere in which individuals and people around them can correctly recognize their roles (Ueda 2003). The consortium in this study is a horizontal inter-organizational collaboration led by the private sector; no master-servant relationship exists between the two parties, and no institutional compulsion occurs. Moreover, the consortium deals with the advanced technology of AI as a theme and involves an extremely high degree of uncertainty; therefore, individual human-role conflicts are inevitable.

In a private consortium involving such advanced technologies, the following two initiatives must be implemented based on a collaborative attitude of both leaders and members. First, the leader must overcome role conflicts. Specific actions include assigning expected roles to each member through detailed individual dialogues with members, confirming the roles of other members, and encouraging coordination among members. Second, action must be taken to alleviate the ambiguity of each other's roles through cooperation between leaders and members or among members. Each member should perceive their role, fulfill their expected role, and solve the problem. For this purpose, building a relationship among members is imperative, enabling them to request others to act following their role expectations.

5.3. Limitations and Future Research

Value-creating consortia create new value through horizontal collaboration among an unprecedented combination of companies, which is becoming increasingly important. Since the companies involved in these consortia have different origins, they must overcome various conflicts to advance their activities, increasing interdependence. Through

this experience, intercompany collaboration moves to the next stage, strengthening the trusting foundation between the companies. This study analyzed the interactions between individuals in the initial stage, using an ongoing organization soon after the consortium formation as our research subject. As a result, this study elaborated on the process leading to a healthy interdependent relationship to overcome the role conflicts that each individual recognized as their position in their organization. Few studies have focused on interactions among individuals in organizations that formed and built over time a new consortium.

Nonetheless, we only tracked a single interaction group in the consortium. In actual consortiums, the consortium members are influenced by multiple interacting groups. In a closed network created through consortium activities, when a trust relationship is formed bilaterally among members through sequential interactions, the trust relationship eventually spreads to third-party members (Lambright et al. 2010). Therefore, a method to track the propagation of trust relationships to third parties could be a potential topic for future studies.

Moreover, the consortium was established recently; thus, we could only observe the process of building a healthy, interdependent relationship. Further analysis over an extended period could reveal more about the success mechanisms in private consortiums with flat relationships.

Furthermore, due to the circumstances of the research collaborators, this study was based on a small sample of four interviewees. Although we addressed this by conducting a supplementary analysis, the results were still influenced by the characteristics and experiences of the specific sample, which may have been too specific to those situations. Therefore, limitations may exist in generalizing the hypotheses derived in this study. As such, future research could conduct quantitative surveys and verify the general pattern through statistical analysis.

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